(No Model.) 2 Sheets—Sheet 1.

A. H. R. GUILEY.

ELECTRIC BLOCK SYSTEM FOR RAILWAYS.

No. 454,344. Patented June 16, 1891.

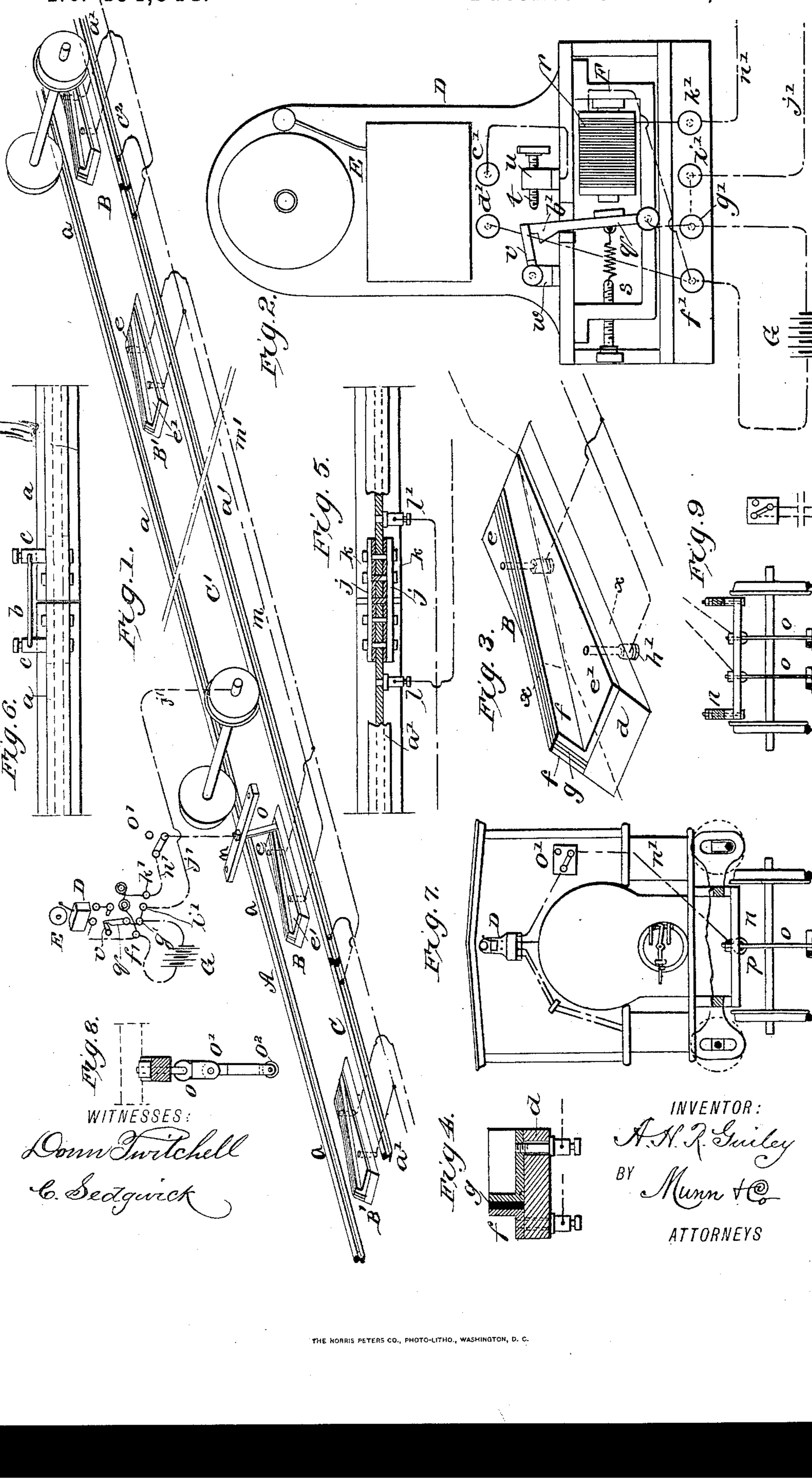

Fig. 1.

