Feb. 2, 1943. W. B. SCHMIDT ET AL 2,310,039

INTERLOCKING INDICATING AND CONTROL DEVICE FOR AMUSEMENT PARK RIDES

Filed Aug. 2, 1940 3 Sheets-Sheet 1

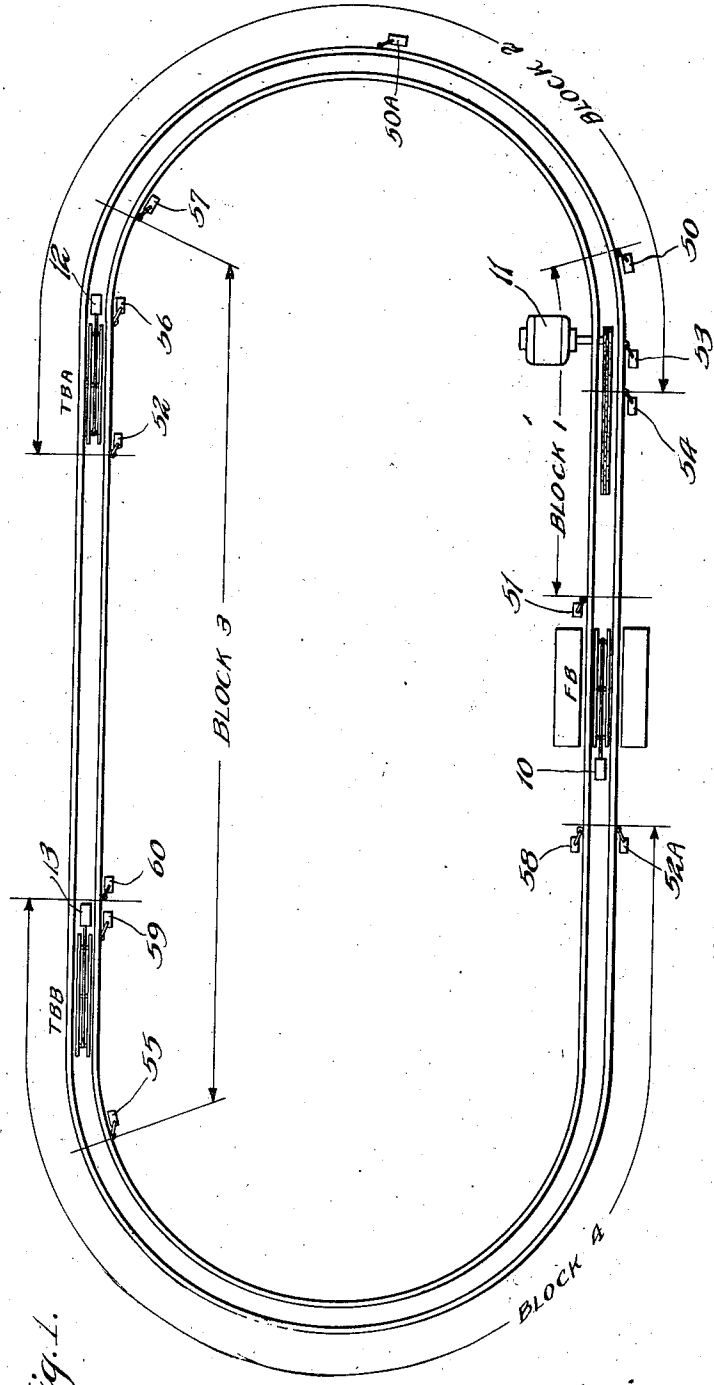

Fig. 1.

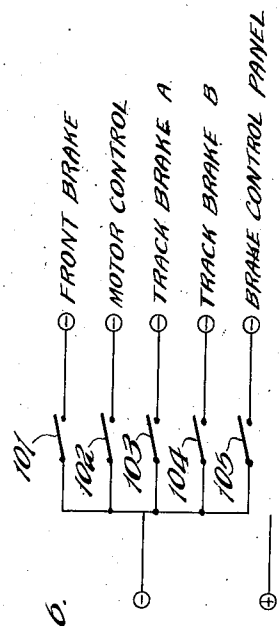

Fig. 6.

INVENTORS.
William B. Schmidt
Ted B. Morse
Marshal H. Rieves
BY George H. Simmons ATTORNEY.

