May 3, 1932. B. N. MINER 1,856,499

RAILWAY CROSSING SAFETY DEVICE

Filed May 9, 1930 2 Sheets-Sheet 1

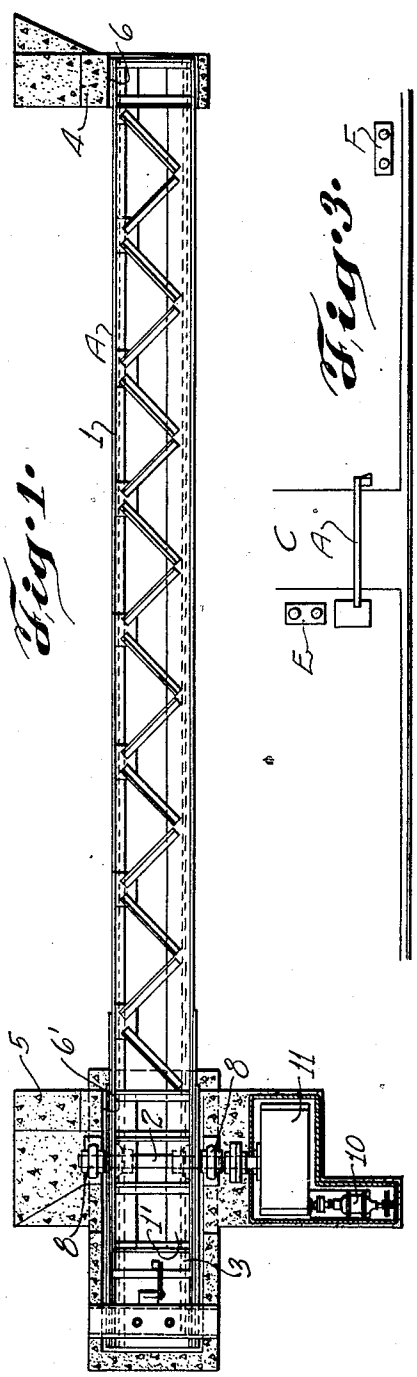

Fig. 1.

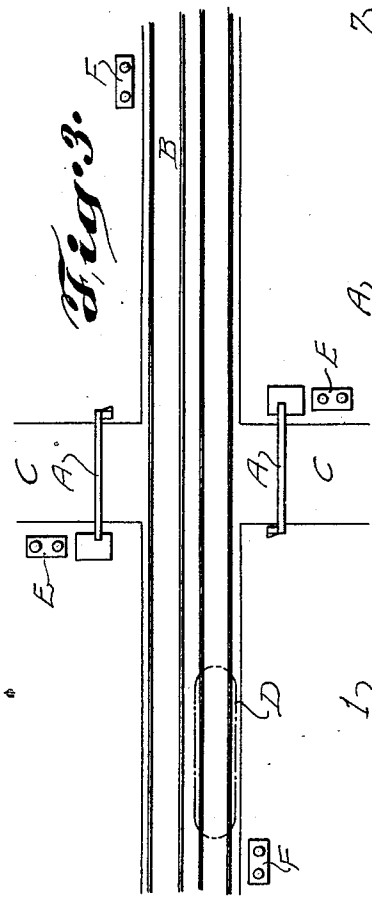

Fig. 3.

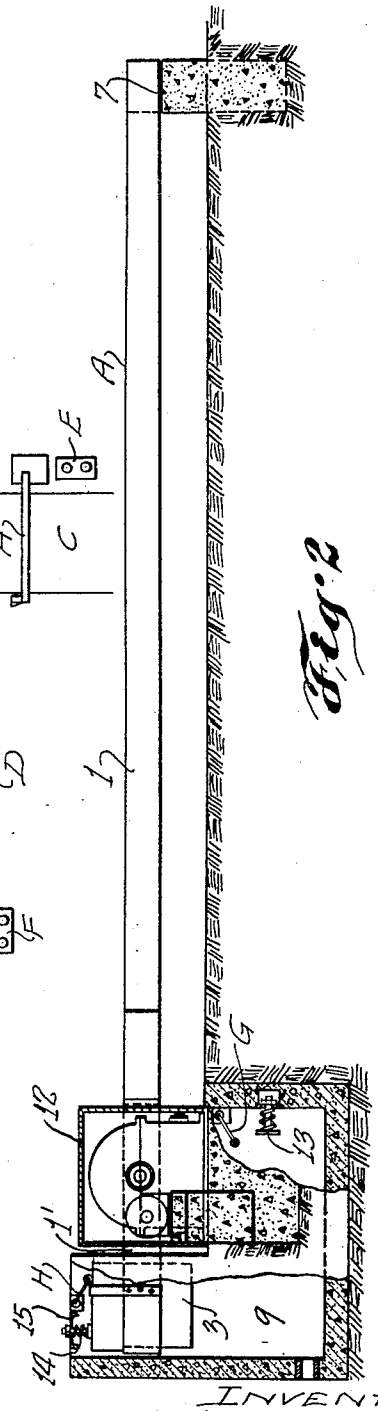

Fig. 2.

