No. 833,765. PATENTED OCT. 23, 1906.

M. G. VOIGTLANDER.

SIGNAL SYSTEM FOR RAILWAYS.

APPLICATION FILED NOV. 14, 1904.

5 SHEETS—SHEET 1.

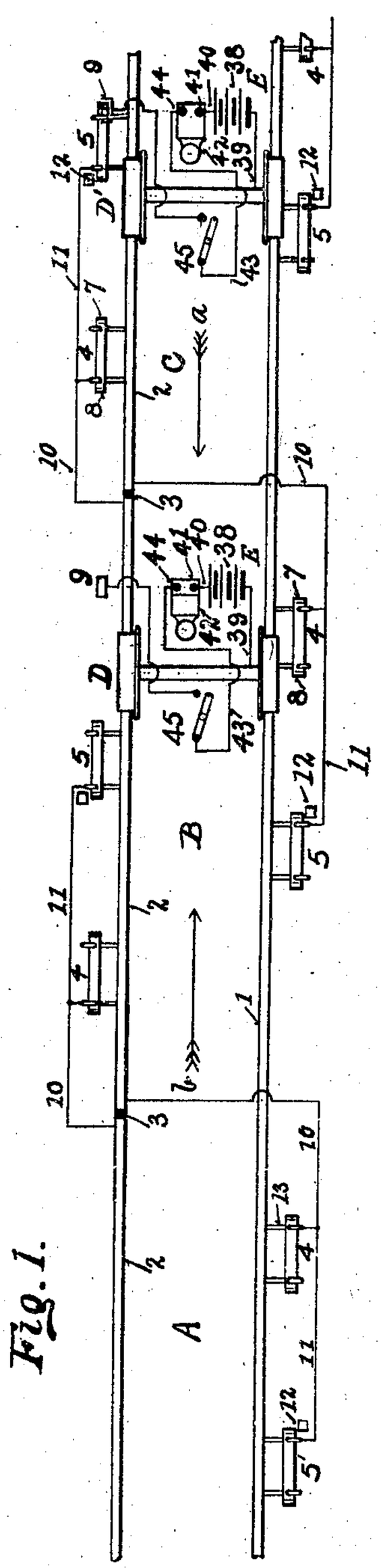

Fig. 1.

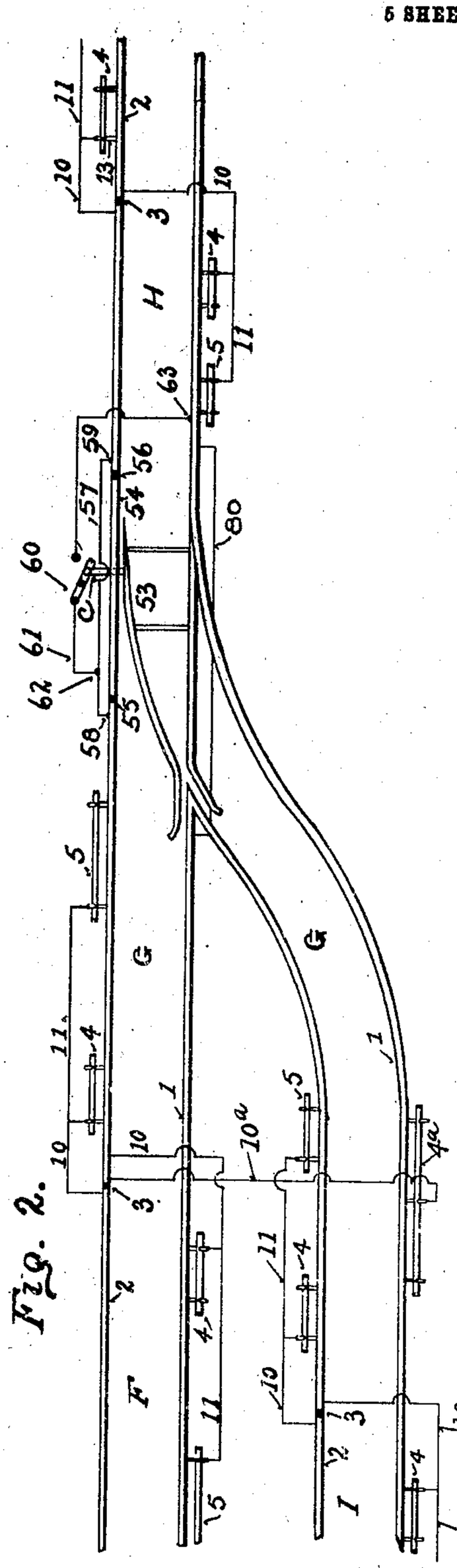

Fig. 2.

Witnesses:
Theodore C. Jung.
Fred Abel

Inventor:
Maximillian G. Voigtlander,
by A. D. Babcock, His Atty.

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5 SHEETS—SHEET 2.