Fig. 2.

Fig. 6.

Fig. 5.

Fig. 3.

Fig. 9.

Fig. 7.

Fig. 8.

Fig. 4.

WITNESSES:

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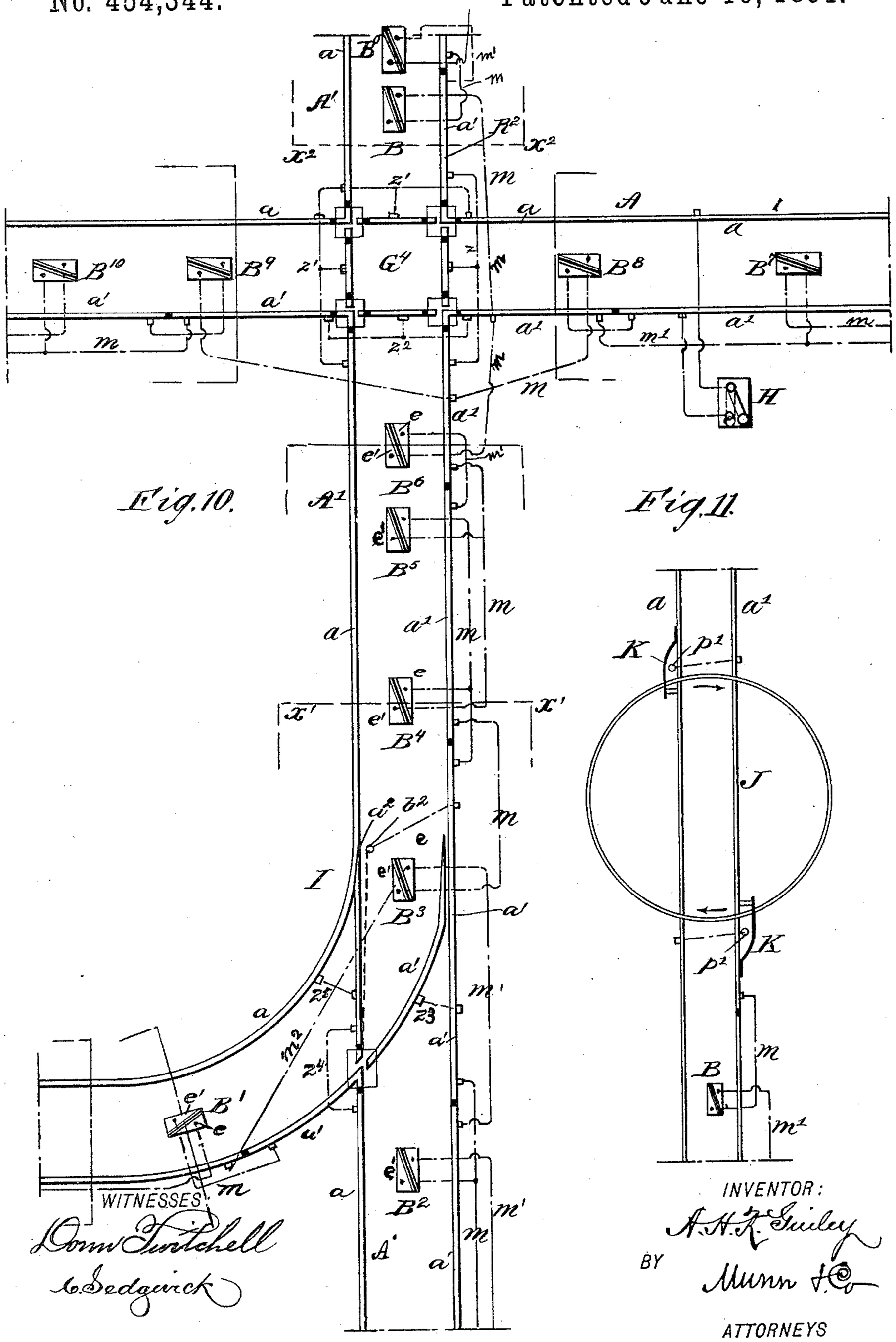

Fig. 10.