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RAILWAY CROSSING SAFETY DEVICE

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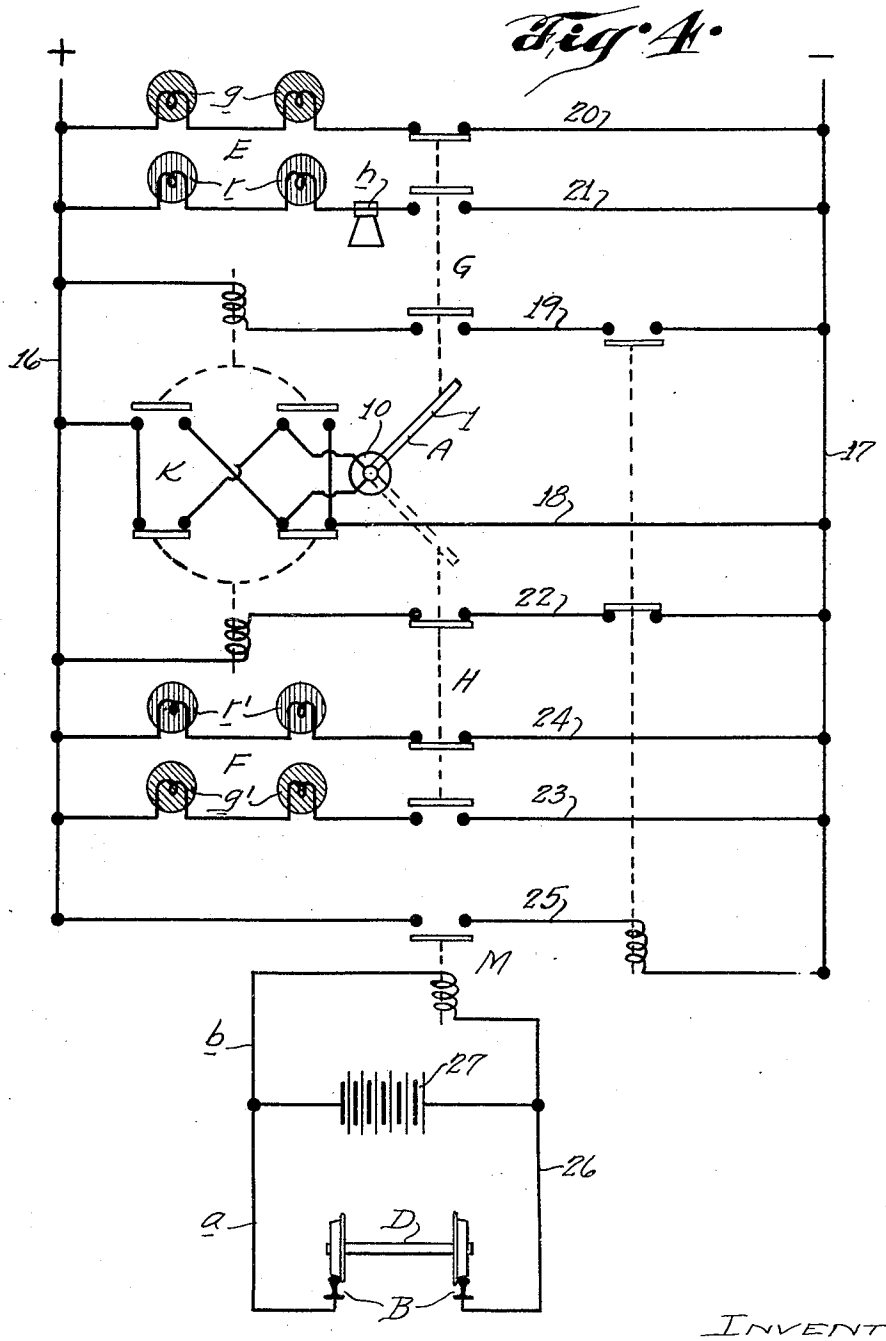
Fig. 1.