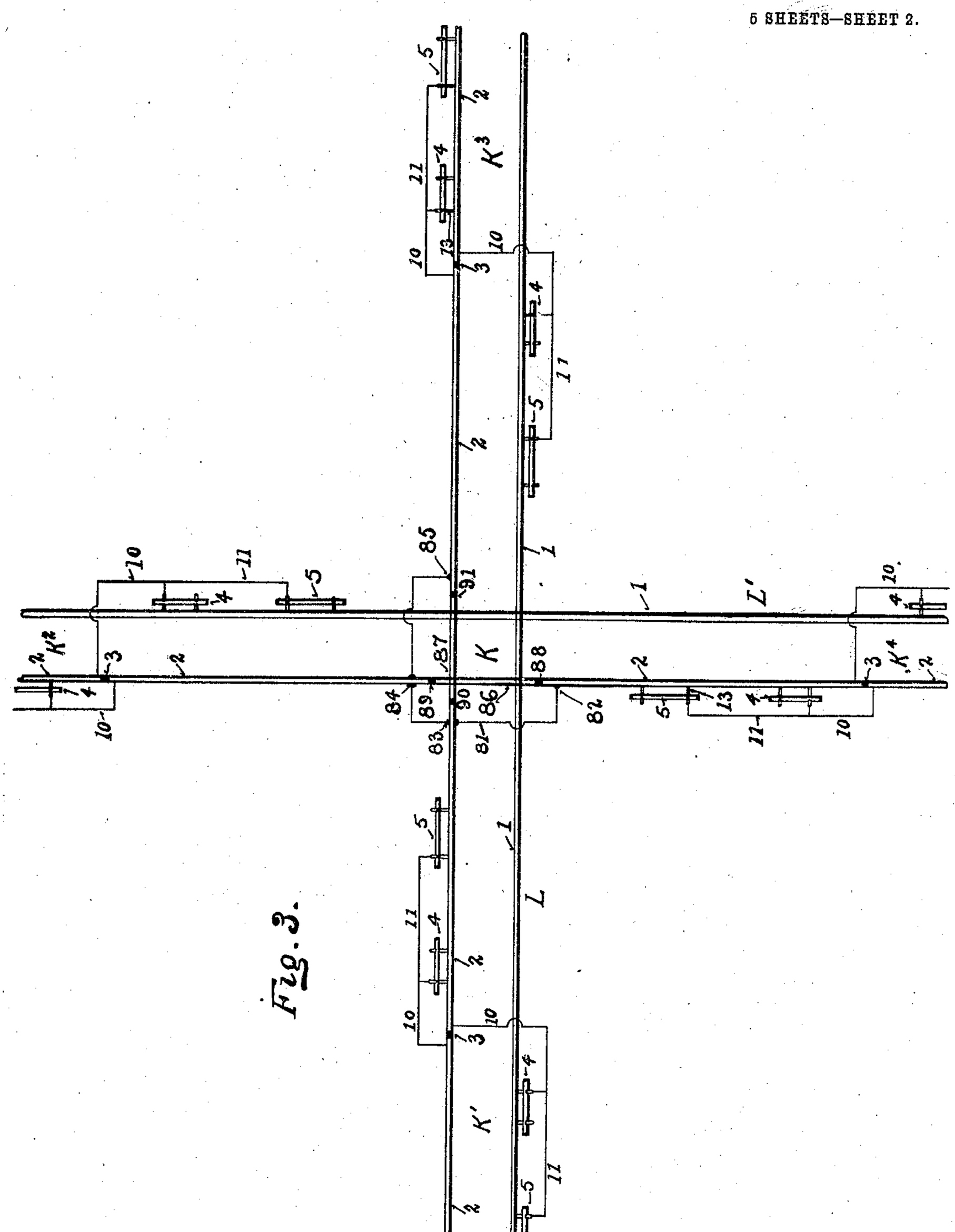

Fig. 3.

Witnesses:
Theodore C. Jung.
Fred Abel

Inventor:
Maximilian G. Voigtlander,
by A. F. Dahlgren His Atty.

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M. G. VOIGTLANDER.

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5 SHEETS—SHEET 3.

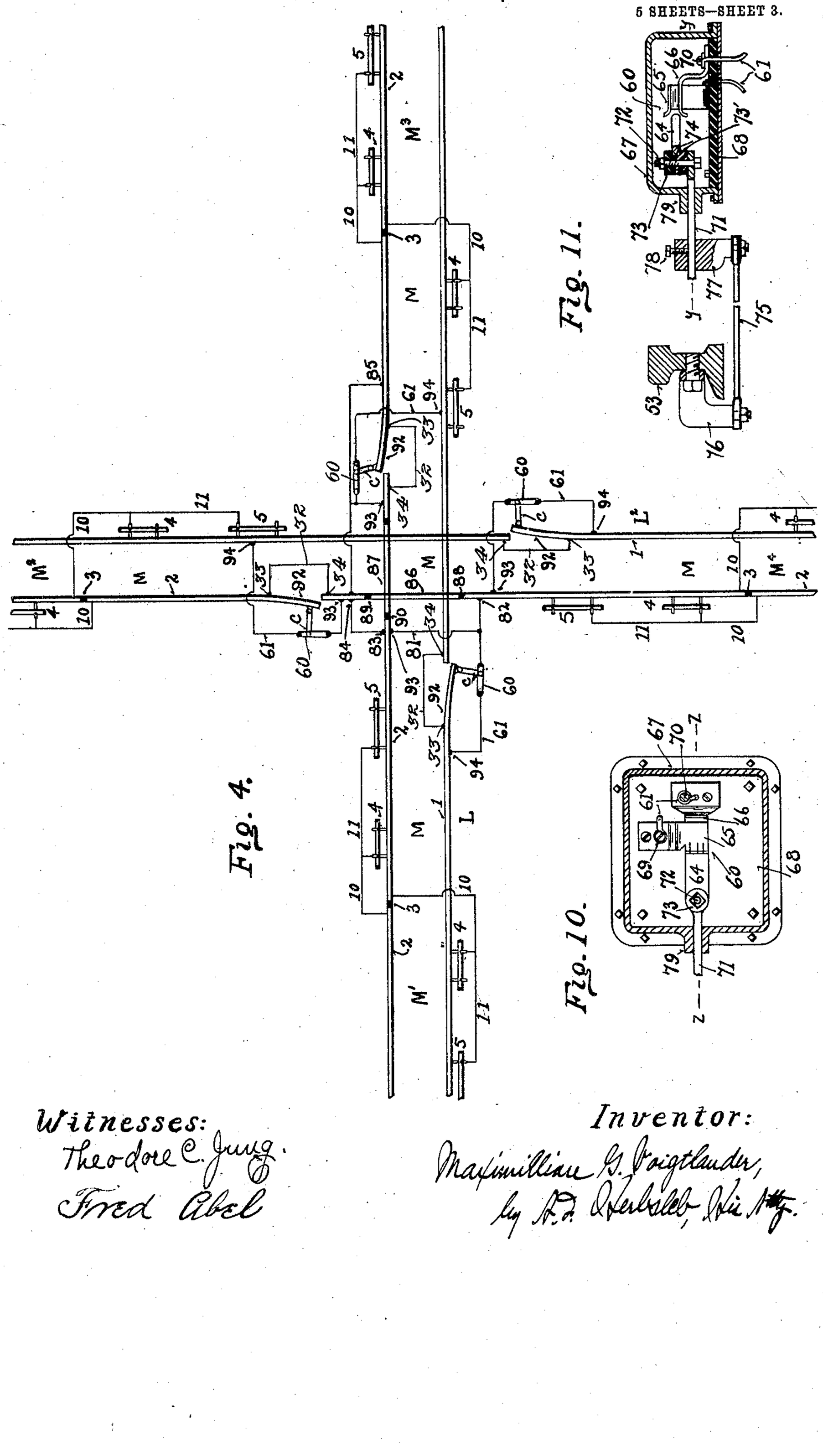

Fig. 11.

Fig. 4.

Fig. 10.

Witnesses:
Theodore C. Jung.
Fred Abel

Inventor:
Maximilian G. Voigtlander,
by A. D. Herbolsheimer, Atty.

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M. G. VOIGTLANDER.

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5 SHEETS—SHEET 4.