Fig. 11.

INVENTOR:
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UNITED STATES PATENT OFFICE.

AUGUSTUS H. R. GUILEY, OF SOUTH EASTON, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-THIRDS TO WILSON B. SOLLIDAY, OF SAME PLACE, AND ELIJAH B. CORNELL, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC BLOCK SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 454,344, dated June 16, 1891.

Application filed February 11, 1890. Serial No. 340,040. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS HARPER RAIGUEL GUILEY, of South Easton, in the county of Northampton and State of Pennsylvania, have invented a new and Improved Electrical Block System for Railways, of which the following is a specification, reference being had to the annexed drawings, forming a part thereof, in which—

Figure 1 is a perspective view, partly diagrammatic, of my improved electric block system. Fig. 2 is a side elevation of the signal used in connection with my improved block system. Fig. 3 is a perspective view of the contact-piece. Fig. 4 is a transverse section taken on line *x x* in Fig. 3. Fig. 5 is a plan view, partly in horizontal section, of the rail-joint, showing the overlapping connections of two adjacent sections. Fig. 6 is a plan view of the electrical connections between the ends of the rail, which form a continuous conductor. Fig. 7 is a rear elevation of a locomotive, showing the relation to the same of the signaling apparatus. Fig. 8 is a side elevation of the double-jointed contact-lever. Fig. 9 is an elevation of a portion of the locomotive-truck, showing the application of two contact-levers. Fig. 10 is a plan view of a track, showing a grade-crossing and a switch; and Fig. 11 is a plan view of swing-bridge connections.

Similar letters of reference indicate corresponding parts in all the views.

The object of my invention is to guard railway trains, cars, and locomotives from collision by giving a timely alarm to the engineer on a moving locomotive on approaching a standing or moving car, train, or locomotive on the same track or in the way of a moving locomotive; also to give timely notice of an occupied grade-crossing, an open switch, an open draw-bridge, or a car projecting from a side track, and to afford a signal which will be effective in daylight or darkness on a straight or curved track or in a tunnel.

In carrying out my invention I make one of the track-rails a continuous conductor by connecting the rails electrically at the joints, and I divide the other rail into sections or blocks and provide electrical connections therefor, which overlap from one block to the other. I provide the road with contact-pieces of peculiar construction and arrange upon the locomotive a contact-lever and alarm apparatus, all as will be hereinafter more fully described.

The road A, to which my improvement is applied, is formed of the rails *a a'*, the lengths in rail *a* being connected electrically by a wire *b* entering binding-posts *c*, projecting from the sides of the lengths near their ends. Between the rails are arranged contact-pieces B B' at suitable intervals, the contact-pieces being formed of a beveled block of wood *d* and two triangular metallic plates *e e'*, secured to the top of the block oppositely arranged with respect to each other, the said plates being provided with upwardly-turned flanges *f*, which are separated by the insulation *g*. To the triangular plate *e* is attached a binding-post *h*, and to the plate *e'* is attached a binding-post *h'*.

The rail *a'* is divided into blocks C C' C^2, and the rails at the adjacent ends of these blocks are connected by fish-plates *j* with intervening insulation *k*, as shown in Fig. 5, and the adjacent ends of the rails are provided with binding-posts *l l'*. I preferably arrange the contact-pieces B B' at opposite ends of the blocks, as shown in Fig. 1, so that the central portion of the upwardly-turned flanges *f* will be centrally located with reference to the track-rails *a a'*. The plate *e'* of the contact-piece B of the block C' is connected with the wire *m*, which is connected electrically with the rail of the block C^2. The plate *e'* of the contact-piece B' is also connected with the wire *m*. The plate *e* of the contact-piece B' is connected with the wire *m'*, which extends to the block C, where it is connected electrically with the rail *a'*. It is also connected with the plate *e* of the contact-piece B. The rail *a'* of every block is connected in this manner with the block on either side thereof, and every block is protected by at least two contact-pieces B B'.