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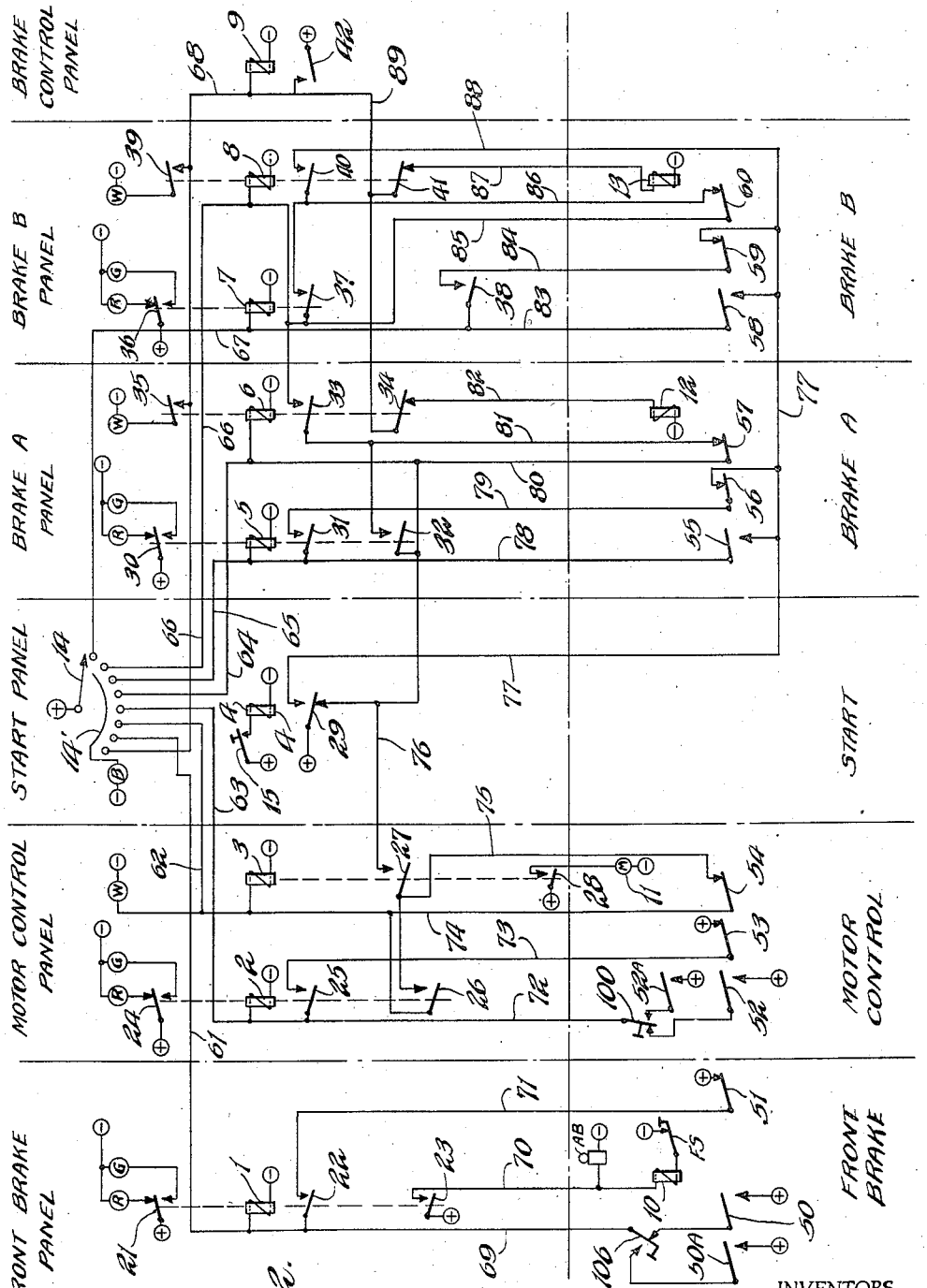

Fig. 2.

INVENTORS.
William B. Schmidt
BY Ted B. Morse
Marshal H. Rieves
George H. Simmons ATTORNEY.

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Fig. 3.

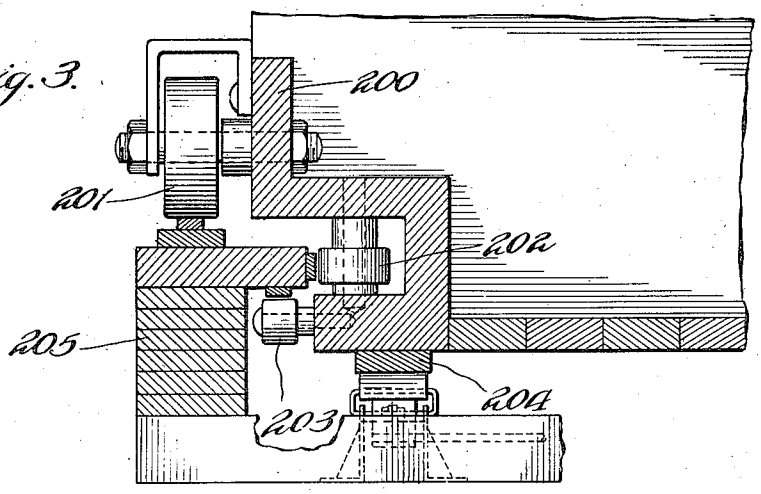


Fig. 4.

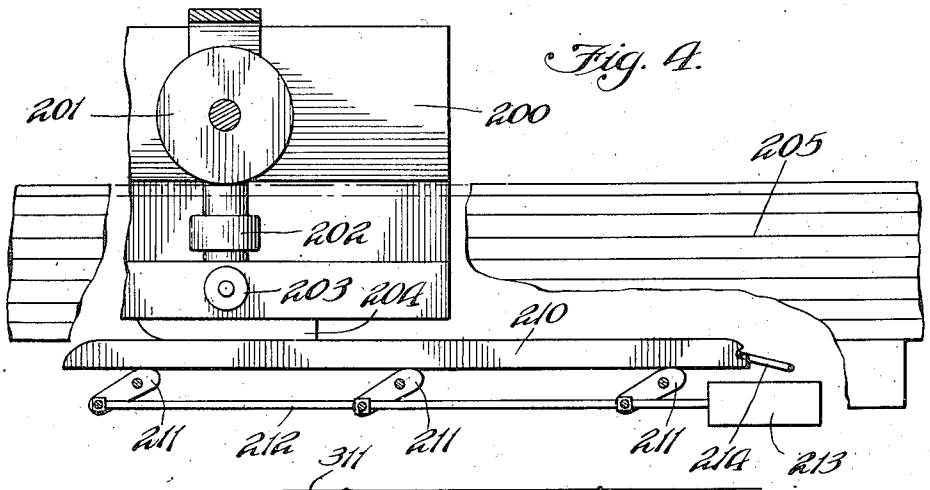
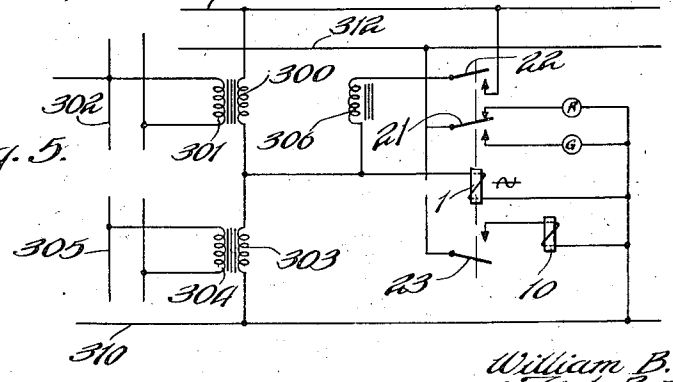


Fig. 5.