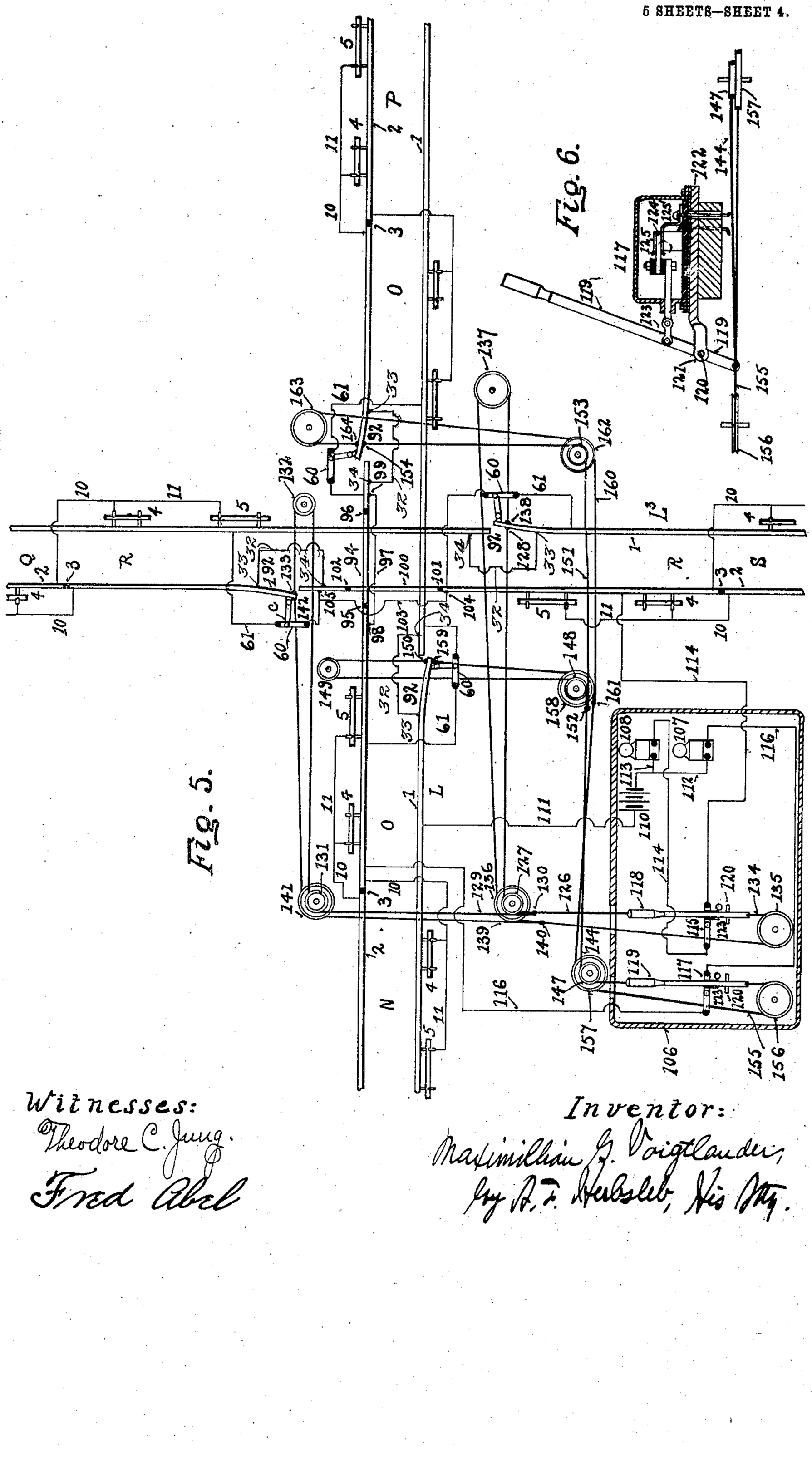

Fig. 5.

Fig. 6.

Witnesses:
Theodore C. Jung.
Fred Abel

Inventor:
Maximillian G. Voigtlander,
by R. F. Hebsleb, His Atty.

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M. G. VOIGTLANDER.

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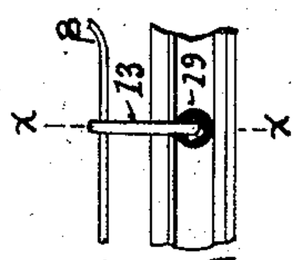
5 SHEETS—SHEET 5.



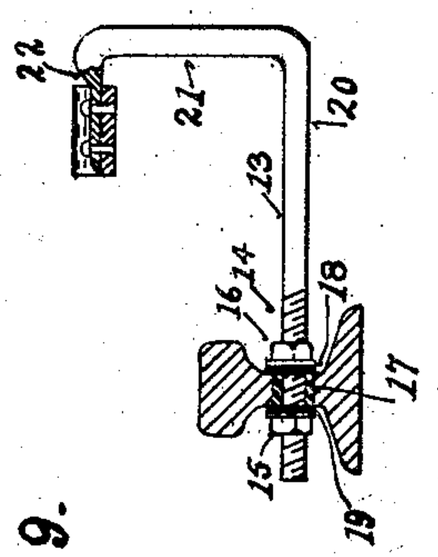


Fig. 9.

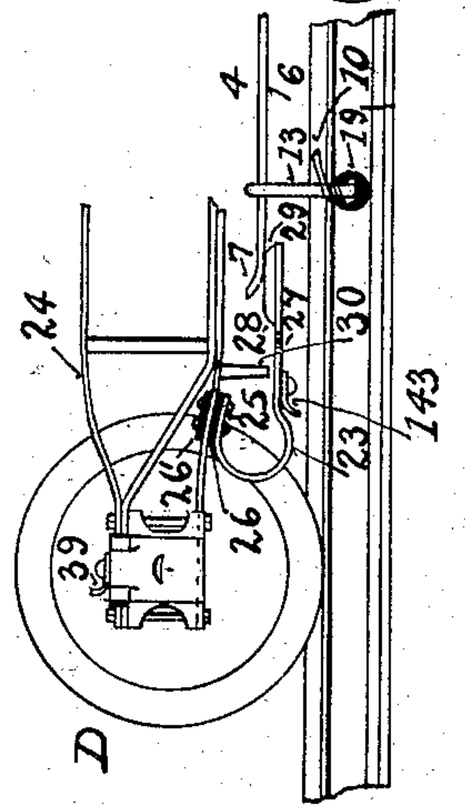


Fig. 8.