To the locomotive at some convenient point, preferably across the frame just back of the

pilot-wheel S or the truck, is secured a beam *m*, to which is pivoted a contact-lever *o*, which hangs over the track in a central position, so that it can strike upon either side of the contact-pieces B B′, &c., according as the locomotive goes in one direction or the other. The contact-lever *o* is made of electrically-conducting material, or is provided with a conductor extending from its free extremity upward to its pivotal support *p*.

Upon the locomotive, at some convenient point, is arranged a signaling apparatus D, formed of a vibrating bell E of ordinary well-known construction, and the relay F. The armature-lever *q* is pivoted to the frame of the relay and held away from the relay-magnet *r* by the adjustable retractile spring *s*. The free end of the armature-lever *q* extends upward above the magnet *r*, and a contact-screw *t* is supported in the path of the armature-lever by the post *u*. The latch *v*, pivoted to the post *u′*, rests upon the free end of the armature-lever *q*, when the said armature is drawn back by the spring *s*, but is capable of engaging the armature-lever when it is drawn forward by the action of the electro-magnet *r*, so as to make a contact with the screw *t*. The downward motion of the latch *v* is limited by the lug *b′*, projecting from the back of the armature-lever *q*. The binding-post *c′* of the bell E is connected electrically with the post *u* of the contact-screw *t*. The binding-post *d′* is connected electrically with a binding-post *f′* on the frame of the apparatus D. One terminal of the relay-magnet *r* is also connected with the binding-post *f′*, and the said binding-post is connected with one pole of the battery G. The remaining pole of the battery is connected to the binding-post *g′*, and the said binding-post is connected electrically with the armature-lever *q*. The binding-post *g′* is also connected electrically with the binding-post *i′*, and the binding-post *i′* is connected electrically with one of the axles of the locomotive by the wire *j′*. The binding-post *k′* is connected electrically with the contact-lever *o* by the wire *n′*. The switch *o′* is placed in the wire *n′* for breaking the circuit whenever necessary. So long as the blocks adjoining the block C′ are unoccupied a locomotive may enter upon the block C′, and the contact-lever *o* may strike the contact-piece B without producing any effect upon the alarm apparatus; but when the block C^2 (for example) is occupied electric connection is established between the rails *a* and *a′* of the block, so that when the contact-lever *o* touches the contact-piece B a circuit is established which extends from the battery G through the binding-posts *g′ i′* and wire *j′* to the truck, thence to the track-rail *a*, to the wheels and axles of the train on the block C^2, to the rail *a′* of the said block C^2, thence through the wire *m*, the plate *e′*, through the contact-lever *o*, wire *n′* to the relay-magnet *r*, thence to the binding-post *f′*, and back to the remaining pole of the battery G. This causes the armature-lever *q* to be drawn toward the relay-magnet *r*, closing the electric contact on the screw *t*, when the current from the battery flows through the armature-lever *q*, contact-screw *t*, post *u* to the binding-post *c′* of the bell, and from the binding-post *d′* of the bell to the binding-post *f′* back to the battery. This establishes a circuit through the bell and causes the bell to ring. The latch *v* engages the armature-lever *q* when the latter is drawn forward and holds it in contact with the screw *t*, thus maintaining the circuit closed upon the bell, causing the bell to ring continuously until the circuit is broken by the engineer. The result is precisely the same when the train advances from the opposite direction and strikes the opposite side of the diagonal part of the contact-piece B. In the case of a grade-crossing, as shown in Fig. 10, the wires *m* of the track A at the crossing are connected with the insulated rail *a′* of the road A′ adjoining the crossing. In a similar manner the wires *m* of the road A′ are connected with the insulated rail *a′* of the road A at the crossing, so that a train approaching from either direction upon the road A will act upon the connections of the road A′ as if the road A′ were a continuation of the road A. In a similar way a train approaching the crossing from either direction on the road A′ will act upon the electrical devices, so as to signal the train or trains upon the road A as if that road were a continuation of the road A′. It will thus be seen that when a train approaching the crossing upon either road enters the block adjoining the crossing if the block upon the other road adjoining the crossing is occupied the warning will be given.

