

**June 29, 1943.**

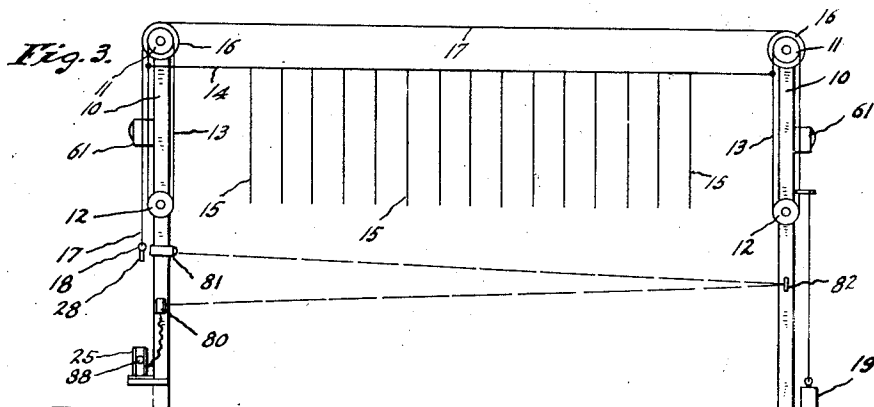
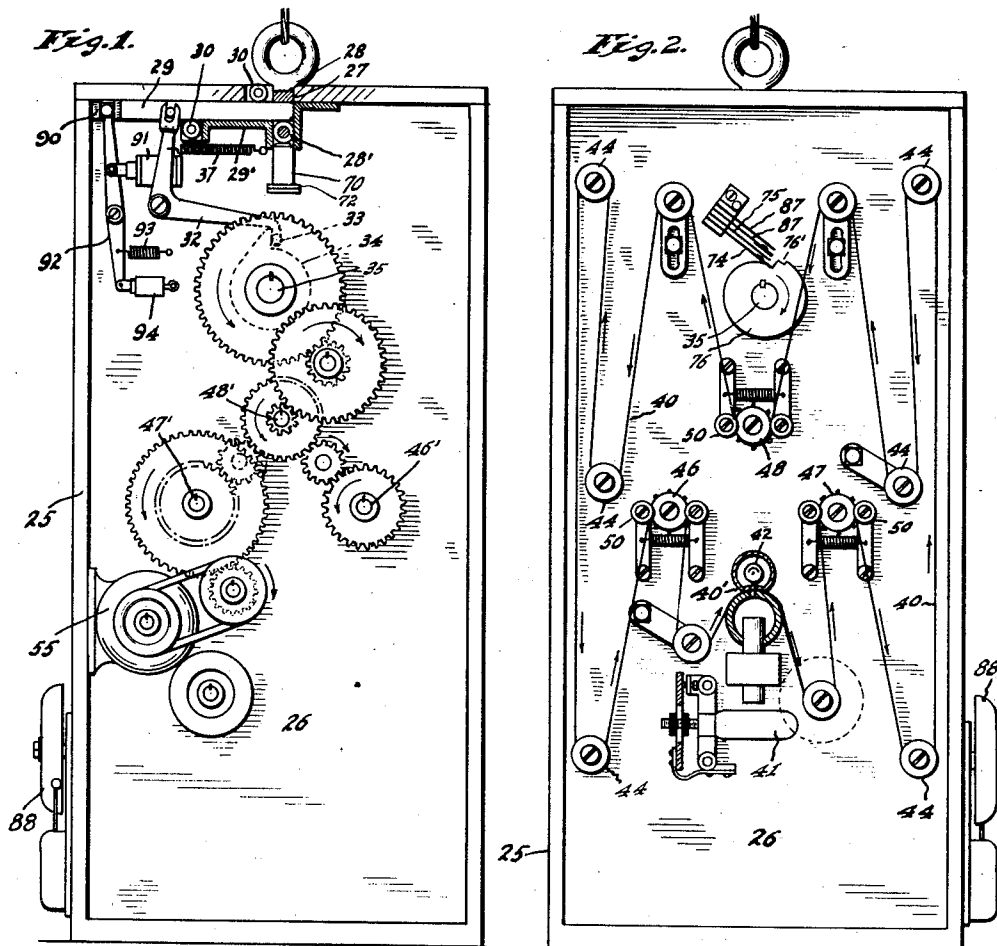
R. M. HITE

