No. 662,497. Patented Nov. 27, 1900.

N. RATCHFORD.

RAILWAY CROSSING SIGNAL.

(Application filed June 20, 1899.)

(No Model.) 2 Sheets—Sheet 1.

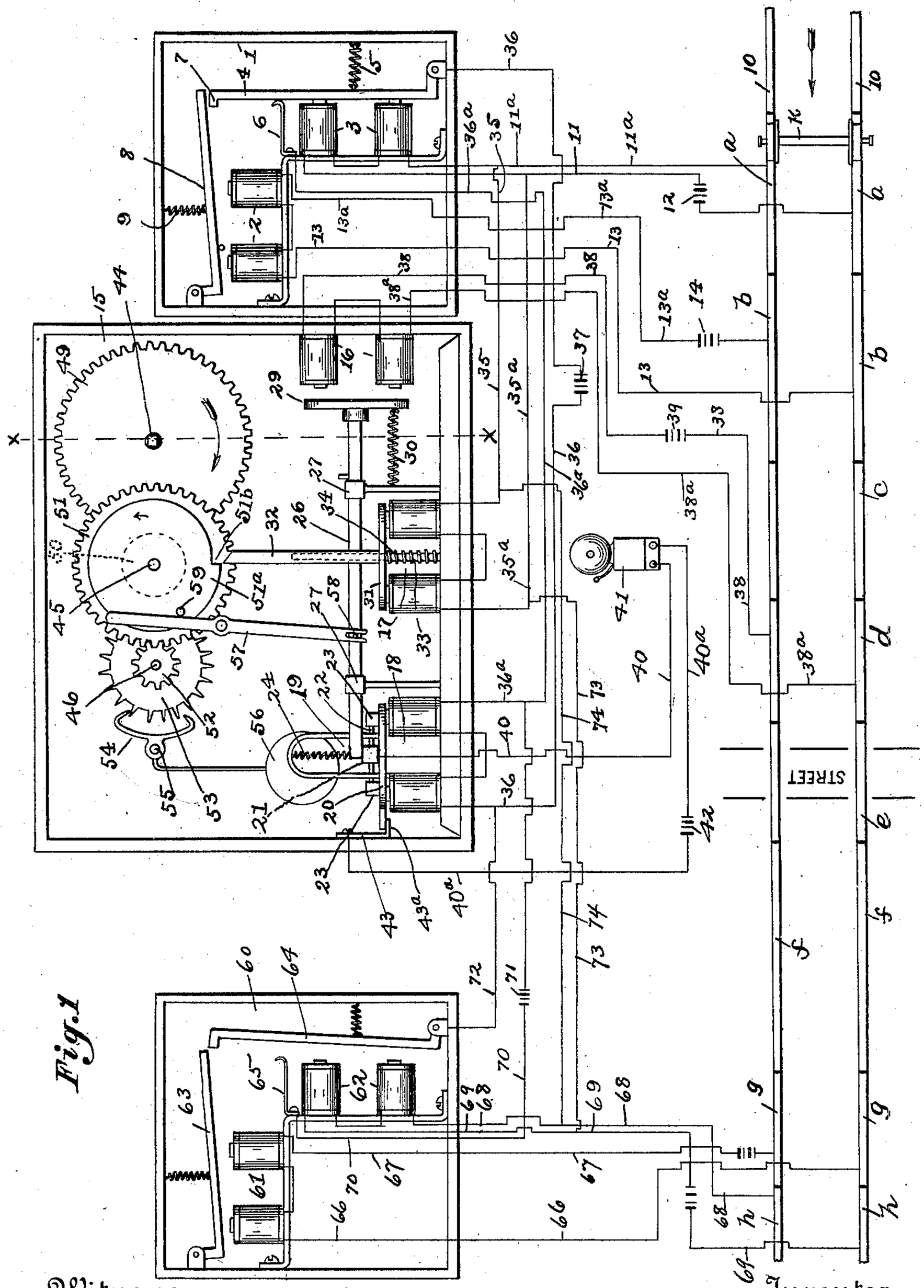

Fig. 1.