In connection with the road A near the crossing is arranged a switch H, by which the circuit can be closed between the rails *a′* and *a*, which is in effect the same as the closing of the circuit by the car-wheels and axle.

In practice the switch is designed to be used to stop a train should the track be temporarily impassable, and it may be then quickly applied by a gang of section-hands for their own protection.

I have applied the same devices to the switch I and have placed a contact-piece B′ near the switch, so that as soon as a train occupies the switch an alarm will be given on the main track upon either side of the switch, and the block adjoining the switch is made so short that if it should be occupied by a car with a portion of it projecting over the main track the signal would be given to the engineer of a train upon the main track.

The circuits of the switch or Y with the main track are as follows: When the switch is open, circuits may be completed at contact-pieces B^2 B^4 B^5 of the main track A. Thus when the contact lever or "feeler" *o* of a locomotive approaching the switch touches plate *e* of contact-piece B^4 or B^5 the circuit is from battery G to said lever *o*, thence by wire *m* to the rail-section *a′* next the switch

by oblique wire to stud b^2, with which the inner or split rail of the switch is in contact, as shown by dotted lines, Fig. 10, thence along such split rail to wire z^5 to rail a, and then back through locomotive wheels and axles to the alarm and the battery. On the other hand,(the switch being open as before,) when a locomotive approaching the switch junction from the opposite direction on the main track reaches the contact-piece B^2 and its feeler or lever o touches plate e' a circuit is formed from battery through such lever and plate and the wire m to next rail-section a', then by oblique wire to stud b^2 by the split switch-rail and bridge-wire z^4 back to rail a, and by locomotive wheels and axles to alarm and battery. When the switch is closed, the contact-piece B^3 guards the switch beyond B', the circuit being from battery on locomotive at B^3 through its lever o, the contact-plate e, oblique wire m^2, and switch-rail section a' adjacent to and extending beyond B' through wheels of locomotive on such portion of switch back by rail a to alarm and battery of the locomotive at B^3. Again, (the switch being still closed,) if a locomotive reach B' on the switch, notice will be given to a train on the main track beyond the switch-points, the circuit being then from battery of locomotive at B' through its feeler o to the plate e' and by wire m to adjacent rail a', thence by wire z^3 to the rail-section a' of main track A', then through wheels and axles of train that is beyond the switch to the continuous rail a, and thus back to the aforesaid locomotive at B'. The crossing G^4 is provided with bridge-wires z, z', and z^2, as shown in Fig. 10. Suppose two trains to simultaneously approach the crossing G^4 from opposite directions on the same track A', and one of them to have reached the contact-piece B^4, as shown by line x', when the other is at x^2 beyond the crossing. Then the circuit will be from battery G through contact-lever o, plate e', wire m of contact-piece B^4 to the insulated rail-section a' nearest the crossing G^4, thence through bridge-wire z to the insulated rail-section a' on the other side of the crossing, through the wheels of the train at x^2 to the other rail a, and by bridge-wire z' back around the crossing to the continuous rail-section a on the other side of the crossing, and finally back to the battery G through the wheel and axle of the locomotive at x'. Thus the alarm will be sounded on such locomotive. If the latter were at B^5 instead of B^4, the result would obviously be the same, since B^5 is similarly connected with wire m and the rail beyond the crossing. Again, to show how an alarm will be given if trains simultaneously approach the crossing on different tracks—that is to say, the two tracks A and A', which are at a right angle to each other—let it be supposed one locomotive is at B^6 on track A' and the other near B^8 on track A. Then the circuit will be from battery G of the locomotive on A' through its contact-lever o and the plate e' of contact-piece B^6, thence by wire m to the first rail-section a' of the intersecting track A, then through the bridge formed by the wheels and axles of the other locomotive to the opposite rail a by bridge-wire z' around the crossing G^4 to the continuous rail a of track A', and thus back to the battery of the locomotive at B^6, which completes the electrical circuit and sounds the alarm. In the same manner B^6 protects the neighborhood of B^9 on track A. For example, from the locomotive at B^6 the circuit is, as before, to the nearest rail-section a' of track A, thence by bridge-wire z^2 across the crossing G' to the aligned rail-section a', then through the wheels and axles of the locomotive that is near B^9 to the opposite rail a, thence by the bridge-wire z' to the rail a of track A', and thus back to the battery of the locomotive whence it started. Similarly the locomotive which bridges the rails at B^9 will be detected or sound an alarm at B^7, one at B^8 will be detected at B^{10}, and one at B^6 at B^0. B^8 on track A protects from side trains on A' at B and B^6, while B on track A' protects from side trains on A at B^8 and B^9.