INVENTORS.
William B. Schmidt.
Ted B. Morse
Marshal H. Rieves
George H. Simmons
BY
ATTORNEY.

Patented Feb. 2, 1943

2,310,039

UNITED STATES PATENT OFFICE

2,310,039

INTERLOCKING INDICATING AND CONTROL DEVICE FOR AMUSEMENT PARK RIDES

William B. Schmidt, Ted B. Morse, and Marshal H. Rieves, Chicago, Ill.

Application August 2, 1940, Serial No. 349,854

10 Claims. (Cl. 246—32)

This invention relates to amusement park rides and has for its principal object the provision of a safety device therefor arranged to enable a given structure to handle the same or a greater number of trains with greater safety.

It is a principal object of the invention to provide means for speeding up the schedules of trains operating on an existing ride.

A further object of the invention lies in the provision of means for eliminating the human element in the dispatching and controlling of trains on a ride structure.

Still another object of the invention lies in the provision of a safety device for preventing a train from entering a block on the trackway until a preceding train has cleared that block.

Still another object of the invention lies in the provision of signals and indicators by which the attendants and passengers may note the position of each train at any moment.

Further objects of the invention, not specifically mentioned here, will be apparent from the detailed description and claims which follow, reference being had to the accompanying drawings in which:

Figure 1 is a diagrammatic track diagram of an amusement park ride showing the location of the safety devices thereon;

Figure 2 is a schematic diagram of the electrical circuits of the safety device;

Figure 3 is a fragmentary elevational view in cross section showing a car, the track and car braking arrangement;

Figure 4 is a fragmentary side elevational view showing particularly the car braking arrangement;

Figure 5 is a schematic circuit diagram of a modified form of the invention; and

Figure 6 is a diagrammatic view of the power supply.

Amusement park rides, commonly known as roller coasters, consist of a track leading from a loading platform to a chain mechanism by which a train, which may consist of one or more cars, is elevated to the top of the structure and then started over the trackway. This trackway contains steep hills, sharp curves that are traversed by the train at high speed to give the passengers a thrilling ride. As soon as the train leaves the chain by which it is elevated to the top of the ride, it operates by gravity thereon. In certain instances, particularly where the trackway is relatively short, it is impossible to stop the train once it has cleared the end of the chain until it arrives at the unloading platform. In other rides where the trackway is relatively longer, one or more track brakes are provided between the outgoing end of the chain and the loading platform so that if necessary the train may be stopped out on the track structure.

In all cases, it is advantageous to use two or more trains on the ride, in the case of a short ride, one train being at the loading and unloading platforms while the other is on the track structure. In the longer ride, two or more trains may be on the track structure at the same time with safety if the spacing between the trains can be maintained accurately. Since the speed of the trains on the structure is fixed, the only way that the carrying capacity of the ride can be increased is by speeding up the operations at the loading and unloading platforms and by spacing the trains on the trackway as close together as is possible without danger of collisions.

Heretofore, the operation of the track brake and chain motor of the rides has been purely manual, attendants dispatching the trains by releasing one from the loading platform as soon as the preceding train has reached a predetermined point on the trackway. When there are a large number of passengers waiting on the loading platform, the attendants naturally try to keep the trains moving as close together as possible and in certain instances have released a train before the preceding train has cleared the safety point and trouble has developed on the preceding train so that it would not clear the safety point and a collision resulted.

In the present invention, we seek to eliminate entirely the human element in the dispatching and controlling of trains upon the trackway, substituting therefor electrical and mechanical devices which, with frequent routine testing, can be maintained at a very high degree of reliability. As the result of this arrangement, trains can be spaced much closer together upon the trackway with absolute safety and the structure therefor can be made to handle a larger number of passengers in a given time.

In accordance with the teachings of our invention, we have divided the trackway into sections or blocks and have provided safety devices co-operating with the track brakes and chain motors to prevent a train entering a given block until the preceding train has definitely cleared that block by passing out of it into the next block. In the event that a train arrives at the entrance to a block before the preceding train has cleared the block, the track brakes are

operated to bring the train to rest and also to stop all trains back of the train that tried to enter the block prematurely.

Referring now to the drawings in more detail, particularly Figure 1 where we have diagrammatically illustrated a track diagram, block 1 is seen to extend from the front brake F. B. which is located at the loading platform to a point just beyond the outgoing end of a chain by which the trains are elevated to the top of the structure. Block 2 extends from a point near the top of the chain to a point just beyond the first track brake T. B. A. Block 3 extends from the point of entrance of the track brake T. B. A. to a point just beyond the track brake T. B. B. and block 4 extends from the point of entrance of the track brake T. B. B. to the loading platform. By the arrangement shown, four trains can be handled simultaneously upon the trackway without danger of collision, one of the four trains being unloaded and loaded while the other three are traversing the structure.