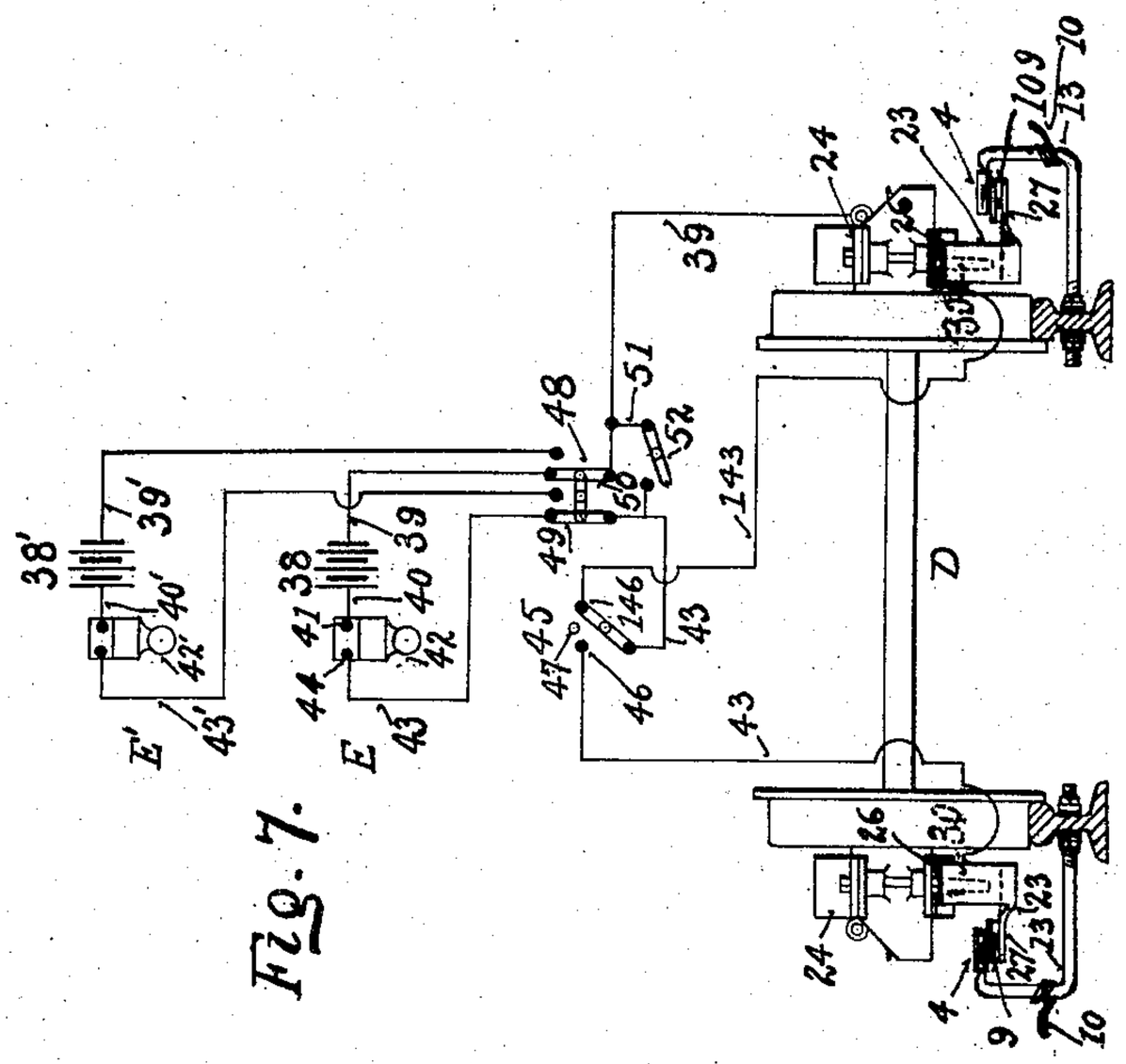


Fig. 7.

Witnesses:
Theodore C. Jung.
Fred Abel

Inventor:
Maximillian G. Voigtlander.
by A. F. Harksleb, Atty.

UNITED STATES PATENT OFFICE.

MAXIMILLIAN GEORGE VOIGTLANDER, OF HARRISON, OHIO, ASSIGNOR OF ONE-THIRD TO OWEN W. GRUBBS, OF HARRISON, OHIO, AND ONE-THIRD TO ABRAHAM L. WEEKS, OF HARRISON, INDIANA.

SIGNAL SYSTEM FOR RAILWAYS.

No. 833,765. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed November 14, 1904. Serial No. 232,678.

To all whom it may concern:

Be it known that I, MAXIMILLIAN GEORGE VOIGTLANDER, a citizen of the United States, residing at Harrison, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Signal Systems for Railways, of which the following is a specification.

It is the object of my invention to provide a signal system for railways in which the railway is divided into signal sections or blocks and in which the occupancy or derangement of a given section or block may be tested from the train, car, or vehicle upon the railway; and the invention consists partly in devices for accomplishing this purpose.

My invention consists, further, in so arranging the rails that one of the rails forms an electrically-continuous rail, while the other rail is insulated into blocks or sections; further, in providing for electric overlapping of sections or blocks; further, in providing for electrically overlapping sections or blocks at both ends thereof, so that notice of the occupancy or derangement of a preceding section or block may be received upon a locomotive, car, or vehicle proceeding in either direction along the track; further, in providing means whereby notice of the occupancy or derangement of adjoining blocks of adjoining main or siding or crossing tracks may be imparted upon the vehicle; further, in providing novel means whereby notice of the occupancy or condition of a crossing-block may be imparted at a signal-tower; in novel means for manipulating the respective crossing tracks by the tower apparatus, and thereby affecting the tower-signal therefor, and in novel means for notifying the tower-operator of the continuance of occupancy of either track by a vehicle and the departure of said vehicle from said blocks; further, in providing means for testing the condition of the signal apparatus upon the vehicle; further, in novel means provided on the vehicle for testing occupancy or condition of a given block, and, further, in the parts and in the construction, arrangement, and combinations of parts hereinafter described and claimed.

In the drawings I have illustrated my improved signal system as applied in various relations and under various conditions presented in the operation of a railway, although it is obvious that other conditions may be presented and other arrangements than those shown may be employed within the spirit of my invention. I have shown and described my invention as applied, primarily, to a single-track railway. It is obvious, however, that the same may be applied to a multitrack railway, and the necessary connections for the latter may be readily ascertained from the description and drawings by one skilled in the art.

Figure 1 represents a plan view of my improved signal system as applied to a single-track railway with vehicles upon the track, showing the signal apparatus on the vehicle diagrammatically in simple form. Fig. 2 is a plan view of my improved system, taken at a siding or switch and showing the electric connections diagrammatically. Fig. 3 represents a plan view of a single-track-railway crossing in my improved system. Fig. 4 is a plan view of a single-track-railway crossing in my improved system provided with a derail at each side of the crossing and electric connections for the same. Fig. 5 is a plan view showing a crossing of single tracks in my improved system with derails therein in connection with a stationary signal station or tower. Fig. 6 is a detail in side elevation, partly broken away, showing the tower-lever connections. Fig. 7 is an end view showing the local and traveling contacts in duplicate ands howing diagrammatically the signal apparatus on the vehicle in duplicate, with means for short-circuiting the same on the vehicle for testing said apparatus and means for causing electric circuit through either of said duplicate signals. Fig. 8 is a side elevation, partly broken away, showing the manner of mounting the traveling or vehicle contact and the stationary or trackage contact. Fig. 9 is a detail in section on the line $x\,x$ of Fig. 8, showing the manner of mounting the track-contact. Fig. 10 is a plan view of the electric switch for the movable rail, with the casing thereof in section, on the line $y\,y$ of Fig. 11. Fig. 11 is a vertical cross-section of the same on the line $z\,z$ of Fig. 10, also showing its connection with the movable rail.