Witnesses
H. B. Bradshaw
J. H. Travel

Inventor
Nicholas Ratchford
By his Attorney
C. Shepherd

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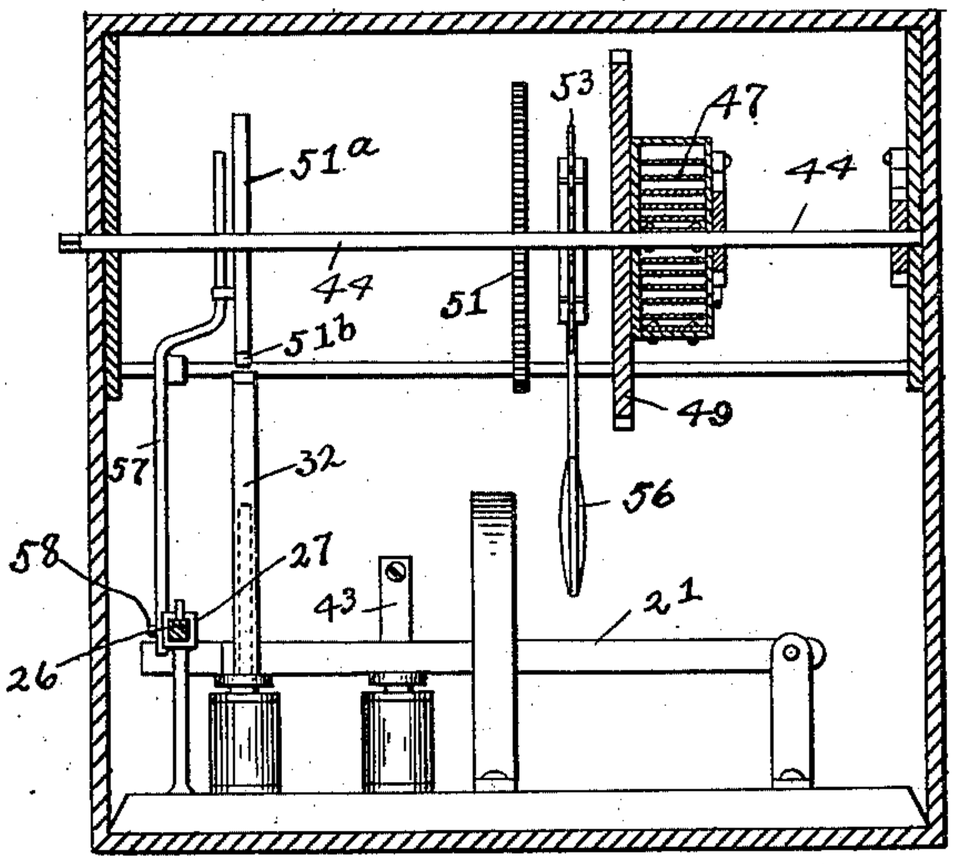

Fig. 2.

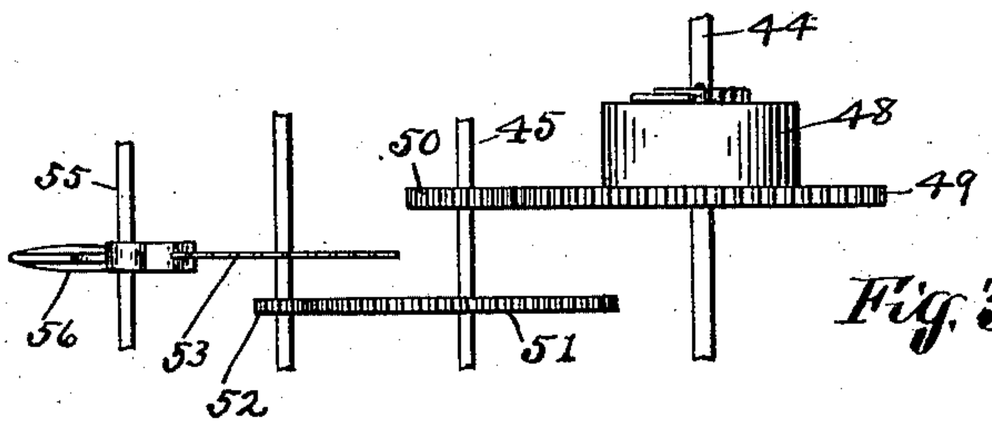

Fig. 3.