As will be well understood by those skilled in the art, the cars of trains used on a device of this kind are carried on running wheels 201, Figures 3 and 4, which bear against a metallic plate or track located upon the top of the plate 205 and side thrust is taken up by wheels 202 carried upon the frame 200 of the car. The car is prevented from jumping the track by safety rollers 203 which ride under an overhanging portion of the track, these rollers normally being out of engagement with the track. The car frame 200 carries a pair of brake shoes 204 usually located immediately beneath the rear wheels of the car and between the rails of the trackway. The track brake mechanism used both as a front brake and as a safety brake out on the trackway is shown in Figure 4 as comprising a longitudinal brake shoe engaging member 210 that is supported on cams 211 which are rotated to elevate the member 210 through a draw bar 212 by the brake operating mechanism 213. The brake shoe engaging member 210 is anchored against longitudinal movement by suitable means such as link 214 and when the shoes are engaged the car may actually be lifted off the running wheels 201 and thereby rapidly brought to rest.

The operating mechanism 213 may take any one of a number of forms now in common use on devices of this kind. Frequently the front brake operating mechanism will consist merely of a manual lever that is manipulated by the platform attendant. The safety brake may be electrically, hydraulically, or pneumatically operated. In certain instances, the operating mechanism may consist of a heavy weight, latched in non-operated position of the brake and released to permit it to fall to move the brake into operated position. Our safety equipment is readily adapted for use with any of these existing types of brake operating mechanisms, or other types which may be operated electrically, hydraulically, or mechanically.

Referring now to the drawings in more detail, particularly Figures 2 and 6, when it is desired to put the ride into service, manual switches 101—104 inclusive, Figure 6, are closed to apply electrical current to the equipment. If all of the equipment is to be placed in service, all switches will be closed, but if only a part of the equipment is to be used, as will hereinafter appear, only the needed ones of these switches will be closed. As is customary in a schematic diagram of this type, each relay is shown as connected to battery but it will be understood that in an actual installation, commercial current may be used, and in certain instances, this may be alternating current, it being understood that the relays being alternating current type relays. Assuming that all switches 101—104 inclusive are closed, switch 15 is then closed manually. In an actual installation switch 15 may be identical with power switch 103, Figure 6, although it is shown in Figure 2 as a separate switch for the sake of clarity of the drawings. As soon as switch 15 is closed, relay 4 operates over the obvious circuit to move its main spring 29 from its back contact to its make contact as a first step in the preparation of the system for use. While 29 is designated as a main spring, as are other springs throughout this description, it may be an armature such as is commonly found in alternating current relays, rather than a spring. Manual switch 14 is then operated to move its contactor over the plurality of contacts, one at a time, so as to close the following circuits. The first circuit closed extends from one side of the source of current, for convenience hereinafter referred to as ground, wiper 14 and the first contact engaged thereby conductor 67 through the winding of relay 7 to the other side of the source of current, for convenience herein referred to as battery. Relay 7 energizes over this circuit and is held in operated position over a circuit which may be traced from ground through spring 29 and its make contact, conductor 77, track switch 59 and its break contact, spring 38 of relay 7 and its make contact through the winding of relay 7 to battery.

As soon as wiper 14 is moved into engagement with its first contact, contact plate 14' is engaged thereby to close a circuit through the indicator lamp B causing that lamp to be lighted to indicate that the starting switch 14 is out of its normal position. Switch 14 is then turned to bring the wiper into engagement with the second contact whereupon a circuit is extended from ground through that wiper and conductor 66 through the winding of relay 8 to battery, operating that relay which holds itself in operated position over a circuit from ground on conductor 77, through conductor 88, spring 40 and its make contact, conductor 86, track switch 60, conductor 85, through the winding of relay 8 to battery. Track switch 60 is shunted through spring 37 and its make contact since relay 7 is in its operated position.

Starting switch 14 is then moved to its next contact to close a circuit which extends through conductor 65 and the relay 5 to battery, operating that relay which is held in operated position over a circuit from ground on conductor 77 through track switch 56, conductor 79, spring 31 and its make contact and the relay winding to battery. Contactor 14 is then moved to the next contact to extend a circuit through conductor 64 and the winding of relay 6 to battery to operate that relay which holds itself over a circuit from the ground on conductor 77, through conductor 88, spring 40 of relay 8 and its make contact, conductor 86, track switch 60, conductor 85, spring 33 and its make contact, conductor 81, track switch 57, conductor 80 through relay 6 to battery. Track switch 57 is shunted through spring 32 and its make contact since relay 5 is in its operated position.

The contactor 14 is then moved to its next contact to extend the grounded circuit through con-

ductor 63 and the winding of relay 2 to battery to operate that relay which holds itself over a circuit from ground placed on conductor 73 through track switch 53, through spring 25 and its make contact, through the winding of relay 2 to battery.

The next operation moves the contactor 14 into engagement with the contact to which conductor 62 is connected to extend a circuit through that conductor and the winding of relay 3 to battery. Relay 3 operates and holds itself over a circuit from grounded conductor 77 through conductor 88, spring 40 and its make contact, conductor 86, track switch 60, conductor 85, spring 33 and its make contact, conductor 81, track switch 57, conductor 80, conductor 76, spring 27 and its make contact, conductor 75, track switch 54, conductor 74, through the winding of relay 3 to battery. Track switch 54 is shunted through spring 26 and its make contact since relay 2 is in its operated position.

The next movement of contactor 14 closes the circuit through conductor 61 and the winding of relay 1 to operate that relay which holds itself over a circuit from ground on track switch 51 through conductor 71, spring 22 and its make contact and the winding of relay 1 to battery.

Relays 1 to 8 inclusive are now in operated position and held over the various circuits traced above. Relays 3, 6 and 8 which may be termed guard relays are held in operated position over a chain which includes contacts on these relays and track switches 54, 57 and 60, and these track switches are shunted by contacts on relays 2, 5 and 7 respectively. Relays 2, 5 and 7 may be termed supervisory relays.