Referring to Fig. 1, A B C represent three blocks of a single-track railway. The rail 1 is an electrically-continuous rail, preferably electrically bonded at the joints, and forms one of the electric conductors for my improved block system. In the form shown it constitutes one of the conductors for forming the circuit for passing through the signal on the vehicle. The rail 1 is common to all the blocks. The rails 2 2 2 represent the block-rails of the respective blocks. They are insulated, as shown at 3, for forming the blocks. Preferably at the entrance of a block, at both ends thereof, especially in a single-track railway, there is a contact-plate 4, hereinafter called the "home" contact-plate, and distant therefrom there is preferably a contact-plate 5, hereinafter called the "distant" contact-plate. These contact-plates have an electric contact-surface 6 presented downwardly for protecting the same from sleet, snow, ice, and dirt. The plates have curved ends 7 8 for readily receiving the contact-brush 9 on the vehicles, which latter are shown at D D'. The home contact-plate is electrically connected with the block-rail in advance thereof by an electric conductor or wire 10. The distant contact-plate is also electrically connected with the block, in advance thereof, as by having a conductor 11 connected therewith and to conductor 10, as shown in Fig. 1, or the conductor 11 may be connected with the home plate. The conductors 10 and 11 may be carried on poles or under ground or in other suitable manner. The track contact-plates are located alongside, but insulated from, a given block and have electric connection with the block in advance, so that electric connection may be made therefrom to the signaling apparatus on the vehicle, while in the given block for sounding or testing the presence of a vehicle in or the derangement of the block in advance to insure that said block in advance is clear and that the vehicle may safely enter thereinto and to indicate whether the switches and derails therein are closed. The track contact-plates for a block in advance are preferably located at the right of the preceding block. Thus, referring to Fig. 1, the contact-plates for block A for a vehicle traveling in the direction of the arrow *a* are located alongside block B, while those for block B are located alongside of block C, although it is obvious that the connections can be so made as to have the contact-plates overlap into any preceding block. For a vehicle traveling in the direction of the arrow *b* the contact-plates for the block C are located alongside block B, while those for the block B are located alongside block A, the wires 10 in this instance taking past the rail 1 in order to make connection with the block-rail. These track contact-plates form local contacts for a given block located in some other block. In practice these blocks may be of any desired length, and, if desired, the home and distance contact-plates may be united for forming a continuous contact-plate; but for purposes of economy I prefer the construction shown. For instance, the blocks may represent a mile in length, and the home contact-plate may be so located that electrical connection will be maintained with the signal apparatus on the vehicle until the first wheels of the vehicle are about to enter upon the block in advance, so that electrical connection may be maintained with the block in advance until the instant the vehicle enters thereupon in order to prevent the possibility of a vehicle entering the other end of said block in advance from the opposite direction between the time of breaking of contact with said contact-plate and the entrance of said first-named vehicle upon said block in advance. Said home plate may extend a suitable distance into the preceding block, and the distant plate may begin at the whistle-post (marked 12) and extend, say, two hundred feet beyond. The contact-plates may be secured to and be insulated from the rail by being secured to brackets 13, having a threaded shank 14, nuts 15 16 taking about the shank for adjusting the shank and securing it in place. (See Fig. 9.) Insulating-collar 17 and insulating-washers 18 19 take about the shank for insulating the shank from the rail. The brackets are preferably reclinedly U-shaped, having a lateral outward extension 20, an upwardly-projecting portion 21, and an inwardly-projecting portion 22, below which latter the contact-plate is secured.

The brush 9 is preferably yieldingly supported, as by being mounted on a spring-arm 23, secured to the car-truck 24 at 25. (See Figs. 7 and 8.) This arm is insulated from the truck, as see insulation 26 26'. It is projected outwardly, as shown at 27, so that the brush 9 at its end may take vertically below the contact-plates. The brush 9 is provided with curved ends 28 29. The curved ends 7 8 of the contact-plates form inclines or finders, by which the brush with its oppositely-curved ends will readily make contact with the plate, and thereby compensate for the variations in height which the brush may assume during travel of the vehicle, the contact plate and brush being also wide enough to compensate for side vibrations of the vehicle. The brush, having found the contact-plate, will ride thereunder, the resilience of the spring-arm normally pressing the brush against the contact-plate for securing electrical connection between the brush and plate. In order to normally position the brush and prevent vibration thereof when not in contact with the track-plates, I provide a stop 30, against which the spring-arm normally rests. It is obvious that the brush may be in the form of a wheel. In the sim-

pler form of signal for the vehicle, (shown at E in Fig. 1,) I provide a battery 38, preferably of low potential. One terminal of this battery has electric connection with the axle and wheels of the vehicle through a conductor 39. The other terminal of the battery has connection through a conductor 40 with the post 41 of an electric bell 42, a conductor 43 connecting with the post 44 of the bell. The conductor 43 makes electric connection with the brush 9 preferably through the arm 23. I prefer, however, to interpose an electric switch 45 in the conductor 43, which switch is normally closed, and to also provide a left-hand brush, as shown at 109 in Fig. 7, to be used in backing up.

Illustrating the operation of my improved device in the simpler form heretofore described, and referring to Fig. 1, it may be assumed that a vehicle (represented by D) is proceeding in block B in the direction of the arrow *a*. Electrical connection is thereby made through the axle and wheels between the block-rail 2 of block B and the continuous rail 1. The block-rail and continuous rail are normally insulated from each other. It may be further assumed that a second vehicle (represented by D′) is proceeding in block C, also in the direction of the arrow *a*. As soon as the contact-brush 9 on the vehicle D′ reaches the distant plate alongside block C electrical connection for the signal on the vehicle, (which in a locomotive would be located in an engineman's cab or in an electric or traction line at the motorman's position,) is made with block B and circuit formed through the following connections: post 44 of bell 42, conductor 43 and switch 45, brush 9, distant plate 5, conductor 11, conductor 10, block-rail 2 of block B, wheels and axle of the vehicle D, continuous rail 1, wheel and axle of vehicle D′, conductor 39, battery 38, conductor 40, and post 41 of bell, thereby ringing the bell and indicating to the driver of the vehicle that a vehicle is on the section in advance and giving said driver, whether he be engineman, motorman, or other controller or driver of the vehicle, ample time to reduce speed, so that upon arrival at the home plate he may be advised by contact of the brush with the home plate whether the vehicle D has since passed out of the block B or is still therein. If the block B is still obstructed, the bell sounds and the driver stops at the home plate. If the switch 45 is allowed to remain closed, the bell 42 will ring as long as the section in advance is occupied, or the driver may selectively open the switch and close it at intervals for "sounding" or testing the occupancy of the block in advance from time to time. As soon as the vehicle D has passed out of block B the signal in the vehicle D′ will so indicate, permitting the vehicle D′ to enter block B and pass therethrough.

I have thus far described the sounding or signaling device on the vehicle in its simpler form in order that the principle underlying my invention may be more readily understood. Referring now to Fig. 7, there is preferably a brush located upon each side of the vehicle, so that electric contact may be made with the track contact-plates whether the vehicle be placed upon the track with the nose to the front or be reversed in position or be traveling in either direction. I therefore add a brush 109 at the left of the vehicle, (looking in the direction of forward travel of the vehicle,) which brush has electric connection with the conductor 43 by a conductor 143, the switch 45 making contact with either terminal 46 or 146 of the switch for placing either brush 9 or 109 in circuit, the point 47 being the point for cutting out both brushes from the circuit. If desired, the signal upon the vehicle may be in duplicate, as shown at E and E′, and may also be provided with short-circuiting connection for testing its efficiency and with switches for throwing either signal into connection with the block-circuit, as either signal shows the higher efficiency. Thus 38′ is the duplicate battery, and 42′ is the duplicate bell, of signal E′. This battery and bell are connected by a conductor 40′. A conductor 43′ leads from the bell 42′, and a conductor 39′ leads from the battery 38′. A double switch 48 comprises the switch members 49 50. The member 49 is interposed in the conductor 43 between the bell and switch 45, and the member 50 is interposed in the conductor 39. When the switch is thrown, its members will make contact, respectively, with the conductors 43′ and 39′, thus cutting in the battery 38′ and bell 41′ and cutting out the battery 38 and bell 41, or vice versa. In order to short-circuit the signals on the vehicle for testing their efficiency, which is preferably done prior to arrival of the vehicle at the track contact-plates, I connect a conductor 51 to the conductor 39 between its connection with the axle and the switch 48 and to the conductor 43 between the switches 45 and 48 and interpose a switch 52 in said conductor 51. By the manipulation of these switches either signal may be operated from either brush and either signal may be short-circuited on the vehicle. I have preferred to show the signals as electric bells; but it is obvious that other signals may be employed.