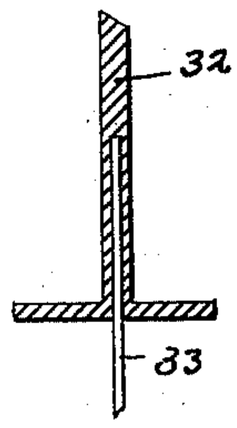

Fig. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

NICHOLAS RATCHFORD, OF GREENVILLE, OHIO.

RAILWAY-CROSSING SIGNAL.

SPECIFICATION forming part of Letters Patent No. 662,497, dated November 27, 1900.

Application filed June 20, 1899. Serial No. 721,211. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS RATCHFORD, a citizen of the United States, residing at Greenville, in the county of Darke and State of Ohio, have invented a certain new and useful Improvement in Railway-Crossing Signals, of which the following is a specification.

My invention relates to the improvement of mechanism for ringing alarm-bells at railway-crossings; and the objects of my invention are to provide an improved combination of electrical and mechanical devices through the medium of which an alarm-bell will be rung as a train approaches a crossing from either direction and the ringing of said bell will be discontinued after the train leaves the crossing, and to produce certain improvements in details of construction and arrangement of parts which will be more fully pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a view, partially in the nature of an elevation and partially in the nature of a diagram, of the mechanism and circuits which I employ. Fig. 2 is a sectional view on line *x x* of Fig. 1. Fig. 3 is a plan view of the clock-gear which I employ for the purpose hereinafter described; and Fig. 4 is a vertical section in detail of an armature-bar and its stem which I employ in the manner hereinafter described.

Similar numerals and letters refer to similar parts throughout the several views.

Arranged in a suitable casing 1 and at a desirable point with reference to a railway-line are two pairs of magnets 2 and 3, one pair of magnets projecting at right angles with the other pair.

4 represents an armature-bar which is hinged at its lower end to the casing 1 and which is normally held out of contact with the magnets 3 by a coiled spring 5.

6 represents a contact-strip, with one end of which the armature-bar 4 is adapted to contact when the same is in contact with the magnets 3. The outer end of the bar 4 is turned inwardly to form a hook or shoulder 7.

8 represents the armature-bar for the magnets 2, the latter being hinged to the casing at one end and normally retained out of contact with said magnets 2 through the medium of a spring 9. The armature-bar 8, which extends substantially at right angles with the bar 4, is of such length as to permit of the engagement of the hook end 7 with the upper side of the outer end of said bar 8.

10 represents the parallel rails of a trackway, which on one side of the street-crossing (indicated in the drawings) has its oppositely-located rails divided by insulation into sections *a*, *b*, *c*, and *d*. At the point of the street-crossing are insulated sections *e*, and on the opposite side of the street-crossing from said first-mentioned sections the rails are divided into similar sections *f*, *g*, and *h*. Through the medium of wires 11 and 11ª and a battery 12 the rail-sections *a* are connected, respectively, with the magnets 3, while the rail-sections *b* are connected by wires 13 and 13ª and a battery 14 with the magnets 2.

15 represents a casing, within which are contained three pairs of magnets, which are indicated at 16, 17, and 18, the magnets 16 being arranged horizontally and at right angles with the magnets 17 and 18. The magnets 18 form part of a relay 19, which consists in said magnets and an armature-bar 20, adapted to contact therewith, said armature-bar being connected centrally with an arm 21, which is pivoted through the medium of a transverse pivot-rod 22 in relay-bearing projections 23. Through the medium of a vertical spring 24 the armature-bar arm has its outer end portion normally raised.