Contactor 14 is next moved into engagement with its last contact to extend a ground circuit over conductor 68 through the winding of relay 9 to battery to operate that relay which holds itself over a circuit from ground through main spring 42 and its make contact through the winding of relay 9 to battery. Relay 9, through spring 42 and its make contact, maintains conductor 68 grounded thereby to maintain a circuit through spring 39 and its make contact and the white lamp associated with relay 8 to battery, and a similar circuit through spring 35 and its make contact and the white lamp associated with relay 6 to battery, lighting those lamps to indicate that the two brake operating units T. B. A. and T. B. B. are in readiness for operation. The ground previously traced to conductor 74 and the relay 3 extends through the white lamp W associated with relay 3 to battery, to light that lamp and to indicate that the motor control equipment is in readiness for operation. Starting switch 14 is then moved out of engagement with its contacts into the position in which it is shown in Figure 2, the lamp B being extinguished when the contactor 14 moved into said normal position.

As soon as relay 3 is operated, a circuit is closed from ground through spring 28 and its make contact, through the motor 11 to battery, to start the motor. In an actual installation the motor draws too much current to be handled by relay contacts and the motor device 11 will be a suitable motor starting device, the particular type depending upon the particular motor being used.

Operation of relay 1 closes spring 21 against its make contact thereby to operate the green lamp G to indicate that block 1 is clear and in readiness for the movement of a train. Relay 2 similarly operates spring 24 to operate the green lamp G, thereby to indicate that block 2 is clear and in readiness to receive the train. Similarly, the operation of relay 5 through springs 30 operates the associated green lamp to indicate that block 3 is clear and the operation of relay 7 through springs 36 indicates that block 4 is clear.

The station attendant noting this and having his train in readiness releases foot switch F. S. thereby completing the circuit from ground through spring 23 and its make contact, conductor 70, through the alarm bell A. B. with a parallel path through the winding of front brake operating mechanism 10, through the foot switch to negative battery, the front brake being thereby released to permit the train to move away from the loading platform. The foot switch F. S. preferably closes the circuit through it when the switch is in normal position as shown in the drawings. The platform attendant, by stepping on the switch, may hold a train at the platform until the passengers are safely loaded. The alarm bell A. B. rings as soon as the train is due to leave and its ringing will tend to cause late arriving passengers to hurry.

As will be seen in Figure 1, as soon as the train has cleared the front brake, track switch 51 will be engaged to open its normally closed contacts, thereby removing ground from conductor 71 to permit relay 1 to restore to its unoperated position. Springs 21 extinguish the green lamp and light the red light to indicate that block 1 is occupied and that the front brake is set against a succeeding train, the restoring of spring 23 deenergizing the brake operating mechanism 10 to permit that brake to return to the safe position thereby to stop a second train at the loading platform.

The first train proceeds into engagement with the chain and is picked up thereby and moved up to the top of the track structure, the train engaging track switch 54 as the end of the chain is approached. The operating of track switch 54 tests the clear condition of block 2 by opening the previously traced holding circuit for relay 3, but since at the moment there is no train ahead of the first train, relay 2 will be in its operated position and track switch 54 will be shunted by a circuit through spring 26 and its make contact, and relay 3 remains in operated position. A moment later the first train engages track switch 53, as will be seen in Figure 1, thereby to open the holding circuit for relay 2 to permit that relay to restore to its unoperated position. At spring 24 relay 2 extinguishes the green lamp and lights the red thereby indicating that block 2 is occupied by the train. As soon as the first train moves off of the chain, it operates track switch 50, thereby momentarily closing a circuit from ground through track switch spring 50 and its make contact, conductor 69, through the winding of relay 1 to battery, operating that relay which holds itself over a circuit from ground at track switch 51 as before, and at springs 21 extinguishes the red lamp and lights the green lamp to indicate that block 1 is clear and a train can be moved away from the loading platform. At spring 23, relay 1, again closes the circuit of front brake operating mechanism 10 and alarm bell A. B. to start the second train in motion. As the train moves out of the loading platform, track switch 51 is operated again to restore relay 1 to normal so as to trap the succeeding train.

We now have two trains on the structure, one in block 1 and one in block 2. The first train now in block 2 should clear the block by moving over track brake T. B. A. before the second train

moves into engagement with the track switch 54. However, let us assume that the first train for some reason or other does not do this. Relay 2 having been deenergized by the first train in moving over track switch 53 is now in its unoperated position so that when the second train moves into engagement with track switch 54, the holding circuit of relay 3 is broken since the multiple circuit around the track switch 54 is opened by the deenergized condition of relay 2. Immediately the second train operates the track switch 54, relay 3 will return to unoperated position and at spring 28 remove ground from the motor circuit 11, thereby bringing the motor to rest and stopping the chain before the second train has moved off it.

The first train continues on its way, eventually entering the testing section for block 3 by engaging track switch 57 which opens the previously traced locking circuit for relay 6. However, since relay 5 is now in its energized position, the multiple circuit through springs 32 is intact and shunts track switch 57 and relay 6 remains operated. The first train continues, engaging track switch 56 thereby opening the previously traced locking circuit for relay 5 to permit that relay to return to its unoperated position, the first train passes over the track brake T. B. A. without interference therefrom and engages track switch 52 thereby to momentarily close a circuit from ground through switch 52 and its make contact, conductor 72, through the winding of relay 2 to battery to reenergize relay 2 which holds itself over a circuit through springs 25 and track switch 53 as before. In order to reoperate relay 3, manual switch 14 must be moved to engage the contact to which conductor 62 is connected, whereupon relay 3 operates and is held in operated position as before. Relay 3 recloses the circuit through motor 11. Whether or not the motor 11 will be re-started will depend upon the particular type of controller used. In certain controllers now commonly used, once the mechanism has been tripped to off position, it must be reset manually before the motor can be re-started, this arrangement being advantageous in that it will give an attendant an opportunity to make sure that everything is clear before permitting the second train to proceed from its present position at track-switch 54.