Referring to Fig. 2, F, G, and H represent succeeding blocks in the main track of my improved system, the block G also being a siding-block, or block for a branch road, and the branch road may, in turn, be blocked in similar manner to the main road, as indicated at I. Each of the blocks is provided with track contact-plates heretofore described. 53 represents the rail-switch or movable-rail section. The rail-switch is normally insulated from the block-rail, but is provided

with means whereby electrical connection may be made with the block-rail. Thus at the rail-switch the portion 54 of the main block-rail is insulated from the block-rail at 55 and 56. A bond-wire 57 spans the gap thus formed in the block-rail and connects with both sections of the block-rail, respectively, at 58 59. An electric switch 60 is interposed in the conductor 61, which latter electrically connects the block-rail and the continuous rail when the switch is closed. The conductor 61 connects with the bond-wire 57 at 62, thus forming connection with the block-rail and with the continuous rail at 63. The rail-switch has connection with the electric switch for operating the latter, as see the connection *c*.

Referring to Figs. 10 and 11, I have shown a preferred construction of rail and electric-switch connection in which the rail-switch is provided with a tongue 64, which moves with the rail-switch and takes between the leaves 65 66 of the electric switch 60 in order to form the electric connection in the conductor 61 when the switch is closed. The electric switch 60 is preferably inclosed in a box 67. An insulating-plate 68 is attached to the bottom of the box, and the leaves 65 66 are secured to this plate, the respective sections of the conductor 61 being electrically connected to the leaves, respectively, by screws 69 70. The connection between the tongue 64 and the movable rail comprises a bar 71, secured to the tongue by a nut and bolt 72 and insulated therefrom by washers 73 73′ and collar 74 and a rod 75, pivotally connected at one end to a finger 76, secured to the movable rail and pivotally connected at its other end to a collar 77, secured to the bar 71 by a set-bolt 78. The bar 71 slides in a bearing 79 in the box. A bond-wire 80 bonds the continuous rail with the siding-rails at the rail-switch. If a vehicle in block F approaches block G and the siding-switch in block G is closed, thus leaving the main track continuous, and no vehicle is present in the main or siding portion of block G, block G will show clear, as the electric switch 60 will be open and no obstruction will be present on the said block last mentioned. If, however, the siding-switch is open, interfering with continuity in the main track, the tongue 64 will take between the leaves 65 66 of the electric switch 60, and thereby form a circuit with the bell in the vehicle and ring the bell, the circuit being formed through the contact-plate for block G alongside block F, brush 9, its conductor 43, the electric bell on the vehicle, conductor 40, the battery, conductor 39, the axle and wheels of vehicle, continuous rail 1, conductor 61, in which the electric switch 60 is closed, bond-wire 57, block-rail 2 of block G, conductor 10, and the track contact-plate just mentioned. Notice will also be given to a vehicle in the siding of the presence of a vehicle in block G of the main track, the siding being provided with a siding contact-plate 4^a, connecting with the block-rail of block G of the main track by a conductor 10^a, the circuits being readily ascertained from the descriptions heretofore given.

Referring now to Fig. 3, which shows a single-track crossover in my improved system, K represents the crossover-block, and K′ K^2 K^3 K^4 represent the adjoining blocks of the two tracks L L′. The continuous rails 1 1 of the respective tracks L L′ may be electrically connected. The block-rails 2 2 of the crossing-block of the respective tracks have an electric gap formed therein immediately adjacent the crossover proper, the end sections of the block-rails, however, being bonded together by a conductor 81, having connection at 82 with one section of the crossing block-rail of track L′, at 83 with one end of the crossing block-rail of track L, at 84 with the other end of the crossing block-rail of track L′, and at 85 with the other end of the crossing block-rail of track L. The electric gap in the crossover is occupied by insulated block-rail sections 86 87, respectively, insulated from the block-rail of track L′ at 88 89 and from the block-rail of track L at 90 91. A vehicle traveling in any of the blocks K′, K^2, K^3, or K^4 toward the crossover-block will be able to sound for and detect the presence of a vehicle in any part of block K.

Referring to Fig. 4, I have shown a derail-crossover in my improved system. This crossover is similar to that shown in Fig. 3, except that it is provided with derails and the necessary electric connections for same. The derails are shown at 92 and are movable-rail sections, having electric connections similar to the track-switch shown in Figs. 10 and 11. Thus the tongue 64 of the electric switch 60 of conductor 61 is secured to the movable or de rail. The electric gap in the rail formed by the derail when opened is spanned by an electric conductor 32, having connection at 33 and 34 with the rail in which the derail is located at opposite ends of said derail. M represents the derail crossover-block, and M′ M^2, M^3, and M^4 the adjacent blocks of the two tracks L L^2. The block-rails of the crossing-block have electric gap formed therein, with insulated filling-in rails for said gap and are bonded together by a conductor 81, similar to the crossover-block shown in Fig. 3, the connection of conductor 81 with the crossing block-rail of track L adjacent to the derail of said rail being in rear of said derail, as shown. The conductors 61 for the electric switches connect the respective block-rails with the continuous rails when said switches are closed—*i. e.*, the derails are open—similarly to the rail-switch connections shown in Fig. 2. Thus their connections with the block-rails are shown at 93 and their connections with the continuous rails are shown at 94, the con-

ductors 81 and 61 being common in places for convenience. A vehicle traveling in any of the blocks M′ M² M³ M⁴ toward the cross-over-block M will be able to sound for and detect whether the derails of block M are open and whether any vehicle is present in block M.

