

May 22, 1951

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2,553,780

HIGHWAY-RAILWAY CROSSING SAFETY BARRIER

Filed Dec. 20, 1946

4 Sheets-Sheet 1

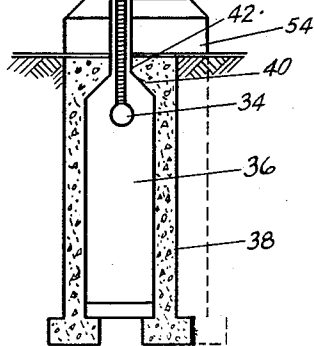
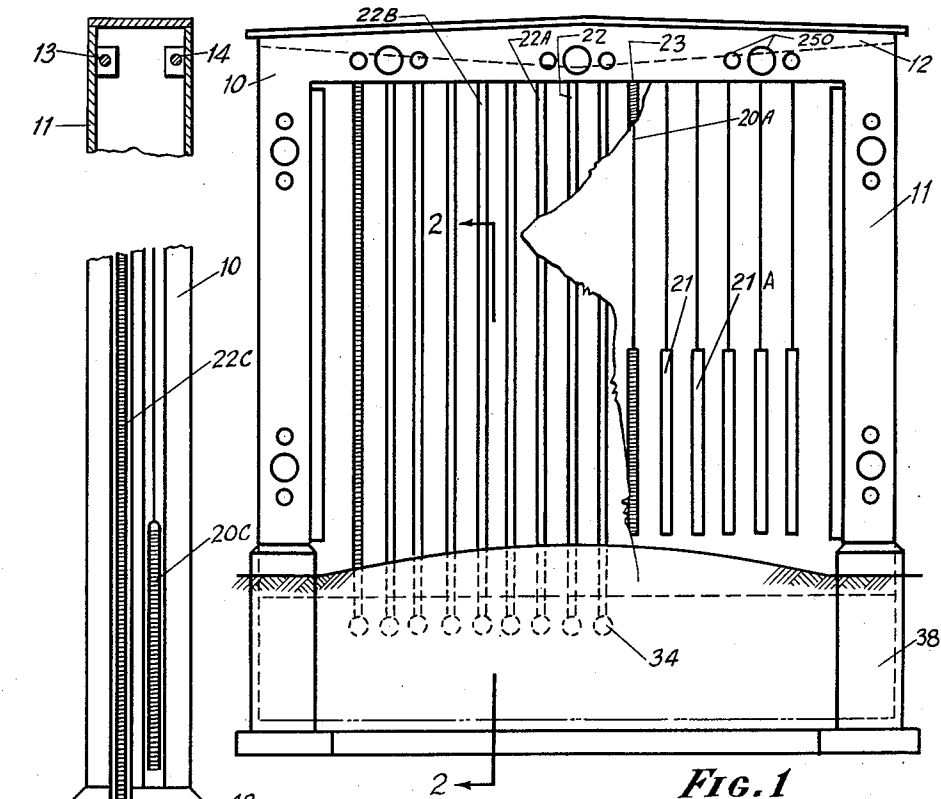