**2,322,936.**

STARTING BARRIER

Filed Jan. 27, 1941

2 Sheets-Sheet 1



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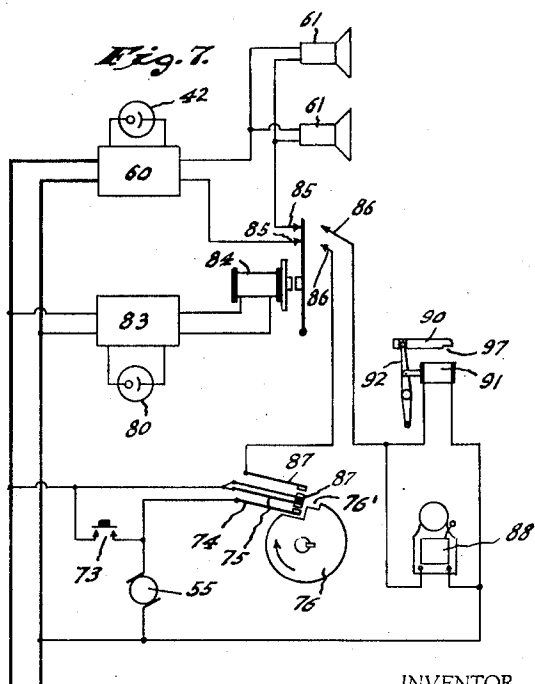
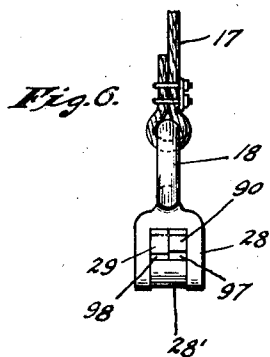
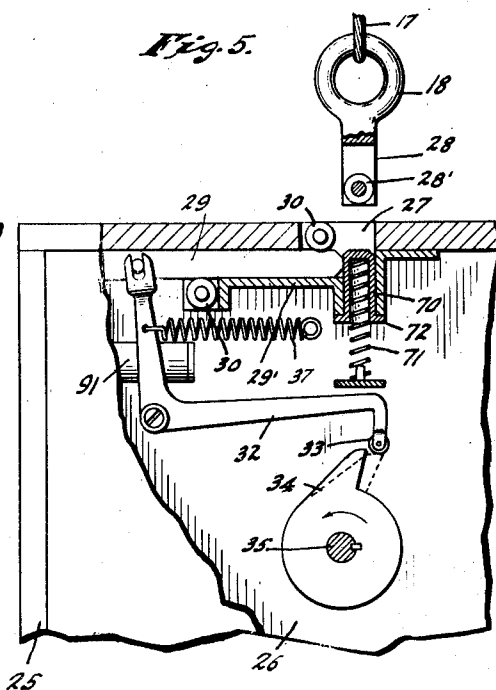
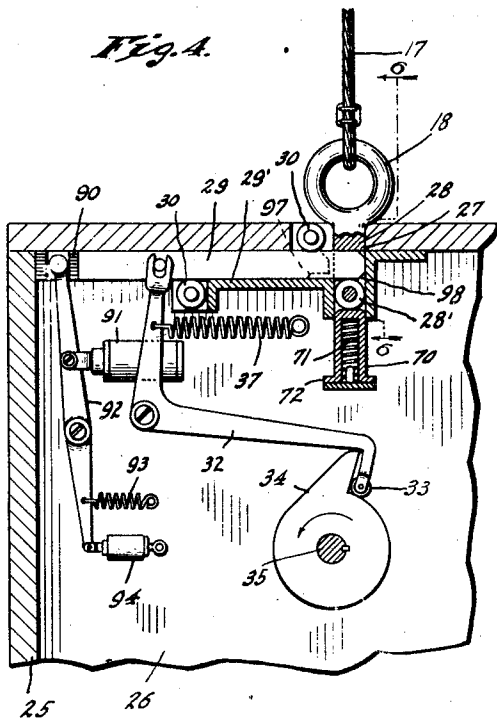
**R. M. HITE**

**2,322,936**

## STARTING BARRIER

Filed Jan. 27, 1941

2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,322,936

## STARTING BARRIER

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11 Claims. (Cl. 119—15.5)

In harness racing, it has been proposed to start the horses from immediately in rear of a barrier which, at the instant the race is intended to start, is quickly raised to an elevation high enough to clear the horses. In such a system, it is customary to warn of the impending rise of the barrier by the giving of a series of audible signals at one-second intervals, and to raise the barrier simultaneously with the enunciation of a "go" signal following the last of the series of starting signals. If a horse breaks through the barrier before it is raised, the driver is penalized, usually by disqualification; but if a short enough interval of time intervenes between a premature breaking through and the rise of the barrier, or if the officials are not sufficiently observant, an offending driver may not be detected.