26 represents an armature latch-bar, which is mounted to slide horizontally in suitable brackets or standards 27, the outer end portion of said latch-bar extending, as shown, above the relay 19. What I shall term the "inner" or "rear" end of the latch-bar 26 is provided with an armature or contact head 29, which is supported, as shown, in front of the magnets 16, but which is normally held out of contact with the latter through the medium of a spring 30, which exerts an outward influence on said latch-bar 26.

The armature-bar 31 of the magnets 17 is provided with an upwardly or outwardly extending central arm or standard 32, the outer end of which is beveled and the lower or inner end of which is provided with a deep socket, within which extends telescopically a guide-rod 33, the latter extending between the mag-

net-spools 17 and being provided between the armature-bar 31 and the base of the casing 15 with a coiled spring 34, the tendency of which is to hold said armature-bar 31 raised out of contact with the magnets 17. One of the magnets 17 is connected through a wire 35 with the wire 11ª, while the remaining magnet 17 is connected through a wire 35ª with the wire 11. Through wires 36 and 36ª the armature-bar 4 and contact-strip 6 are connected with the magnet-spools 18, said wire 36 intersecting a battery 37.

Through wires 38 and 38ª and a battery 39 the track rail-sections *d*, which are adjacent to the crossing-section *e*, are respectively connected with the magnet-spools 16. Running from the armature-bar arm 21 to one post of a bell 41 is a wire 40.

40ª represents a wire which leads through a battery 42 to a contact-plate 43 on the inner side of the casing 15, said contact-plate having a horizontal end portion 43ª, which is on a level with the upper or outer ends of the magnet-spools 18 and which is adapted when the armature-bar 20 is in contact with said spools to contact with an extension of said armature-bar.

Mounted in the upper or outer portion of the casing 15 is a partial clock-gear, the wheels thereof being mounted, as indicated, upon shafts 44, 45, and 46. For the purpose of rotating the shaft 44, through which motion is imparted to the remaining wheels, I have shown mounted on said shaft an ordinary clock-actuating spring, such as is indicated at 47, the latter having one end connected with said shaft 44 and its remaining end connected with a casing 48, which in turn is connected with a gear-wheel 49, which is mounted on said shaft 44. The gear-wheel 49 gears with a pinion 50 upon the shaft 45, said shaft 45 also carrying on the outer side of the pinion a gear-wheel 51 and a cam-disk 51ª, the periphery of which presents a shoulder 51ᵇ, which is normally held in engagement with the outer end of the arm 32 through the upward pressure of the spring 34, this contact operating to prevent rotation of the gear-wheels. The gear-wheel 51 meshes with a pinion 52 upon the shaft 46, the latter carrying a speed-regulating or escapement wheel 53, the teeth of which are adapted to be engaged alternately by the ends of an escapement-pawl 54, which is mounted upon a rod or shaft 55 and which has depending therefrom a pendulum 56. At a point beneath and at one side of the center of the wheel 51 I fulcrum a lever 57. The lower end of this lever is notched or bifurcated and said notch or bifurcation loosely engages a laterally-projecting pin 58 on the latch-bar 26. The upward extension of the lever 57 is adapted to contact with an eccentrically-located pin 59, which projects from the disk 51ª.

On the opposite side of the street-crossing from that on which is located the mechanism heretofore described I employ a suitable box or casing 60, in which is provided a duplicate of the mechanism contained in the casing 1. Of this mechanism, 61 represents the pair of vertical magnets and 62 the pair of horizontal magnets, 63 the spring-actuated armature-bar for the magnets, 61 and 64 the spring-actuated armature-bar for the magnets 62, while 65 represents the contact-strip corresponding with the strip 6. The magnets 61 are connected, respectively, through wires 66 and 67, with the rail-sections *g*, while wires 68 and 69, respectively, connect the magnets 62 with the rail-sections *h*. The contact-strip 65 is, through the medium of a wire 70 and a battery 71, connected with the wire 36ª, which leads to one of the spools 18, and the armature-bar 64 is, through a wire 72, connected with the wire 36. The wires 68 and 69 are respectively connected with the wires 35ª and 35 by wires 73 and 74.