Fig. 2

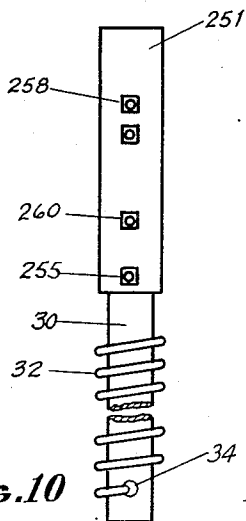


Fig. 10

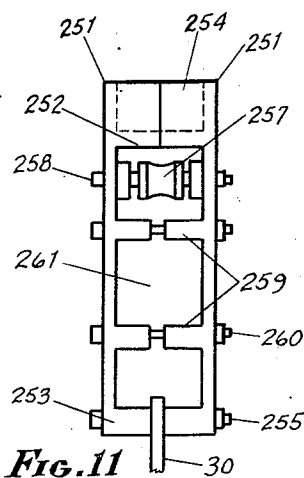


Fig. 11

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2,553,780

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4 Sheets-Sheet 2

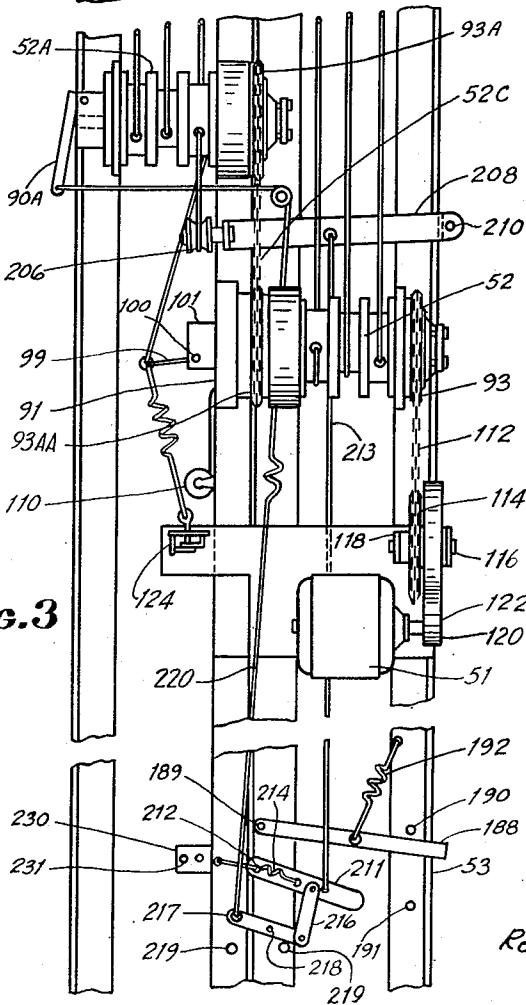
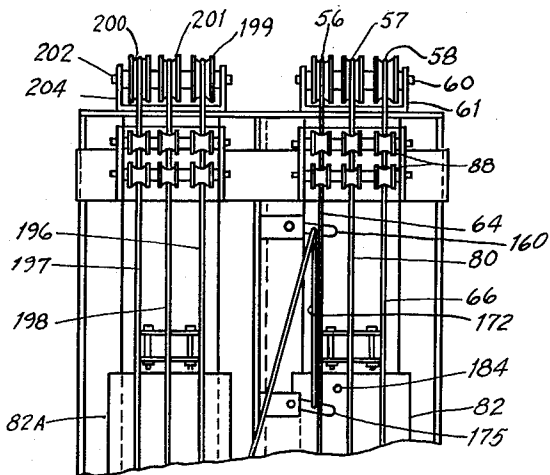


Fig. 3

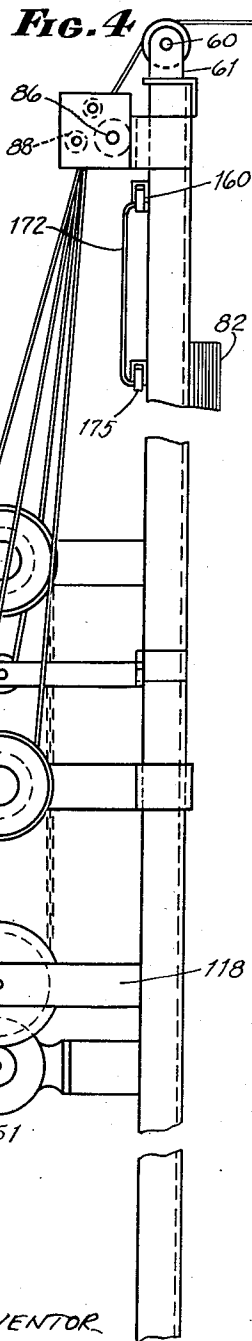


Fig. 4

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Filed Dec. 20, 1946

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FIG. 7

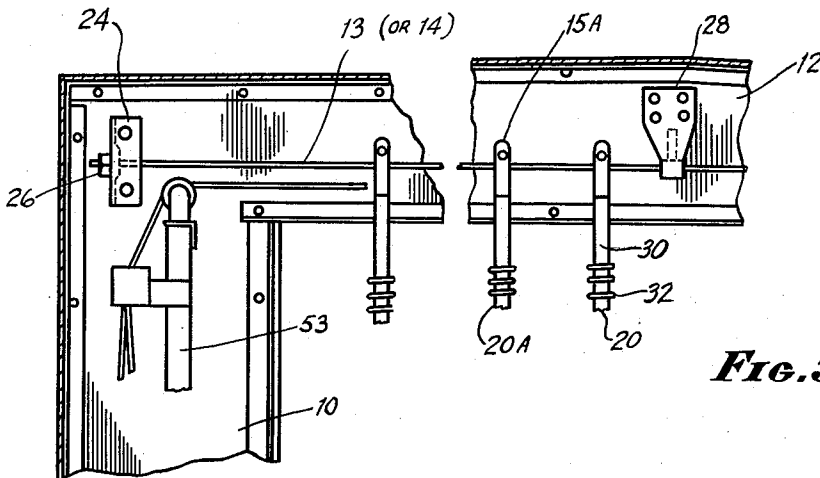
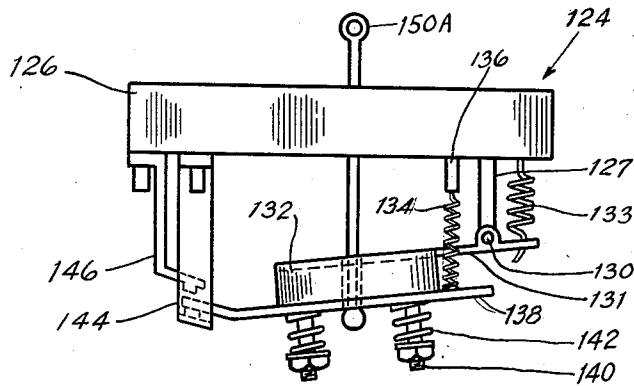