As soon as the motor is restarted, either automatically or manually as above explained, the second train moves into engagement with track switch 53 to operate the same and thereby break locking circuit of relay 2 to permit that relay to return to its unoperated position as before. The second train moves on past track switch 50 operating the same to again close the circuit of relay 1, thereby to release a third train from the front brake mechanism. The operating being the same as hereinbefore explained.

The first train having cleared track switch 52 proceeds into engagement with track switch 60 near the end of block 3 thereby to test the condition of block 4 before entering the same, the operation of track switch 60 opening the holding circuit of relay 8 without effect at this time since relay 7 is still held in operated position and track switch 60 is shunted through spring 37 and its make contact. This test shows that block 4 is clear so the train is permitted to proceed past the brake operating track switch 59 enroute thereby to restore relay 7 to its normal position, in which normal position it remains until the first train moves out of block 4 and operates track switch 58 located at the end thereof.

The second train moving in block 2 tests the position of the first train in block 3 by operating track switch 57, and if that operation occurs before the first train has moved out of the block and operated track switch 55, relay 5 will be in its unoperated position and the second train will be stopped by the track brake T. B. A. Assume for the moment that this condition exists. When track switch 57 is operated by the second train under these conditions, the holding circuit of relay 6 will be opened and that relay will drop back to its unoperated position, thereby closing a circuit from ground at spring 42 and its make contact, conductor 89, through spring 34 of relay 6 and its break contact, conductor 82, through the magnet of operating mechanism 12 of the brake T. B. A., operating that magnet to set the brake T. B. A. to stop the second train. The operation of track switch 57 also removes ground from conductor 76 thereby breaking the previously traced holding circuit for relay 3 to permit that relay to return to its unoperated position and open the circuit of motor 11 to bring the chain to rest. Relay 6 upon restoring at spring 33 opens the circuit from ground on conductor 77 to the track switch 57 so that the holding circuit of relay 3 remains open until relay 6 is reoperated even though the train moves out of engagement with track switch 57. The third train which has been released from the loading platform and is in block 1 will be stopped by the stopping of the chain.

We now have train number 2 stopped on track brake T. B. A., train number 3 stopped on the chain and train number 1 moving in block 4 toward the loading platform. It will be understood by those skilled in the art, train number 1 will move into the unloading platform and will be stopped thereby by the usual back-brake mechanism which is operated by the attendants on the platform. Train number 4 which it will be assumed has been moved up to the loading platform will remain ahead of train number 1 under these conditions.

In most instances where safety brake structures are located on the trackway, such as for example the brake T. B. A., when once operated to stop a train, the brake must be released by attendants at the brake itself. This is to insure that the train cannot be moved again until everything is in the clear.

As soon as the brake T. B. A. is released, train number 2 proceeds into block number 3, operating track switch 52 to operate relay 2 as before. Switch 14 is manually operated to close the previously traced circuit for relay 6 and after that relay has operated and is held in operated position as before, switch 14 is moved to close the circuit of relay 3 which operates and is held as before, switch 14 is then restored to normal as shown in Fig. 2 and the motor 11 is restarted so as to permit train number 3 to proceed. Train number 3 tests the clear condition of block number 4 by engaging track switch 60, the operation depending upon whether or not train number 1 now at the unloading platform has operated track switch 58 prior to the operation of track switch 60.

If relay 7 is in its unoperated position by reason of the fact that track switch 58 has not been operated when track switch 60 is operated relay 8 will restore to its unoperated position and track brake B will be operated over a circuit from

ground through spring 42 and its make contact, conductor 89, spring 41 and its break contact, conductor 87, through the winding of operating mechanism 13 of track brake B to battery, releasing the track brake to stop the train. At spring 40, relay 8 opens the previously traced holding circuit not only of itself but also of relays 6 and 3 so that track brake B is operated to stop a train track brake A will likewise be operated to stop the following train and the motor will be stopped to stop the second following train.

From the foregoing it will be apparent that as each train moves up to the entrance point of a particular block it tests the clear condition or blocked condition of that block and is stopped if a preceding train is in the block. As a train moves out of a particular block, it resets the block behind it so that a following train may move into the same. In the normal operation of the system with the track switches and devices properly located and adjusted, the trains will move over the trackway in spaced apart relation with a minimum of lost time, that is, a first train will clear a block just a moment before a second train arrives at the position for testing of the clear or block condition of that block. It will be apparent to one skilled in the art that inasmuch as the trains are moved out of the loading platform automatically, as soon as the preceding train has cleared the chain, maximum carrying capacity of the ride is achieved and since each train is definitely held against entering a block that is already occupied, capacity operation can be carried on without danger of a collision of two or more trains.

As hereinbefore explained, the operation of track switch 50 by a train leaving the chain releases a succeeding train from the loading platform by operating the front brake mechanism. By this arrangement the spacing of the trains on the trackway is automatically determined.

Under certain conditions a greater interval of time between trains may be desirable, in which case, switch 106 is thrown to disconnect track switch 50 and connect in its place track switch 50A which is located along the trackway farther from the end of the chain than is track switch 50. Since the train has farther to travel, more time will be consumed in its travel from the loading platform to the track switch 50A and consequently the release of a second train from the loading platform is delayed and the trains are thereby spaced farther apart upon the trackway.

In the foregoing description all of the safety equipment and four trains have been used. Oftentimes one train will suffice to handle the passengers who want to ride, this being particularly true just after the ride has been put in service at the beginning of the day and just before the ride is closed down at the end of the day. Under such circumstances no safety is necessary and all of the equipment may be taken out of service except the motor control which must be in service to keep motor 11 operating. As the number of passengers increases two trains may be necessary to handle them in which case there is danger of a collision and the safety equipment should be put in operation, partially at least.