Referring now to Fig. 5, I have shown a crossing-block of my improved system provided with a crossing-tower in which an operator may operate the derails and simultaneously manipulate the electric circuits connected therewith. N, O, and P represent successive blocks of the track L, and Q, R, and S successive blocks of the track L³, O and R being the crossover-blocks, the block-rails thereof being insulated from each other. The block-rail of block O has a section 94 thereof insulated from the end sections of the block-rail at 95 96, a bond-wire 97 connecting those end sections at 98 99. The block-rail of section R has an insulated section 100 therein insulated from the end sections of the block-rail by insulations 101 102, a bond-wire 103 having connection with the end sections, respectively, at 104 105. The respective derails 92 connect with and operate electric switches 60 in conductors 61, which when the switches are closed connect the respective block-rails and continuous rails. The electric conductors 32 form electric bond for spanning the electric gap at the derails when said derails are open. In a signal-tower (represented by 106) there is a signal and an electric switch for each track. I have shown the tower-signals in the form of electric bells with battery therefor, although it is obvious that other signals may be employed. The electric bell 107 connects with the block O, and the electric bell 108 connects with the block R. 110 is a battery for the signal-tower bells. A conductor 111 connects the continuous rail of block O with the battery 110, a conductor 112 connects the battery with bell 107, and a conductor 113 connects the conductor 112 with bell 108, these bells being in the signal-tower. A conductor 114 connects the bell 108 with the block-rail of block R, an electric switch 115 being interposed in said last-named conductor. A conductor 116 connects the bell 107 with the block-rail of block O, an electric switch 117 being interposed in said conductor 116. 118 is a derailing-lever for the derails in block R and has connection with switch 115, and 119 is a derailing-lever for the derails in block O and has connection with switch 117. When either derailing-lever is thrown, it opens or closes the respective derails and the switch connecting with the tower-bell circuit of the block in which the derails are located. The derailing-lever connections, with the derails and electric switches, may be made in any suitable manner. Thus I have shown the respective levers pivoted on pins 120 in bearings 121 on a plate 122, secured in suitable manner in the tower, the levers being each provided above their pivotal point with a connection 123 with the respective switches 115 117. In construction the switches 115 117 and their connection with the levers, respectively, may be similar to the switches 60 and their connection with the movable rail. Thus in Fig. 6 the tongue 124 takes between the lips 125 125′ of the respective ends of the conductors. Below its pivotal point the derailing-lever 118 has a wire 126 secured thereto which takes forwardly from the lever over a sheave 127 and connects at 128 with the inner face of the derail in the continuous rail of block R. A wire 129 connects with wire 126 at 130 and passes over sheaves 131 and 132 and connects at 133 with the inner face of the derail in the block-rail of block R. A wire 134 connects with lever 118 below its pivotal point and passes to rear of said lever and takes about sheaves 135 136 137 and connects at 138 with the outer face of the derail in the continuous rail of block R, while a wire 139 connects with wire 134 at 140, passes over a sheave 141, and connects at 142 with the outer face of the derail in the block-rail of block R. If lever 118 is thrown forward, the switch 115 and the derails in block R are closed. If it is thrown backwardly, the switch 115 and derails in block R are opened. Below its pivotal point the derailing-lever 119 has a wire 144 secured thereto which takes forwardly from the lever over sheaves 147, 148, and 149 and connects at 150 with the inner face of the derail in the continuous rail of block O. A wire 151 connects with wire 144 at 152 and passes over sheave 153 and connects at 154 with the inner face of the derail in the block-rail of block O. A wire 155 connects with lever 119 below its pivotal point and passes to rear of said lever and takes about sheaves 156 157 158 and connects at 159 with the outer face of the derail in the continuous rail of block O, while a wire 160 connects with wire 155 at 161, passes over sheaves 162 163, and connects at 164 with the outer face of the derail in the block-rail of block O. If lever 119 is thrown forward, the switch 117 and the derails in block O are closed. If it is thrown backwardly, the switch 117 and the derails in block O are opened.

Assuming now that a train is in block N at the home signal-plate and that there is another train at the farther end of block O, the engineman of the first-named train sounding for the block O will form circuit in his cab between the home plate, signal device in the cab, the wheels and axle of his train, continuous rail, the wheels and axle of the train in block O, the block-rail of block O, the connection between the block-rail and the home plate, thereby ringing the bell in the engine-cab. If, however, the signal in the

cab indicates block O clear and the vehicle enters block O, the continuous rail and the block-rail of block O are short-circuited by the wheels and axle of the train and circuit formed with the battery and bell 107 in the tower through conductors 111, 112, and 116, thereby ringing the bell 107 in the signal-tower, notifying the tower operator of the entrance of a train into block O. The operator in the signal-tower thereupon throws the derailing-lever 118, thereby opening the derails in block R and the electric switch 115, thereby cutting out bell 108 and giving the vehicle which has just entered block O the right of way, said vehicle thereupon proceeding through the block, the bell in the signal-tower indicating the presence of the vehicle in the block, the bell 107 ceasing to ring when said vehicle has passed from the other end of the block. Similar operations upon block O are performed if a train enters block R, the operator thereupon opening the derails in block O, thereby notifying any train that may wish to enter block O that the block is not clear, the opening of the derails in block O causing the bell on any vehicle in blocks N or P making contact with the signal-plates or contacts alongside thereof to ring, thereby notifying the driver that said block is not clear.

By means of my improved device the driver of a vehicle is continually being notified on the vehicle itself of the occupancy or continuity of a previous block. If any switches or derails in the previous block are open or if the previous block is occupied, whether such occupancy is due to another train or car or to the fact that another train has broken in two, leaving one or more cars behind, the driver of the vehicle is notified on the vehicle of such derangement or occupancy before he enters upon the affected block. The driver may sound any block on his vehicle before he enters the block, and he obtains knowledge on the vehicle of the condition of the block while attending to his other duties, without necessity of observance of distant, obscure, or changing signals at the side of the track.

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

1. In a system of the character described, the combination of an electrically-continuous rail and a mating block-rail whose respective blocks have an electric conductor at each end respectively at opposite sides thereof projected into other blocks of said block-rail.

2. In a signal system for railways, the combination of a track comprising an electrically-continuous rail and a mating block-rail arranged into electric blocks, the block-rail of a given block having an electric contact electrically connected therewith at each end thereof and extending into some other block, said electric contacts being on opposite sides of said track.

3. In a system of the character described, the combination of a track comprising an electrically-continuous rail and a mating block-rail insulated into blocks, a local contact for a given block at each end thereof and located in another block and having electric connection with the block-rail of said given block, said local contact at the respective ends of said given block being located on opposite sides of said track, a signal on a vehicle, a contact part on said vehicle for said local contact, and electric connection between said signal, contact part and track for affecting said signal, substantially as described.

4. In a system of the character described the combination of a track comprising an electrically-continuous rail and a mating rail insulated into blocks, the respective blocks having local contacts electrically connected to the respective ends thereof and at opposite sides of said track and located in but insulated from other blocks, with a vehicle and signal on said vehicle, electric connection between said signal and an axle and wheels of said vehicle, and a contact part on said vehicle having electrical connection with said signal and arranged to make contact with a local contact.

5. In a system of the character described the combination of a track comprising an electrically-continuous rail and a mating rail insulated into blocks, the respective blocks having home and distant local contacts electrically connected to each end thereof respectively on opposite sides of said track and located alongside but insulated from other blocks, with a vehicle and signal on said vehicle, electric connection between said signal and an axle and wheels of said vehicle, and a contact part on said vehicle having electric connection with said signal and arranged to make contact with a local contact.

6. In a system of the character described, the combination of a track comprising an electrically-continuous rail and a mating block-rail insulated into blocks, track-contacts for both ends of said blocks electrically connected therewith, the track-contacts for one of the ends of said blocks being located at one side of said track beyond said respective ends alongside but insulated from other blocks, the track-contacts for the other ends of said blocks being located at the other side of said track beyond said respective other ends alongside but insulated from other blocks, a signal on a vehicle, contact parts on said vehicle, one of said contact parts arranged to make contact with the track-contact on one side of said track, another of said contact parts arranged to make contact with the track-contact on the other side of said track, electric connection on said vehicle for

said signal with said track and respective contact parts, and a switch in said connections for cutting out either of said contact parts from said connections.