FIG. 5

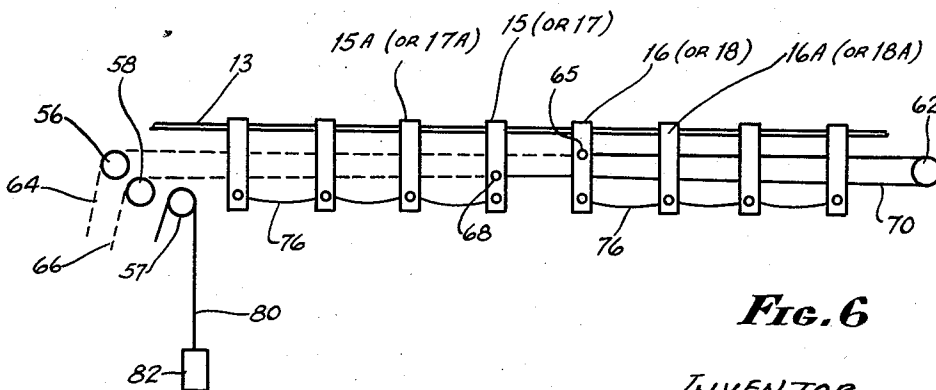


FIG. 6

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May 22, 1951

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2,553,780

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Filed Dec. 20, 1946

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Fig.9

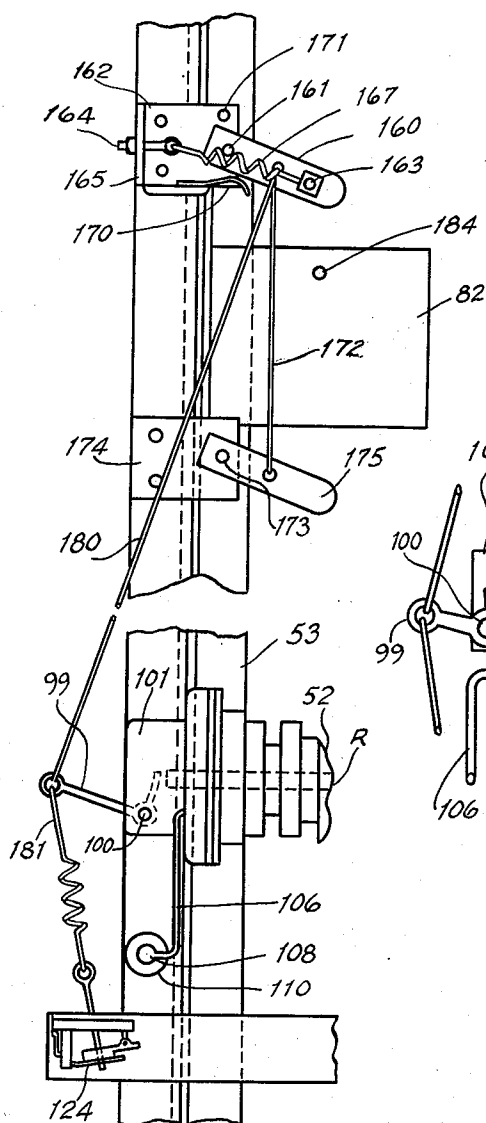
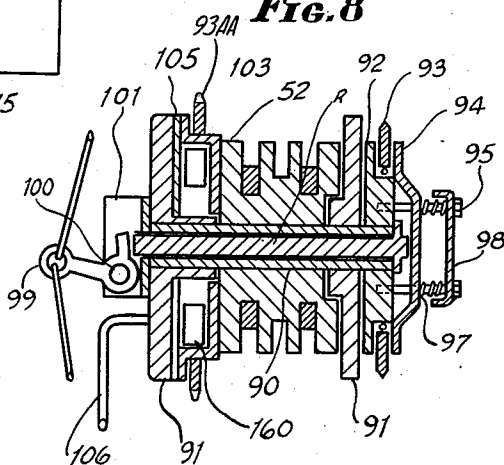


Fig. 8



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UNITED STATES PATENT OFFICE

2,553,780

HIGHWAY-RAILWAY CROSSING SAFETY
BARRIERRobert Nicholas Murphy, Ottawa, Ontario,
CanadaApplication December 20, 1946, Serial No. 717,423
In Canada December 22, 1945

4 Claims. (Cl. 160—126)

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My invention relates to a highway-railway crossing safety barrier.