In order to illustrate the operation of the mechanism hereinbefore described, we will assume that the end of the bar 26 is in contact with the side of the armature-bar 21, the armature-bar 20 being thus raised out of contact with the plate 43ª and magnets 18, and that the remaining parts are in their normal positions with the various circuits broken. Now assuming that a train is approaching the street-crossing in the direction of the arrow and that the same has reached the position indicated by the axle at *k*, in this position the car axles and wheels will serve to connect the rail-sections *a*, thereby completing the circuit through the wires 11 and 11ª and magnets 3, resulting in the armature-bar 4 being drawn inward to the position indicated in Fig. 1 of the drawings. In this position the bar 4 contacts with the strip 6. Through the latter contact and the wires 36 and 36ª the armature-bar 20 is drawn downward into contact with the magnets 18, the downward movement thereby produced of the armature-bar arm 21 resulting in allowing the latch-bar 26, through the action of the spring 30, to move forward until the end of said latch-bar is over the bar 21. Said latch-bar, as is obvious, now serves to hold the armature-bar 20 in contact with the magnets 18 whether a circuit is closed through the latter or not, and the contact thus produced of said armature-bar 20 and plate 43 results, through the wire connections 40 and 40ª, in completing a circuit through the bell 41 and causing the latter to ring. In passing over the track-sections *b* it is obvious that a circuit will be closed through the wires 13 and 13ª and magnets 2, thereby drawing the armature-bar 8 downward, said bar, however, being prevented from contacting with the magnets 2 by the engagement of its outer end with the bar 4. The cars now having reached the track-sections *d* it is obvious that a circuit will be closed through the wires 38 and 38ª and magnets 16, resulting in drawing the latch-bar head or armature 29 into contact with said magnets 16 and in releasing the ar-

mature-bar arm 21 and allowing the armature 20 to be drawn upward by its spring 24. It will thus be seen that the train having passed the track-sections and the circuit having been broken through the magnets 18 and the armature-bar 20 returned to its upper position the ringing of the bell will cease as the last car leaves the sections *d*, which are adjacent to the street-crossing. Now assuming that the forward cars of the train have reached the rail-sections *g*, a current is established through the wires 66 and 67 and magnets 61, which results in the armature-bar 63 being drawn down into contact with said magnets. While the rear cars are still upon the sections *g* and the forward cars are upon the sections *h* a circuit is established through the wires 68 and 69 and magnets 62, which while it moves the armature-bar 64 inward causes an engagement of the hook end of the latter with the end of the bar 63 and prevents a contact of said bar 64 and magnets 62 and strip 65, thereby preventing any ringing of the bell during this operation. I will now assume that the train is approaching the crossing in the opposite direction from that indicated by the arrow. When the forward cars reach the section *h*, the current established through the wires 68 and 69 result in the armature-bar 64 being drawn inward into contact with the magnets 62 and strip 65, which through the wires 72 and 70 and their connections with the wires 36 and 36ª results in again bringing the armature-bar 20 into contact with the magnets 18 and strip 43. In this manner a bell-ringing operation is again established until the cars are upon the section *d*, when in the manner heretofore described the latch-bar 26 is drawn into contact with the magnets 16 and the armature-bar 20 again released. Reaching the sections *b*, the armature-bar 8 is drawn downward this time into contact with the magnets 2, in which position it prevents the contact of the arm 4 with the magnets 3 and strip 6 when the forward cars are upon the section *a*.