It is the object of my invention to produce a race-starting device which will insure fairness to all contestants, which will eliminate the human factor, and which will remove the possibility of a premature start without detection. More specifically, it is my object to produce an automatic device which will automatically reproduce the desired number of warning signals and the "go" signal at the desired intervals, which will automatically raise the barrier at the instant the "go" signal is given, and which will automatically detect any false or premature starts.

In carrying out my invention in its preferred form, I provide a barrier which is biased for upward movement and I hold this barrier in depressed or operative position by a suitable latch. For the purpose of reproducing the warning and "go" signals I employ sound-reproducing mechanism which is operatively connected in timed relation to said latch so as to release it at the instant the "go" signal is enunciated. Adjacent the barrier I provide a photo-sensitive apparatus controlled by a beam of light projected across the track and adapted, if the light beam is interrupted by a horse prematurely breaking through the barrier, to actuate a recall signal and to render the sound-reproducing apparatus inoperative to reproduce further signals.

The accompanying drawings illustrate my invention: Figs. 1 and 2 are rear and front elevations respectively of a casing within which parts of my apparatus are enclosed; Fig. 3 is a front elevation of the barrier; Figs. 4 and 5 are fragmental elevations on an enlarged scale showing details of the barrier-release latch and its operating mechanism; Fig. 6 is a section on the line

6—6 of Fig. 4; and Fig. 7 is a wiring diagram illustrating electrical connections.

The barrier employed in carrying out my invention may take any desired form. A barrier of conventional form is illustrated in Fig. 3 and comprises a pair of posts 10 installed on opposite sides of the track and a pair of vertically spaced pulleys 11 and 12 mounted on each of such posts. An endless belt or similar element 13 of flexible material is passed about each pair of pulleys 11 and 12, and secured to corresponding stretches (shown as left-hand stretches) of the element 13 is a cable 14 which extends across the track and from which a plurality of shorter ropes 15 are suspended. The pulleys 11 and 12 are so located that by their rotation the cable 14 can be moved vertically between a position in which the ropes 15 hang in front of horses lined up behind the barrier and a position in which the ropes 15 are high enough to clear the horses passing through the barrier. To interconnect the two pairs of pulleys 11 and 12 so as to insure that both ends of the barrier will rise at the same rate, each upper pulley 11 has rigid with it a drum 16. A rope or cable 17 has one end secured to one of the drums 16 (the right-hand drum as shown in Fig. 3) and, after being wrapped several times around that drum, extends across the track to the other drum 16 about which it is also wrapped for several turns. The extreme end of the cable 17 hangs downwardly from the left-hand drum 16 and has attached to it an eye 18, the purpose of which will hereinafter become apparent. Secured to one of the flexible elements 13 at a point spaced approximately half the developed length of the element from the point of its connection to the cable 14 is a weight 19 of adequate size to maintain the barrier raised in the position shown in Fig. 3. To depress the barrier and to hold it depressed until the race is started, the end of the cable 17 bearing the eye 18 is pulled downwardly. The resultant movement of the cable 17 rotates the two drums 16 and with them the pulleys 11, in corresponding directions, and causes the flexible elements 13 to move to lower the barrier and raise the weight 19. Upon release of the cable 17, the weight 19 falls and causes the barrier to rise.

The automatic mechanism which I employ for starting the race comprises a casing 25 which is suitably mounted, desirably on one of the posts 10, adjacent the eye 18 when the latter is in its lowermost position. Conveniently, and as illustrated in the drawings, the casing 25 contains a

vertical panel 26 dividing it intermediately. At one side of the panel 26, the top wall of the casing 25 is provided with an opening 27 for the reception of the shank 28 of the eye 18; and beneath the opening 27 there is mounted a bolt 29 horizontally slidable in a support 29' and adapted to enter an opening in the shank 28 of the eye 18 and to hold the eye in lowered position against the pull exerted upon it by tension in the cable 17. In order to minimize friction the bolt 29 may be guided into and out of association with the shank 28 by guide rollers 30 suitably supported above and below the bolt from the casing 25 and the shank may be provided with a roller 28' positioned to engage the lower surface of the bolt 29.