More particularly, the barrier is one of the automatically-operated type, being operated by an electric motor interposed in a circuit of which a bonded rail section forms a part. Upon the approach of a train to the crossing, the circuit to the motor is closed, and the barrier is automatically operated to obstruct the highway; after the train has left the crossing, or has travelled a predetermined distance beyond the crossing, the circuit to the motor is broken, and the barrier automatically operates to clear the highway.

The objects of the invention, generally, are to improve on known such barriers.

A specific object of the invention is to provide a barrier which will be as mechanically safe of operation as possible.

Another specific object of the invention is to provide a positive barrier, preferably in the form of coil springs which are held at top and bottom, so that while the springs will stretch to a certain extent under the impact of a colliding vehicle, they will finally bring the vehicle to a stop. Even if the springs should be damaged, or strained, or even if the colliding vehicle should be damaged to some extent, it is believed that the knowledge by motorists of the existence of such a positive barrier, will result in their abandoning all thought and tendency of proceeding across a railway crossing after they have been given ample signal that a train is approaching. Should a vehicle collide with the barrier and stretch a spring or springs beyond its or their elastic limit, the speed at which the vehicle was travelling when it impinged the spring or springs will be possible for computation, once one has a knowledge of the weight of the vehicle, the size, length and tensile strength of the spring, number of coils, and diameter of coils.

Another specific object of the invention is to combine with such a positive barrier, a parallel loose or non-positive barrier, the idea being that should the positive barrier fail to operate, especially during winter, the loose barrier will operate to give a sufficient signal of an approaching train. Should the positive barrier fail altogether to operate, so that only the loose barrier would operate to close the highway, the presence of this loose barrier only would in most cases be sufficient to induce motorists to come to a stop, since from a distance they cannot tell whether only one, or both barriers, is or are closing the highway.

Another specific object of the invention is to provide controlling means such that the positive

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barrier will, should it encounter a predetermined resistance when in process of moving toward its obstructing position, be moved back to its clear position independently, and without affecting the movement, of the free barrier.

Still another specific object of the invention is to provide controlling means such that if a train approaches the highway in one direction, soon after another train travelling in an opposite direction on a double track system has just cleared the highway or where in the case of a system having more than two tracks, two trains approach the highway in the same direction but one slightly ahead of the other, the barrier will be immediately operated to obstruct the highway, without its having to first assume its clear position.

Other objects and advantages of the invention may possibly be found to exist in a barrier operating in accordance with this invention.

In the drawings, wherein like numerals of reference indicate corresponding parts in the various figures,

Figure 1 is a front elevation of the barrier in its closed or operative position, obstructing the highway, parts being broken away or omitted for the sake of clarity;

Figure 2 is an enlarged, fragmentary section on line 2—2 of Figure 1;

Figure 3 is a front elevation, on an enlarged scale, of the controlling mechanism, mounted to one of the standards;

Figure 4 is a side view of Figure 3;

Figure 5 is an enlarged, fragmentary sectional view of Figure 1;

Figure 6 is a diagrammatic view illustrating method of operatively connecting together the carriages suspending the various tails, respectively;

Figure 7 is a more or less diagrammatic view of the switch used for co-ordinating parts of the controlling mechanism;

Figure 8 is an enlarged, sectional view of one of the operating drums, clutch and brake;

Figure 9 is an enlarged, fragmentary view of Figure 3;

Figure 10 is a front elevation of a typical carriage and tail (tail shown in part only);

Figure 11 is a side view of Figure 10.

Referring now by numerals to the drawings, 10 and 11 are two upright, hollow posts, one on each side of the rod, between which extends a crosswise hollow member 12 enclosing two spaced, parallel rods or trackways 13 and 14. On the rod 13, ride carriages indicated as 15, 15A, etc. consecutively from the centre out, and over the other

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side ride carriages indicated as 16, 16A, etc. consecutively from the centre out. On the other rod, 14, ride similar carriages, 17, 17A, etc., and 18, 18A, etc. From the carriages 15, 15A, etc., and 16, 16A, etc., are suspended tails or signalling or obstructing members indicated as 20, 20A, etc., and 21, 21A, etc., consecutively, corresponding to their respective carriages. From the carriages 17, 17A, etc., and 18, 18A, etc., are suspended tails 22, 22A, etc., and 23, 23A, etc., respectively, likewise similarly consecutively numbered.

The posts are located as best shown in Figure 5 adjacent the sides of the highway, and the barrier is located at a selected distance on each side of the railway line. The rods or trackways 13 and 14 may be anchored at both ends in brackets 24 secured within the posts, the rods being conveniently threaded at each end to receive nuts 26. The rods may be supported at mid-length in a bracket 28 secured within the crosswise member 12.