In Fig. 11 I have shown the method of applaying my improvement to a draw-bridge. When the bridge J is closed the spring-switch K is held open by contact with a projection on the bridge; but when the bridge J is open the spring-switch K automatically closes the circuit upon the contact-point p', thus establishing communication between the rails a' and a and giving the alarm upon the locomotive approaching the bridge.

It will be seen that by arranging diagonal flanges upon the contact-pieces B, I am able to construct a contact which will close the circuit from approach from either direction by a locomotive provided with the contact-lever o. The electrical contact begins as soon as the lever begins to pass over the ends of the contact-pieces, and is continued along the flanges to the other end of the contact-piece. I have beveled the flanges, the plates upon which they are formed, and the blocks by which they are separated, to prevent accidental injury from any object which may be dragged over them.

In Fig. 9 I have shown the application of two contact-pieces and two contact-levers o for working separate circuits or any special circuit, or on a system where both rails are in blocks.

In Fig. 8 I have represented a contact-lever o provided with an extra joint o', which will prevent the breakage of the lever should the locomotive back up while the lever rests upon any object between the rails—such, for example, as one of the contact-blocks. I have also provided in the end of the lever a roller o^2, which facilitates the passing of the lever over the contact-blocks.

The battery G may be replaced by any form of electric, Faradic, or electro-magnetic generator, and in case a magneto-machine is used the bell E would be replaced by a pair

of magneto-bells. A magneto-machine kept constantly running in some feasible way is preferred.

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

1. In an electrical block system for railways, the combination, with a pendent contact-lever carried by the locomotive, of contact-pieces provided with two flanged plates insulated from each other and placed diagonally with reference to the track-rails and adapted to be engaged by the contact-lever of the locomotive, substantially as specified.

2. In an electric block system for railways, the combination of the two diagonally-arranged flanges insulated from each other and adapted to make separate contacts for trains running in opposite directions, a contact-lever carried by the locomotive and arranged to strike either of the diagonal flanges, and an electrical alarm carried by a locomotive, substantially as specified.

3. In an electrical block system for railways, the combination, in the contact-piece B, of the block *d*, the flanged plates *e e'*, and the insulation *g*, substantially as specified.

4. In an electrical block system for railways, the combination of the contact-piece B, provided with diagonal flanges, the contact-lever *o*, the electrically-continuous rail *a*, the interrupted rail *a'*, the alarm carried by the locomotive, and electrical connections, substantially as specified.

AUGUSTUS H. R. GUILEY.

Witnesses:

GEO. NOTHHELFER,

J. A. WALTMAN.