Assume that two trains are to be operated on the trackway. One train will be at the loading platform and the other train will be out on the trackway. Preferably the one train leaves the loading platform just as the other train approaches the unloading platform. So long as a train is on the chain it can be stopped should anything happen to prevent the other train from reaching the unloading platform and back brake thereat. Under these circumstances the trackway from the end of the chain to the unloading platform can be operated as one block, with the trackway from the front brake to the end of the chain as another block. Under these circumstances, block 1, Figure 1, remains intact and blocks 2, 3 and 4 are combined as a second block.

To prepare the equipment for operation under these conditions, switches 101 and 102 are operated as before to supply power to the front brake and motor control panels, but switches 103, 104 and 105 are left open, switch 15 is not closed and consequently relay 4 remains in its unoperated position as shown in Figure 2. Switch 14 is operated to close circuits to relays 3, 2 and 1 as before. Switch 100, Figure 2, is moved to the right to disconnect track switch 52 and to substitute track switch 52A which is located at the entrance to the unloading platform as shown in Figure 1.

When the foot switch F. S. is operated to release a train from the front brake, as before, that train operates track switch 51 to break the holding circuit of relay 1, which falls back to its normal position. As the train moves up the chain, track switch 54 is operated without effect since relay 2 is in operated position and track switch 54 is shunted by spring 26 and its make contact, track switch 53 is next operated by the train as it leaves the chain to restore relay 2 thereby to protect the train in the second block. As the train passes over track switch 50, relay 1 is operated as before, and a second train may be released from the loading platform.

Since the second block now extends to the unloading platform there is no point to releasing the second train until the first train is near enough to track switch 52A to operate it before the second train reaches track switch 54. A suitable signal switch, not shown, may be located on the trackway to be operated by the trains to indicate to the attendant that the second train can be released. Should the first train fail to reach track switch 52A before the second train operates track switch 54, the second train will be stopped by the deenergization of relay 3 and the consequent stopping of motor 11, as before. With this arrangement, the trains can be spaced so that the two trains in service can carry a maximum number of passengers with safety. When the number of passengers wanting to ride increases so that the use of three trains is necessary to accommodate them, all of the safety equipment should be used the same as in the first example given.

Relays 1, 2, 5 and 7 in addition to operating to assist the guard relay, function as supervisory relays. Each of these relays closes a circuit to a red lamp when the relay is in unoperated position and a circuit to a green lamp when the relay is in its operated position. These lamps, together with the white lamps associated with guard relays 3, 6 and 8, are preferably mounted in a suitable panel located so as to be visible to attendants on the loading platform. The red light indicates that the block is occupied by a train and the green light indicates that the block is vacant. By watching the lights the progress of a train or trains can be seen. Normally a block will be cleared by a preceding train but a very

short time before a succeeding train enters it so that the green lamp burns but a short time. Should a train be slow the fact will be indicated by the burning of the green lamp for a longer than normal time and the slow train thus spotted can be serviced as required to enable it to maintain rated speed. Should one of the guard-relays be restored to normal to stop a train, the associated white lamp will be extinguished and the location of the trouble thus indicated.

Throughout the description heretofore, we have referred to track switches which may, within the teachings of our invention, take any one of a number of forms. If desired, these track switches may be a mechanically operated switch having an arm that is engaged by a cam plate carried upon the car, for example if desired, the brake shoe 204 might be employed for this purpose. As will be apparent to one skilled in the art, the switches herein referred to as track switches, may be contacts upon a relay operated by track circuits from insulated sections of the track, the relay being in its operated position when the track is not short circuited by a train and being moved to its non-operated position when the track is short circuited, track relays of this kind being familiar to those skilled in the art.

In Figure 5 we have shown another arrangement which may be used in lieu of mechanical track switches. Insulated track sections such as 302 and 305 are provided with a secondary winding of a transformer connected thereacross the winding 301 being shown as connected to the track section 302 and the winding 304 to the track section 305. The primary windings 300 and 303 respectively of these transformers are connected in series across a source of alternating current indicated by the wires 310 and 311. A relay such as, for example, relay 1, is connected from the conductor 310 to the midpoint between primary windings 300 and 303 and a reactor 306 connected between the midpoint of the two transformers and a lock-in contact 22 on relay 1, the make contact of this spring in turn being connected to the conductor 311.

When no train is in either one of the two track sections, relay 1 does not receive sufficient current to cause it to operate. When a train moves into insulated track section 302, the impedance of the secondary of transformer 300 is lowered sufficiently so that the impedance drop across the primary winding 300 becomes less than normal with the result that the voltage across the terminals of relay 1 rises sufficiently to permit the relay to operate and lock itself across the source of voltage between conductors 310 and 311 through spring 22 and the reactor 306. The operation of relay 1 closes a circuit from conductor 312, spring 23 and its make contact, through the winding of front brake operating magnet 10 to line conductor 310, thereby to release the front brake as before. A third conductor 312 is shown to illustrate that the voltage used to operate magnet 10 may be different than the voltage across the transformers 300 and 303, it being understood that if the same voltage is used, conductors 311 and 312 will be the same conductor. Spring 21 of relay 1 upon operating, extinguishes the red lamp and lights the green lamp, as before, these lamps being connected through this operation between conductors 310 and 312.

Relay 1 is restored to its unoperated position by a train entering insulated track section 305, thereby to lower the impedance of the secondary and primary of transformer 303 which causes the voltage across the terminals of the relay to drop sufficiently to cause the relay to restore. By this arrangement it will be seen that track switches or track relays can be eliminated and less expensive transformers substituted therefor within the teachings of the invention.

From the foregoing description of the operation of relay 1 by trains moving over insulated track sections it will be apparent that each of the other relays 2 to 8 inclusive may be similarly operated and such operation is contemplated within the teachings of the invention.