The tails 20, 20A, etc., and 21, 21A, etc., preferably each comprise a thin metal member or band 30 encircled by a coil spring 32 extending over part only of the length of the metal band. As seen in Figure 10, the spring is conveniently held in position on its particular supporting band by twisting the lower end of the spring and inserting such end through a hole 34 made through the band. It has been found that a tail so constructed is very satisfactory. It is sufficiently flexible and sufficiently rigid, and will bounce away from a colliding vehicle without permanently bending out of shape or looping around the bumper or other parts of the vehicle, and without causing appreciable damage, if any, to the vehicle or to the tails.

The tails 22, 22A, etc., and 23, 23A, etc., are made of a spiral spring the lower end of which carries a weight or ball of metal 34 adapted to move longitudinally of, and within, a channel 36 defined by a masonry structure 38 disposed crosswise of the highway. The channel is formed with shoulders 40 providing therebetween a narrowed neck 42 of such size or width as to accommodate the spring but to prevent the ball on the end of the band or tail from moving upwardly any substantial distance. The tails 22, 22A, etc., and 23, 23A, etc., which thus carry the balls are therefore such that they provide a positive barrier to a colliding vehicle. The other tails 20, 20A, etc., and 21, 21A, etc., on the other hand, are free to yield or swing an unlimited distance should they be impinged by a colliding vehicle, and thus only provide a free or non-positive barrier.

The carriages 15, 15A, etc., and 16, 16A, etc., and the free or loose tails carried thereby are moved transversely of the highway to obstruct the same upon the approach of a train, and are moved in an opposite direction to clear the highway, and become housed within the posts 10 and 11, respectively, after the train has cleared the highway or otherwise travelled a predetermined distance, by a drum 52 operatively connected to an electric motor 51. Two standards 53 are enclosed within the posts 10 and 11, respectively, the standards being suitably encased at the bottom in masonry bases, 54, upon which the posts 10 and 11 may conveniently rest and be secured thereto. Supported by one of the standards 53, at the top thereof, are sheaves 56, 57, and 58, loose on a shaft 60 journaled in a bracket 61, and in alignment with the drum 52. Supported by the other standard, on the top thereof, is a

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sheave 62 see Fig. 6. A cable 64 is anchored at one end to the drum and anchored at the other end to the carriage 16 as at 65 see Fig. 6, the cable turning on the sheave 56; a second cable 66 is anchored at one end to the drum and anchored at the other end to the carriage 15 as at 68, the cable turning on the sheave 58. As best shown in Figure 3, the drum ends of the cables 64 and 66 are wound or turned in opposite directions on the drum, so that while one cable, say 64, winds on the drum, the other cable, 66, will unwind from the drum; and vice versa. Operatively connected at both ends to the carriages 15 and 16, is a cable 70, which is looped to turn at its closed or looped end around the loose sheave 62. Thus, as the drum turns in one direction, the carriages 15 and 16 will be drawn or moved toward one another, while the carriages will be moved away from one another as the drum turns in an opposite direction.

In order to move all of the carriages, and therefore the tails carried thereby, by and from the movement of the two head or leading carriages 15 and 16, which are the only carriages operatively connected to the operating drum 52, the carriages 15 and 15A, 15A and 15B, etc., are connected together by means of a flexible member such as a chain 76; and likewise, the carriages 16 and 16A, 16A and 16B, etc., are connected together by similar chains 76. Thus, as will be seen, the tails 20, 20A, etc., lying to one side of the axis of the highway, and forming one group of tails, will be moved by and from the head tail 20, while the other group of tails lying on the opposite side of the road and comprising the tails 21, 21A, etc., are moved by or from the other head tail 21. It will also be clearly seen that the tails in each group will be started across the road, one by one. Upon moving in an opposite direction, that is, off the highway and toward their respective posts 10 and 11, the head tail in each group will engage the adjacent tail, and so on, the tails being thus prevented from acquiring too great a speed.

In order to move the tails back to normal or clear position, within their respective posts 10 and 11, a cable 80 is anchored at one end to the drum 52 and secured at the other end to a weight 82 slidably guided in the standard 53, the cable turning on the sheave 57 and being wound on the drum so that it will wind while the cable 64 unwinds, or vice versa. In practice, the portion of the drum on which the cable 80 winds is smaller in diameter than the portion on which the other two cables, 64 and 66, wind, so that the travel of the weight will be less than the extreme travel of the tails. Preferably the three cables are trained around sheaves or pulleys 86 with which are associated idlers or guiding sheaves 88 to prevent the cables from running off the sheaves 86.

The motor must be so associated with the drum 52 that it becomes operatively disconnected when the tails have been drawn across the highway, at which time the motor must be cut off from the electric power; the drum must now also be brought to a stop and restrained from turning back under the action of the weight, which has now reached its raised position. A suitable mechanism such as shown in Figure 8 may be advantageously used.