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Patented May 3, 1932

1,856,499

UNITED STATES PATENT OFFICE

BENJAMIN N. MINER, OF ST. LOUIS, MISSOURI, ASSIGNOR TO MINER SUPER-SAFETY GATE AND SIGNAL SYSTEM, INC., OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI

RAILWAY-CROSSING SAFETY DEVICE

Application filed May 9, 1930. Serial No. 450,899.

This invention relates generally to safety apparatus for railway or highway grade crossings and has particular reference to a certain new and useful improvement in safety devices for preventing collisions between vehicles moving respectively along the highway and the railroad.

My invention has for its principal objects to prevent collision between a moving railroad vehicle and a highway vehicle by presenting to the latter the less hazardous alternative of collision with a positive obstruction or barrier movable automatically across the highway on approach of the track vehicle to the crossing; to provide warning to the driver of the highway vehicle of the position of said barrier in order to minimize the chance of collision of the highway vehicle with the barrier; and to provide warning to the operator of the track vehicle of the position of said barrier in order that the track vehicle may be brought to a stop in the event the barrier fails to close the highway at the crossing.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts hereinafter described and pointed out in the claims.

In the accompanying drawings, (two sheets)—

Figure 1 is a plan view of the barrier forming a part of a railway-crossing safety device of my invention;

Figure 2 is a front elevational view of the barrier as seen by a highway vehicle approaching the barrier, parts thereof being shown in section;

Figure 3 is a diagrammatic plan of a railroad-highway crossing illustrating the use of a safety device of my invention; and

Figure 4 is a view diagrammatically illustrating the electrical circuits also forming part of the safety device for the automatic operation of the barrier.

Referring now more in detail and by reference characters to the drawings, which illustate a practical embodiment of my invention, the device, briefly, comprises a plurality of barriers A, adapted to be used as a protection to traffic moving towards or over a railroad-highway grade crossing; B designates the track, of which two are shown; and C the highway crossing the tracks B. One of the barriers A is located on each side of the tracks B and is movable suitably for obstructing the highway C respensively to movement of a vehicle D on the track B. The movement of the barrier A is synchronized with signals E, F, each preferably including a visual indicating means, the signals E preferably, however, also including an audible warning device, as will later appear, and being located along the highway C a suitable distance from the tracks B, while the signals F are located along the tracks B a suitable distance from the highway C.

Each of the barriers A includes a preferably vertically swingable bar 1 adapted to movably span the highway C to be protected and preferably comprising a framed structural beam of the type commonly known as a horizontal girder, having its principal axis of resistance directed against and for opposing vehicular movement on the highway C.

The bar 1 is designed to absorb the impact occurring on impingement of a vehicle of ordinary weight moving at a usual speed along the highway as determined by the traffic conditions there obtaining.

Secured at an end of and transversely through the bar 1, is a horizontal pivot shaft 2, the bar 1 having a counterweight arm 1′ extending beyond the shaft 2, said arm 1′ carrying a counterweight 3 for approximately balancing the bar 1 about the shaft 2.

When the bar 1 is in vehicle obstructing or closed position, its opposite ends are located adjacent to, and for co-operation with, respective fixed abutments 4, 5, the highway or path C of vehicle movement thus lying between the said abutments 4, 5. The abutment 4 is a simple masonry structure having a vertical abutting seat 6 for absorbing the reaction from the swingable or free end of the bar 1 when the same is in closed position. The abutment 4 may also include a horizontal seat 7 upon which the said end of the bar 1 may rest when in closed position, but the abutment 4 is principally designed to resist, and, as I have said, to absorb, the reaction

from that end of the bar 1 occurring on engagement of a vehicle therewith.

The abutment 5 is, like the abutment 4, a masonry structure primarily designed to resist the horizontal overturning thrust or reaction from the adjacent end of the bar 1, and for like purpose and effect has a vertical seat 6′ against which the bar 1 abuts when in closed position. The abutment 5, however, also pivotally supports the bar 1 and for such purpose is provided with a pair of spaced bearings 8 in which are journaled the respective ends of the shaft 2, and between which is provided, in the abutment foundation, a counterweight pit 9, the counterweight 3 descendingly swinging in the pit 9 when the bar 1 is swung upwardly or elevated to its open or unobstructing position, said bar 1 being then preferably upstanding from the abutment 5 at one side of the highway.

The bar 1 is operable for alternately obstructing and unobstructing the highway C by a reversible motor 10 coupled preferably through a suitable speed-reducing device 11 to the shaft 2. The motor 10 and reducer 11 are preferably protected from the weather by a suitable housing 12 and are also conveniently supported on a suitable extension of the foundation of the abutment 5.