7. In a signal system for railways the combination with the track and vehicle, of a plurality of signals on said vehicle, each of said signals comprising a different source of energy, electric connections for said signals through the track, and an electric switch in said connections for selectively cutting out either of said signals together with its source of energy while preserving electric connection for the other of said signals and its source of energy with said track.

8. In a signal system for railways, the combination of a track insulated into blocks, local contacts for said blocks located alongside but insulated from other blocks, a vehicle, a contact part thereon for said local contacts, a plurality of signals on said vehicle, electric connections therefor through the rails, local contacts and contact parts, and a switch on said vehicle in said connections for selectively cutting out either of said signals while preserving electric connection for the other of said signals with said track.

9. In a signal system for railways, the combination of a track insulated into blocks, local contact for the respective ends of blocks electrically connected with said respective blocks and located at the respective sides of said track alongside but insulated from blocks beyond said respective ends, a vehicle, a signal on said vehicle, a contact part at either side of said vehicle for the local contacts at the respective sides of said track, electric connections with said respective contact parts, the track and said signal, and a switch in said connections for cutting out either contact part.

10. In a signal system for railways, the combination of a track insulated into blocks, local contacts for said blocks at opposite ends and respectively at opposite sides thereof and located in but insulated from other blocks, a vehicle, a contact part thereon for said local contacts, a signal on said vehicle, electric connections therefor through said rails, local contacts and contact parts, and a switch on said vehicle in said connections for short-circuiting said signal on said vehicle.

11. In a signal system for railways, the combination of a track insulated into blocks, local contacts for said blocks located at either side of the track alongside of but insulated from other blocks, a vehicle, a contact part at either side thereof for said track-contacts, duplicate signals on said vehicle, electric connections for either of said signals through said rails, local contacts and either of said contact parts, and electric switches on said vehicle in said connections for cutting out either signal or either contact part, substantially as described.

12. In a signal system for railways, the combination of a track insulated into blocks, local contacts for said blocks located at either side of the track alongside of but insulated from other blocks, a vehicle, a contact part at either side thereof for said track-contacts, duplicate signals on said vehicle, electric connections for either of said signals through said rails, local contacts and either of said contact parts, electric switches on said vehicle in said connections for cutting out either signal or either contact part, and means for short-circuiting said signals on said vehicle, substantially as described.

13. In a signal system for railways, the combination of crossing tracks, each track comprising an electrically-continuous rail and a mating rail insulated into blocks, said tracks crossing at a block in each track, each track having a local contact for said crossing-block in a block in advance of said crossing-block, with a signal on a vehicle having electric connection with said local contact and the track while upon said block in advance, upon occupancy of the crossing-block by a second vehicle, substantially as described.

14. In a signal system for railways, the combination of crossing tracks, each track comprising an electrically-continuous rail and a mating rail insulated into blocks, said tracks crossing at a block in each track, each track having a local-contact crossing for said crossing-block in a block in advance of said crossing-block, with a signal on a vehicle, a contact part for said local contact, and electric connections between said signal, contact part and track for affecting said signal.

15. In a signal for railways, the combination of crossing tracks, each track comprising an electrically-continuous rail and a mating rail insulated into blocks, said tracks crossing at a block in each track, each track having a local contact for said crossing-block in a block in rear of said crossing-block, a derail in each crossing track, a conductor at said derail connecting said block-rail of said crossing track and the continuous rail thereof and having a switch therein, said derail having connection with said switch for operating said switch by the manipulation of said derail, substantially as described.

16. In a signal system for railways, the combination of crossing tracks, each track comprising an electrically-continuous rail and a mating rail insulated into blocks, said tracks crossing at a block in each track, each track having a track-contact for said crossing-block in a block in advance of said crossing-block, each track adjacent said crossing being provided with a derail, electric conductors for said respective derails having connection respectively with the block-rail of said crossing track and said continuous rail, said conductor having a switch therein, said derail having connection with said switch for actu-

ating said switch, a signal on a vehicle, a contact part on said vehicle for said local contact, and electric connections between said signal, contact part and track for affecting said signal by the throwing of said derail.

17. In a system of the character described, the combination of a side track and a main track comprising an electrically-continuous rail and a block-rail insulated into sections forming blocks, said side track being electrically bonded with the continuous rail of said main track at the block, a railroad-switch in said block normally insulated from said block-rail, an electric conductor connecting said block-rail with the continuous rail, an electric switch in said conductor having connection with said track-switch for being operated by the latter, a local contact at said side track having electric connection with the main track, and a local contact at said main track having electric connection through said main track and said conductor with said side track, a signal in a vehicle adapted to travel either of said tracks and having contacting means for said local contacts and arranged to form circuit for said signal upon occupancy of the other of said tracks, or the misplacement of said railroad-switch, substantially as described.

18. In a system of the character described, the combination of crossing tracks, each track comprising an electrically-continuous rail and a mating rail insulated into blocks, said tracks crossing at a block in each track, each track having a local contact for said crossing-block in a block in advance of said crossing-block, a signal on a vehicle, a contact part on said vehicle for said local contact, and electric connections between said signal, contact part and track for affecting said signal, a derail in the crossing-block in each track, an electric conductor therefor connecting the block-rail and continuous rail of the crossing-block in said respective tracks, an electric switch in each of said conductors, the respective electric switches having connection with the respective derails for simultaneous operation of said respective electric switches and derails.

19. In a signal system for railways, the combination of a main track divided into blocks and a siding-track, with electric connection between a block of said main track and said siding, and a signal on a vehicle having means for making contact with said connection, and means on a second vehicle closing circuit with said signal.

20. In a system of the character described, the combination of a track insulated into blocks and having a movable rail-section, an electric conductor having a switch therein, said switch having connection with said movable rail-section, a traveling signal having electrical connection with said conductor for forming or breaking circuit in said traveling signal by the movement of said switch by said movable rail-section, a local signal, and a local means for operating said movable rail-section.

21. In a system of the character described, the combination of a track insulated into blocks and having a movable rail-section, an electric conductor having a switch therein, said switch having connection with said movable rail-section, a traveling signal having electric connection with said conductor for forming or breaking circuit in said traveling signal by the movement of said switch by said movable rail-section, a local signal, a local means for operating said movable rail-section, and an electric connection having a switch therein operated by said local means for forming or breaking circuit in said local signal.

22. In a system of the character described, the combination of crossing tracks insulated into blocks, a derail in each of said crossing-tracks, an electric conductor having a switch therein for each of said derails, said switches having connection with said derails respectively, a traveling signal having electric connection with said conductors respectively for forming or breaking circuit in said traveling signal by the movement of said switches by said derails respectively, local signals for said derails respectively, local means for operating said respective derails, an electric conductor for the operating means of said respective derails, local switches respectively in said conductors for said local signals, said local operating means connecting with said derails and the local switches therefor respectively, substantially as described.

In testimony whereof I have signed my name hereto in the presence of two subscribing witnesses.

MAXIMILLIAN GEORGE VOIGTLANDER.

Witnesses:
S. F. HERBSLEB,
FRED ABEL.