The drum 52 is fixed on a hollow shaft 90, see Fig. 8, journaled in suitable bearings 91 secured to the standard 53. Also fixed to the shaft is a disc 92 formed to rotatably support

a sprocket 93. Both faces of the sprocket are provided with friction means or pads (not shown) adapted to be engaged by the disc 92 and by a dished plate or disc 94, slidable on machine screws 95 carried by the disc 92. The sprocket 93 normally rotates with the drum by the action of coil springs 97 encircling the screws 95 and compressed between the disc 94 and a disc or cap 98. Slidably mounted in the hollow shaft 90 is a rod R, one end of which is adapted to engage one face of the disc 94 and shift the same away from the sprocket 93 to thus allow the sprocket to turn loosely on the disc 92, and, therefore, turn independently of the drum 52. This arrangement provides a suitable form of clutch. The rod R may be shifted in one direction, to operatively disconnect the sprocket 90 from the drum 52 by a lever 99 pivotally connected as at and by a pin 100 to a pair of lugs 101 from one of the bearings 91. Turning with the drum 52 is a dished disc 103 formed to house brake shoes 160 pivotally mounted on a base plate 105 fixed to one of the bearings. The brake shoes are adapted to be operated or swung on their pivoted connections with the base plate 105 and engage the housing 103, by a suitable lever 106, the lower or free end of which is provided with a core or armature 108 forming part of an electromagnet 110 of suitable design, which is fixed to the standard 53.

In order to operatively connect the motor to the drum, or more particularly to the sprocket 93, a sprocket chain 112 is trained around the sprocket and a sprocket 114 fixed to a shaft 116 journaled in a suitable bracket 118. Fixed to the shaft 116 is a gear 120 meshing with a gear 122 fixed to the motor shaft.

In order to disconnect the motor from the source of electric power, as when the tails have been moved to operative or obstructing position across the rod, a suitable two-way switch 124 is used. Such a switch is shown more or less diagrammatically in Figure 7. Thus, the switch comprises a base 126 of insulating material from which depends a post 127. To the post is pivotally mounted, as at 130, a metal bar 131, having an insulating slab 132 secured thereto. The bar 131 is urged away from the base by a coil spring 133 tensioned between it and the base 126. Mounted to one face of the slab 132 is a conductor 138 electrically connected at one end to a post 136, as by a wire 134. The conductor 138 is normally held against the slab 132 by screws 140 and coil springs 142. Two contacts 144 and 146 are also mounted on the base, these being spaced, but superposed, to be alternately engaged by the conductor 138, according as to whether the conductor is in its normal or lowered position, or is raised, by an operating rod 150A. The post 136 of the switch is connected to the source of electric power, while the contacts 144 and 146 are connected to the motor and the magnet, respectively; the contact 144 is in the circuit through the motor, while the contact 146 is in the circuit through the magnet coil 110. Thus, when the switch is in the position shown in Figure 7, the motor 51 is energized, while the coil is de-energized; in the opposite position of the switch, with the conductor 138 engaging with the contact 146, the coil is energized, while the motor is de-energized. When the motor is energized, the tails will be moved over the road and the weight raised at the same time, the brake being now inoperative; when the motor is de-energized and the coil energized, the weight will be held in

its raised position and the tails will remain across the road.

In order to operate the switch so as to de-energize the motor and to energize the magnet coil, and therefore apply the brake, while the clutch is operated to operatively disconnect the drum 52 from the motor, the following mechanism may be used. Thus, as seen in Fig. 9 a lever 160 is pivoted as at 161 to a bracket 162 secured to the standard 53. Between a bolt 163 and an eye bolt 164 anchored in a lug 165 from the bracket 162, is a tensioned coil spring 167. The arrangement is such that the lever or trip 160 is capable of two positions, as its spring 167 passes dead centre over pivot 161, a lowered position such as shown in Figure 9, or a raised position, such positions being limited by the engagement of the lever with the end of a spring 170, and a stop or pin 171, respectively. A second lever 175 is pivoted as at 173 to a bracket 174 secured to the standard 53, below the trip lever 160. Both levers are operatively connected as by a chain 172. The lever 175 is thus raised or lowered with or by the lever 160; this latter lever is not affected by the lever 175 when the same is raised, but is affected by the lever 175 when the same is lowered. Between the lever 160 and the clutch lever 99 is a wire 180, so that the clutch lever is raised to disconnect the motor from the drum 52, by the lever 160 when the same is raised. Connected between the rod 150A of the switch 124 and the clutch lever is a connection, in the form of a wire 181 having a portion thereof formed as a coil spring. When the lever 160 is raised, the switch is operated to disconnect the motor from the source of electric power, but to connect the magnet coil to the power. On the other hand, when the lever 160 is lowered, as in the position shown, the switch is in its normal position, the circuit now being closed to the motor but broken to the coil. The weight 82 is provided with a pin 184 see Fig. 3 positioned to engage both levers 160 and 175. When the weight is being raised from its normal or lowered position, as when the tails are moving away from the posts, the pin 184 first engages the lever 175, lifting the same out of its path, and then engages the lever 160 to raise and trip the same to its raised position, when the lever 175 will also be raised or moved to its raised position. A lever 188 bottom of Fig. 3 is pivoted to the standard as at 189 and is free to swing in an arc of a circle between stops 190 and 191. A tensioned spring 192, anchored between the standard and the lever, serves to urge the lever in an anti-clockwise direction. This lever is positioned to be engaged by the pin 184 carried by the weight 82 when the weight about reaches its lowered position, and therefore serves as a buffer and support. This spring also aids the action of the motor upon starting.