The motor 10 is connected in circuit with a pair of limit switches G, H, the switch G limiting the opening movement of the bar 1 and, for such purpose, being mounted on a wall of the pit 9 for engagement by the counterweight 3 as the bar 1 approaches its open position, when the limit switch G opens the motor circuit and the bar 1 is brought gradually to rest by means of a resilient buffer 13 suitably mounted in a wall of the pit 9 for yieldingly engaging the counterweight 3. The switch H limits the closing movement of the bar 1 in a like manner, a suitable buffer 14 being provided to bring the bar to rest, the buffer 14 and switch H being mounted on a beam 15 extending between and supported by the side walls of the pit 9.

The limit switches G and H constitute a part of a series of electrical circuits by means of which the bar 1 is operated and the signals E, F, actuated, responsively to the presence or absence of a vehicle D on the tracks B, as will best be seen in Figure 4.

The source of power is indicated by the usual plus lead 16 and minus lead 17. 18 designates the motor circuit, in which is incorporated or included an electro-magnetic reversing switch K. 19 designates the barrier-opening circuit, in which is incorporated or included one side of the reversing switch K, such that when the circuit 19 is closed, the reversing switch K connects the motor 10 for opening movement of the barrier A.

20 designates the circuit of the "go" or green lights g of the highway signals E, and 21 designates the circuit of the "stop" or red lights r and the audible signal or horn h thereof.

The limit switch G is incorporated in and controls the three circuits 19, 20, 21, such that, when the barrier A is open, the switch G is actuated to open the circuits 19, 21, and close the circuit 20, but as soon as closing movement of the bar 1 releases the switch G, the circuits 19, 21, are closed and the circuit 20 is opened.

22 designates the barrier-closing circuit, in which is incorporated the other side of the reversing switch K, such that, when the circuit 22 is closed, the reversing switch K connects the motor 10 for closing movement of the barrier A.

23 designates the circuit of the "go" or green lights g' of the track signals F, and 24 designates the circuit of the "stop" or red lights r' thereof.

The limit switch H is incorporated in and controls the three circuits 22, 23, 24, such that, when the barrier A is closed, the switch H is actuated to open the circuits 22, 24, and close the circuit 23, but as soon as opening movement of the bar 1 releases the switch H, the circuits 22, 24, are closed and the circuit 23 is opened.

25 designates the control-relay circuit, in which is incorporated a control-relay L, which, in turn, is incorporated in and controls the circuits 19, 22, such that, when the circuit 25 is closed, the relay L closes the circuit 19 and opens the circuit 22.

26 designates a track circuit energized by a suitable source of potential, as a battery 27. The circuit 26 is composed of two branches a and b. The opposite ends of the branch a are connected to the respective insulated rails of a section or "block" of the track B, and the branch a is, therefore, normally open, but may be closed by the conducting wheels and axle of a vehicle D on the track B. The branch b includes a track-relay M in closed circuit with, and hence normally energized by, the battery 27, but is shunted by the circuit a when the latter is closed. The relay M is incorporated in and controls the circuit 25 such that, when the track B is clear, the circuit 25 is closed, but when a vehicle D is on the track B, the circuit 25 is opened.

The circuit-diagram in Figure 4 represents the conditions obtaining when, the barrier A being in open position, the track signals F showing red and the highway signals E showing green, a vehicle D comes on the insulated section of the track B, resulting in shunting the circuit b to such an extent as to substantially de-energize the track-relay M, which drops-out, thus opening the circuit 25 and de-energizing the control-relay L. The relay L moves to close the circuit 22, and this circuit being already closed through the limit switch H, the reversing switch K

is actuated to connect the motor 10 for closing operation of the bar 1. This is the state of the various parts shown in Figure 4. Continuing the description, a short movement of the bar 1 serves to release the limit switch G, which opens the circuit 20 and closes the circuit 21, causing the highway signals E to show red and the horn *h* to sound. At the same time, the circuit 19 is closed through the switch G, although this circuit, it will be understood, is now open at the relay L. As the bar 1 approaches its closed position, the limit switch H is actuated, opening the circuit 22, and causing the reversing switch K to disconnect the motor 10 from the line. At the same time, the circuit 24 is opened and the circuit 23 is closed, causing the track signals F to show green.

It will be seen that the highway signals E give a "stop" indication substantially as soon as the bar 1 starts to move to closed position, whereas the track-signals F do not give a "go" indication until the bar 1 is substantially in fully closed position.