In order to prevent a continuous ringing of the bell in case a train does not pass over the street-crossing, but approaches the same and then is switched onto another track or backs away from the crossing, I have provided mechanism (heretofore described) the operation of which is as follows: The catch-stem or vertical bar 32 of the armature 31 is normally in engagement with the cam-disk shoulder 51ᵇ, and the spring 47 is maintained in a wound condition. In view of the fact that the gear-wheel 49 travels in the direction of the arrow indicated thereon in Fig. 1 it is obvious that the catch-spring 32 will normally prevent the rotation of the spring-actuated disk 51ª and the train of gear-wheels through which the same is operated. When the train is moving in the direction of the track-arrow and runs upon the sections *a*, a circuit is established through the wires 11 and 11ª and 35 and 35ª and magnets 17, thus drawing the armature-bar 31 down into contact with said magnets and drawing the arm 32 out of engagement with the cam-disk 51ª. The cam-disk being thus released, it is evident that through the action of the spring 47 the disk 51ª may rotate until its pin 59 by contact with the lever 57 moves the latter on its fulcrum-pin and causes the latch-bar 26 to move backward until the armature-bar arm 21 is released, thus stopping the ringing of the bell. It is evident that the same operation will be attained through the medium of the rail-sections *h* and wires 68 69 and 73 74 in case the train is moving in the opposite direction from that indicated by said track-arrow.

From the construction and operation herein shown and described it will be seen that reliable and positive means are provided for ringing an alarm-bell while a train is approaching a crossing and that means are provided in conjunction therewith for stopping the ringing of said bell after the street-crossing has been reached. It will also be observed that in the case of a train approaching a crossing, but not reaching or passing the same and then moving off of the insulated sections of the rails, the ringing of the alarm-bell will be limited in duration to the time required for the pin 59 to operate upon the lever 57.

Although I have shown herein a spring-actuated train of gear-wheels for accomplishing the last-mentioned result, it is obvious that any suitable or well-known means such as a weight suspended from a cord running upon a pulley, might be substituted for said spring.

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

1. In a crossing-signal, the combination with a trackway having insulated oppositely-located sections on opposite sides of a street-crossing, of two sets of magnets 2 and 3 supported at right angles with each other on one side of the crossing and two similarly-arranged sets on the other side, a spring-actuated armature-bar for each set of magnets, one of said armatures being provided with a laterally-projecting end portion which is adapted when the remaining armature is down to engage the same and hold it in contact with its magnets and which is adapted when drawn inward to extend within the path of the remaining armature-bar and prevent the latter being closed against its magnets, thus preventing the complete simultaneous operation of both, wires connecting adjacent track-sections with each set of said magnets, an electric bell, magnets 18 and an armature-bar 20 therefor, wires 40 and 40ª connecting said bell respectively with said armature-bar 20 and a contact-plate 43 with which said armature-bar is adapted to contact when in contact with its magnets and wires connecting said magnets 18 with one pair of each set of said magnets 2 3 and 61 62 whereby the ringing of the bell is dependent on the com-

plete operation of the armature-bar of said pair of magnets, substantially as specified.

2. In a crossing-signal, the combination with a trackway having a plurality of insulated sections on opposite sides of a crossing, magnet pairs 16, 17 and 18, said magnets 16 being connected through wires with the track-sections which adjoin the street-crossing and said magnets 17 and 18 being similarly connected with those track-sections which are farthest away from the crossing, spring-actuated armature-bars 20 and 31 for the magnets 17 and 18, a sliding spring-actuated latch-bar adapted to be attracted by the magnet 16 and normally extending in the path of the armature 20, a catch-arm 32 for the armature 31 and an electric alarm-bell adapted to ring when the armature 20 is in an operated position, of a train of automatically-operated gears and shafts, a disk on one of the latter having a peripheral notch and a pin projecting eccentrically from said disk, said armature-arm 32 adapted to normally engage said disk-notch, a lever fulcrumed so as to extend on one side of the center of the disk, said lever having a loose connection with said latch-bar 26 and said latch-bar adapted to be drawn out of the path of said armature 20 only when a current is established through the magnet 16, substantially as specified.

NICHOLAS RATCHFORD.

In presence of—
C. C. SHEPHERD,
A. L. PHELPS.