The carriages, 17, 17A, etc., and 18, 18A, etc., riding on the rod or trackway 14 and suspending the tails, 22, 22A, etc., and 23, 23A, etc., respectively, which tails constitute the other, or positive, barrier, are operatively connected to a second drum 52A also mounted on the standard 53. This second drum is of the same construction as the drum 52, except that it has no brake shoes, the reason being that, as will be explained presently, this second drum normally turns with, and is turned by, the drum 52. In other words, it is normally operatively connected to the drum 52, but is operatively disconnected therefrom when the tails, or any of the tails, are impeded in their

normally free movement toward obstructing position. Such impediment may be encountered during winter, for instance, when ice is apt to form between the shoulders of the channel or tunnel 36.

The drum 52A is operatively connected to the drum 52 as by an endless chain 52C trained between the sprocket wheels 93A and 93AA of the drum, respectively.

The arrangement of cables between the various carriages and the drum 52A is similar to that previously described with respect to the loose barrier and diagrammatically shown in Figure 6. Thus, cables 196 and 197 are anchored at one end to the drum 52A and secured at the other end to two of the head or leading carriages 17 and 18, respectively, and a third cable 198 is anchored at one end to the drum and secured at the other end to a weight 82A. The rotation of the drum results in the moving of the head carriages, and therefore of the succeeding carriages, to and from, obstructing position, while the weight 82A being raised when the tails are being moved toward obstructing position and is lowering when the tails are being moved toward clear position. The cables 196, 197, and 198 are trained around pulleys or sheaves 199, 200, and 201, respectively, loose on a shaft 202 journaled in a bracket 204. The cable 196 is trained around a pulley 206 journaled on the end of a lever 208 pivotally mounted to the standard 53 as at 210. Between the lever 208 and a lever or trip 211 pivoted to the standard as at 212 is a connection, such as a wire 213. The lever or trip 211 is actuated by a tensioned spring 214, whose tension may be varied, as will be seen later on. The lever is pivotally connected, as by a link 216, to a lever 217 pivoted to the standard as at 218. Two stops 219 determine the two extreme positions of the lever 217, and therefore, of the trip or lever 211 as well. The lower or free end of the clutch lever 90A of the drum 52A is connected to one end of the lever 217 as by a wire 220. The length of the wire is such that, when the lever 208 is in the position shown in Figure 3, the wire 213 will be somewhat loose, while the wire 213 will become taut before the lever 217 assumes its other or extreme position, the result being that the lever 211, when fully tripped up, will have actuated the clutch lever 90A sufficiently to operatively disconnect or declutch the drum 52A from the motor through the chains 52C and drum 52, or in other words, to allow the sprocket 93A to be rotated by the drum 52 while allowing the drum 52A to be rotated by the action of the weight 82A. The trip lever 211 is re-set or lowered from its raised position by the pin 184 of the weight 82 as the weight lowers.

As previously stated the effective tension in the spring 214 may be varied by, say, providing a bracket 230, secured to the standard, and provided with spaced apertures 231 to adjustably and removably receive one end of the spring. Therefore, the spring and the bracket provide means adapted to be selectively arranged or adjusted to determine the resistance offered by the impediment at which the clutch will operate to disconnect the drum 52 from the motor.

The barrier may be operated by reversing the motor but the use of a weight is deemed to be the most practical method, for the reason that the highway is always clear of the barrier if and when the current fails or when there are no trains approaching.

In addition to the tails used, other signalling means may be used, such as bells, (not shown), or

lights 250 see Fig. 1, these being operated before the tails actually begin moving, this being a matter merely of arrangement of the electric circuit.

The carriages may be made as shown in Figures 10 and 11. Two similarly-formed castings 251 are formed with co-engaging upper lugs 252, and lower lugs 253 adapted to receive therebetween, and engage and clasp, the upper end of the tail or band or spring, as the case may be. Between the upper lugs and castings proper is a wall 254; when both castings are assembled together, the wall defines with the castings and lugs, a chamber in which may be enclosed a suitable oil packing. The tail or band is held to and suspended by the carriage by means of a bolt 255, this bolt also serving to hold the lower ends of both castings together. A roller or pulley 257 is journaled between the castings by a bolt 258, which also serves to hold both castings together in assembled relationship. Intermediate lugs 259 are also provided, these lugs terminating short of one another to receive the end of one of the cables, as well as to receive the end of a chain 76, bolts 260 serving to thus anchor such cable or chain. A space 261 provided between the adjacent lugs serves to loosely receive the cable or cables.