While we have chosen to show our invention by illustrating and describing a preferred embodiment of it, we have done so by way of example as there are many modifications and adaptations that can be made by one skilled in the art within the teachings of our invention. As shown, the trackway is divided into four blocks. A lesser or greater number of blocks may be provided, if required, the circuits above described being extended or contracted as required. Two track brakes are shown but in certain instances no track brakes will be used.

Having thus complied with the statutes, and shown and described a preferred embodiment of our invention, what we consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In an amusement park ride, a loading platform, a trackway leading therefrom, said trackway being divided into a plurality of blocks, trains on said trackway arranged to travel through said blocks successively, means in each block for stopping a train therein, train operated means for testing the condition of a block as the train approaches the same, means controlled through said testing means for operating said stopping means to stop the train when the block tested is occupied, and means controlled by said latter means for operating the stopping means in each block to the rear of said train and between said tested block and said loading platform.

2. In a safety system for an amusement park ride, a trackway block through which a train moves, a relay in said block, means for operating said relay to put the safety system in service, a holding circuit for said relay for maintaining the same in operated position, train operated means for momentarily opening said holding circuit as the train approaches said block, means for establishing a substitute holding circuit for said relay when said block is clear, and means controlled by said relay moving into unoperated position responsive to the opening of said holding circuit when the block is occupied for stopping the train.

3. In a safety system for an amusement park ride, a trackway divided into blocks sequentially occupied by a train moving over the ride, a relay for each block, a holding circuit for said relay for maintaining the same in operated position, train operated means for momentarily opening the holding circuit of the relay of a block as the train approaches that block, means for establishing a substitute holding circuit for said relay when the block is clear, and means controlled by the relay moving into unoperated position for stopping the train when the block is occupied.

4. In an amusement park ride, a loading platform, an unloading platform, a trackway leading from said loading platform to said unload-

ing platform, said trackway being divided into a plurality of blocks, trains adapted to move from said loading platform through said blocks sequentially to said unloading platform, a relay in each of said blocks, means for operating said relays, a holding circuit for said relays extending from said unloading platform through said blocks to said loading platform, train operated means in each block for momentarily opening said holding circuit, means in each block for shunting said train operated means in that block when that block is clear, means in each block adapted to be moved into engagement with a train to stop the train, an operation of the train operated means in an occupied block breaking said holding circuit to restore the relay in each block between said occupied block and said loading platform, and means in each block operated by the relay in unoperated position for operating the train engaging means of the block to stop a train therein.

5. In a safety system for an amusement park ride having a trackway block through which a train moves, a relay in said block, means for operating said relay to put the safety system into service, a holding circuit for said relay for maintaining the same in operated position, train operated means for momentarily opening said holding circuit as the train approaches said block, a second relay, means operated by a train leaving said block for operating said second relay to establish a substitute holding circuit for said first relay and means operated by said first relay moving into unoperated position when said first holding circuit is opened before said substitute holding circuit is established for stopping the train at the entrance to said block.

6. In a safety system for an amusement park ride having a trackway block through which a train moves, a relay in said block, means for operating said relay to put the safety system into service, a holding circuit for said relay for maintaining the same in operated position, train operated means for momentarily opening said holding circuit as the train approaches said block, a second relay, means operated by a train leaving said block for operating said second relay to establish a substitute holding circuit for said first relay, means operated by said first relay moving into unoperated position when said first locking circuit is opened before said substitute holding circuit is established for stopping the train at the entrance to said block, and means operated by the train entering said block for restoring said second relay to its unoperated position to break said substitute holding circuit and thereby protect said train while in said block.

7. In a safety system for an amusement park ride having a trackway block through which a train moves, a relay in said block, means for operating said relay to put the safety system into service, a holding circuit for said relay for maintaining the same in operated position, a track switch located ahead of said block and operated by a train moving into the block to momentarily open said holding circuit, a second relay in said block, a second track switch located at the outgoing end of the block and operated by a train leaving the block, means controlled by said second track switch for operating said second relay to establish a substitute holding circuit for said first relay, and brake means in said block operated by said first relay moving into unoperated position when said first holding circuit is opened by said first track switch before said substitute holding circuit is established for stopping the train at the entrance to said block.

8. In an amusement park ride, a trackway divided into a plurality of blocks, train stopping means in each block, a pair of relays in each block, means for operating said relays, holding circuit means for said relays, a train adapted to travel over said trackway, train operated means at the beginning of each block for opening said holding circuit means to test the clear or occupied condition of the block, other train operated means for restoring one of the pair of relays during the time that the block is occupied, means controlled by said relay for indicating the clear or occupied condition of the block, and means controlled by the other one of the pair of relays for stopping the train when said locking circuit is opened by a train attempting to enter an occupied block.

9. In an amusement park ride, a trackway divided into a plurality of blocks, a train adapted to travel over said trackway, a relay for each block, train operated means for operating and restoring said relay, signal means controlled by said relay for indicating the condition of the blocks, a second relay for each block, means including a chain circuit for maintaining said second relay operated, train controlled means for momentarily opening said chain to test the condition of the block, substitute means for maintaining said second relay operated when said chain is opened in a block that is unoccupied, means operated by each of said second relays for stopping a train attempting to enter the block when the same is occupied, and signal means operated by said second relays for indicating the operated condition of the associated train stopping means.

10. In an amusement park ride, a loading platform, a brake mechanism for holding a train at said platform, means for operating said brake to release a train from the platform, a chain into engagement with which the train moves on leaving said platform, means for operating said chain for moving the train over the trackway, a trackway block extending from the outgoing end of said chain, means operated by a train on said chain for testing the clear or occupied condition of said trackway, means for stopping the chain and train when said trackway block tests occupied and means located at the outgoing end of said chain and operated by a train leaving the chain for operating said brake mechanism to release another train from said loading platform.

WM. B. SCHMIDT.
TED B. MORSE.
MARSHAL H. RIEVES.