When the vehicle D leaves that part of the track B included in the track-circuit *a*, the relay M is then energized sufficiently to close the circuit 25, actuating the relay L to close the circuit 19, and since this circuit is already closed through the limit switch G, the reversing switch K is actuated to connect the motor 10 for opening the barrier A. A short movement of the bar 1 serves to release the limit switch H, which opens the circuit 23 and closes the circuit 24, causing the track signals F to show red. At the same time the circuit 22 is closed through the switch H, but it will be understood that this circuit is now open at the relay L. As the bar 1 approaches its open position, the limit switch G is actuated, opening the circuit 19 and causing the reversing switch K to disconnect the motor 10 from the line. At the same time, the circuit 21 is opened and the circuit 20 is closed, causing the highway signals E to show green. It will be seen that the track signals F will give a "stop" indication substantially as soon as the bar 1 starts to move to open position, whereas the highway signals E do not give a "go" indication until the bar 1 is substantially in fully opened position. It will also be seen that any break in the track-circuit *b* tending to leave the highway unprotected will result in closing the barrier A.

It will thus be observed that my new device efficiently accomplishes its purposes and provides for a substantial barrier A to vehicle movement on a highway, such as C, over the tracks B, the barrier A being interposed across the highway C responsively to vehicle movement on the track B. And, further, by means of signals E, warning is given to the operator of the highway vehicle of the position of the barrier A, in order that proper action may be taken to avoid collision with the barrier A, the latter serving, however, to positively obstruct and substantially impede the movement of a vehicle attempting to make the crossing ahead of an advancing train or the like. The operator of the track vehicle is likewise advised of the position of the barrier A by means of signals F, enabling him to come to a stop if the barrier A is not brought to closed position. In such manner, complete and adequate protection is afforded.

While I have herein shown and described a preferred embodiment of my invention, it will be understood particularly that the electrical circuits shown may be modified to best accomplish the results sought, and that the specific form of the bar 1 and the means for operating it may be varied, and that other changes and modifications in the form, construction, arrangement, and combination of parts may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In combination with a railroad track and a highway crossing the track, a barrier movable to close the highway, means including an electric motor for operating said barrier, and electro-magnetic means responsive to the presence and absence of a vehicle on the track for correspondingly actuating said motor, said electro-magnetic means including a motor circuit, a barrier opening circuit, a barrier closing circuit, a reversing switch controlling said motor circuit responsively to said opening and closing circuits, a limit switch in said opening circuit to open when the barrier is open, a limit switch in said closing circuit to open when the barrier is closed, a relay circuit, a relay responsive thereto for controlling said opening and closing circuits, a track circuit, and a relay responsive thereto for controlling said first mentioned relay circuit for energizing the closing circuit when a vehicle is on said track and for energizing the opening circuit when the track is clear, said motor circuit being correspondingly energized responsively to said reversing switch.

2. In combination with a railroad track and a highway crossing the track, a barrier movable to close the highway, means including an electric motor for operating said barrier, electro-magnetic means responsive to the presence and absence of a vehicle on the track for correspondingly actuating said motor, and means controlled by said barrier for giving remote indications of the position of the barrier, said electro-magnetic means including a motor circuit, a barrier opening circuit, a barrier closing circuit, a reversing switch

controlling said motor circuit responsively to said opening and closing circuits, a limit switch in said opening circuit to open when the barrier is open, a limit switch in said closing circuit to open when the barrier is closed, a relay circuit, a relay responsive thereto for controlling said opening and closing circuits, a track circuit, a relay responsive thereto for controlling said first mentioned relay circuit for energizing the closing circuit when a vehicle is on said track and for energizing the opening circuit when the track is clear, said motor circuit being correspondingly energized responsively to said reversing switch, said indicating means including visual signals arranged in groups each directed with opposite significance respectively along said track and said highway, said groups being incorporated in respective signal circuits, the highway signal circuit being controlled by said first mentioned limit switch and the track signal circuit being controlled by said second mentioned limit switch.

3. A safety device for a highway railroad crossing comprising, in combination with the railroad-track, a barrier including a bar pivotally swingable alternately from open to closed position relatively to the crossing, operating-means including an electric motor and its circuit and a reversing-switch in said circuit for swingably actuating the bar, electrically responsive means controlled by movement of a vehicle on the track for actuating said motor, a plurality of signalling circuits and signalling members included therein having go and stop indications normally disposed with alternate opposite significance respectively along said highway and said track, and barrier opening and closing circuits and limiting switches included therein adapted for actuation by and on movement of said bar for both controlling the bar-operating means and the directing significance of said signalling members.

In testimony whereof, I have signed my name to this specification.

BENJAMIN N. MINER.