Operation

As the train reaches the bonded rail section forming part of the electric circuit, the motor is energized, while the magnetic coil remains de-energized. The motor, now in clutch with both drums 52 and 52A, rotates them and the tails constituting both the loose and the positive barriers are moved toward the centre of the highway, that is, moved out and away from their respective housing posts 10 and 11. As the drums rotate, the weights 82 and 82A are raised. The pin 184 of the weight 82 first lifts the lever 175 and then engages and lifts the lever 160 and trips the same. As the lever 160 is tripped to its raised position, the lever 175 is likewise raised. Upon the tripping of the lever 160, the clutch lever 99 is operated in a clockwise direction to shift the rod R and disconnect the motor from the drum 52, while the switch is operated to break the circuit to the motor but making the circuit to the magnet coil. As both drums are normally connected together, both sets of tails will come to a stop and the weights will be held in their raised positions by the brake. Upon the train leaving the bonded section, the circuit is cut off, the brake released, and the weights proceed to lower, thus causing the tails to move to their clear position within their respective posts. So soon as the pin engages the lever 175 and turns the same sufficiently to trip the lever back to its lowered position, as best shown in Figure 9, the clutch on the drum 52 is released to again connect the motor to the drum and release the switch, which now assumes its normal position making the circuit to the motor but breaking the circuit to the magnet coil. The barrier complete, (that is, both loose and positive barriers), is now again ready to operate, upon the closing of the circuit as by a train entering the bonded section. If no such second train approaches, the weights will lower to their normal position.

Should the positive barrier encounter a predetermined resistance when in the process of moving to obstruct the highway, the tension occasioned thereby in the cable 196 will lift the lever 208 and trip the lever 211, when the movement of the lever 217 will pull on the wire 220 and

actuate the clutch lever 90A of the drum 52A to declutch the drum from the motor 51. The weight 82A will now descend and bring the tails of the positive barrier back into their respective posts 10 and 11. The lever 211 will remain in its raised position until the weight 82 has descended to its lowered or normal position.

Having regard to the foregoing disclosure, the patent of which this specification forms part confers, subject to the conditions prescribed in the Patent Act, 1935, the exclusive right, privilege and liberty of making, constructing, using and vending to others to be used, the invention as defined in claims submitted by the patentee as follows:

1. In a highway railway crossing safety barrier, the combination of a structure including two spaced, parallel trackways, a channel under one of said trackways, a member depending from each of said trackways, one of said members having means on the lower end thereof longitudinally movable in said channel and co-operating therewith to limit the upward movement of said means, means operable simultaneously to normally move said members in one direction from a position off the highway to a position above the highway to obstruct the traffic, alternately, and in an opposite direction, and means operable, upon the member which has its lower end movable in said channel encountering an impediment while moving toward its obstructing position, to return said member to its clear position independently of the other member.

2. In a highway railway crossing barrier, the combination of a structure including two trackways, a tail depending from one of said trackways and movable longitudinally thereon, a resilient member depending from the other trackway and movable longitudinally thereon, means below said last-mentioned trackway forming a channel in which the lower end of said resilient member is capable of moving longitudinally, means on the lower end of said resilient member co-operating with said channel to limit the upward movement of said lower end, a drum, means between said drum and said tail for moving said tail, a second drum, means between said second drum and said resilient member for moving said resilient member, a motor, clutch means for connecting and disconnecting said motor and said drums, and means operable to act upon said clutch means

to disconnect said second drum from said motor upon an impediment being encountered by said resilient member in its longitudinal movement without disconnecting said first drum from said motor.

3. In a highway railway crossing safety barrier, the combination of two members independently movable in one direction to obstruct the crossing and in an opposite direction to clear the crossing, means for normally moving said members simultaneously selectively to obstruct or to clear the crossing, and means operable upon one of said members encountering an impediment while moving toward its obstructing position to return said member to its clear position independently of the other member.

4. In a highway railway crossing safety barrier, the combination of a structure including two spaced, substantially parallel trackways, a tail loosely depending from one of said trackways, a resilient tail having an enlargement at the lower end thereof depending from the other trackway, means below said other trackway adapted to receive the lower end of said resilient tail and facilitating movement of said tail longitudinally thereof while constraining movement of said tail at right angles to said means, means operable to normally move said tails to and simultaneously from their obstructing position, and means operable upon said resilient tail encountering an impediment while moving toward its obstructing position to return said tail to its clear position independently of the other tail.

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