The bolt 29 is operatively connected to the vertically extending arm of a bell crank 32 which is pivoted to the partition 26 in any suitable manner. The horizontally extending arm of the bell crank 32 carries a cam-following roller 33 which co-operates with a cam 34 on a shaft 35 rotatably supported from and extending through the partition 26. A spring 37 acting on the bell crank 32 biases the bolt 29 toward engagement with the eye-shank 28, and the cam 34 is arranged to move the bell crank 32 and momentarily retract the bolt 29 against the influence of the spring 37 at a predetermined point in the rotation of the shaft 35.

The sound-reproducing mechanism which is to be employed in the practice of my invention may take any desired form. The form shown in the drawings employs a recording in the form of a flexible film 40 bearing a sound track, provided with the usual edge perforations for co-operation with a driving means, and arranged to move through a gate 40' in co-operative relation with and between a light-source 41 and a photo-electric cell 42. The film 40 is endless and is of a length such that a complete cycle of its movement requires an interval somewhat longer than that required to enunciate the series of warning and "go" signals. To support this length of film within the confines of the casing a plurality of rotatable idlers 44 are employed, such idlers being mounted on the partition 26. Some of the idlers may be adjustably mounted to take up slack. In order to relieve excessive tension in the film, it is desirably driven at a plurality of points in its length. As shown, the film passes over three driving sprockets 46, 47, and 48 mounted respectively upon shafts 46', 47', and 48' which project through the partition 26. Each of the sprockets has associated with it a pair of spring-pressed rollers 50 which hold the film in engagement with the teeth of the sprocket.

For the purpose of driving the film 40 and the cam 34, there is mounted within the housing 25 an electric motor 55 operatively connected through suitable gearing to the shafts 46', 47', 48', and 35. This gearing is so arranged that the film-driving sprockets 46, 47, and 48 will all rotate in the proper direction at the same speed and so that the shaft 35 will make one complete revolution as the film 40 is passing through one complete cycle of its movement.

The photo-electric cell 42 is connected to the input side of an amplifier 60 which is in turn connected to one or more loud speakers 61 (see Fig. 7), such speakers being located wherever desired. It will be understood, of course, that the film 40 will bear a sound track capable of causing the mechanism including the photo-

electric cell 42, the amplifier 60, and the loud speaker or speakers 61 to reproduce audibly the series of warning signals and the "go" signal. The sound track preferably causes the sound-reproducing system to enunciate the numbers from "1" to "14" at one-second intervals and, at the conclusion of the 15th second, to enunciate the word "go." The film 40 is so positioned upon the sprockets and idlers which support it that at the instant the word "go" is enunciated the cam 34 actuates the bell crank 32 to retract the bolt 29, thus releasing the eye 18 and permitting the weight 19 to raise the barrier in the manner above set forth.

In order to prevent accidental or unauthorized release of the bolt 29 and consequent raising of the barrier, the bolt is desirably arranged so that it can not be retracted from without the casing 25. To facilitate insertion of the shank 28 of the eye 18, I may employ a follower 70 which is mounted for vertical sliding movement in a suitable guideway in the support 29' in line with the eye-shank 28, as will be clear from Fig. 4. The follower 70 is biased upwardly, as by means of a spring 71, its upward movement under the influence of the spring being limited, conveniently by providing it with a flange 72 engageable with the lower surface of the support 29'. When the eye-shank 28 is in the position illustrated in Fig. 4 and held in such position by the bolt 29, the follower 70 is held depressed against the action of the spring 71 by reason of its engagement with the lower end of the eye-shank; but when the bolt 29 is retracted and the eye-shank withdrawn due to raising of the barrier, the follower 70 moves upwardly closely behind the roller 28' into the position illustrated in Fig. 5, in which position it overlaps the end of the bolt 29 and retains it in retracted position. When the device is to be reset, the eye-shank 28 is inserted through the opening 27 and forced downwardly, thus restoring the follower 70 to the position shown in Fig. 4 and permitting the bolt 29 to enter the opening in the eye-shank above the roller 28'.

For the purpose of controlling operation of the motor 55, the current-supply wires therefor include a push-button 73 and, connected in parallel with said push-button, a pair of normally separated contacts 74 and 75. The contacts 74 and 75 are mounted in co-operative relationship with a cam 76 rotatable with the shaft 35, and such cam is so shaped that, at one point in its revolution, it permits separation of the contacts 74 and 75 while at other points it maintains those contacts in engagement with each other. To start the device in operation, the push-button 73 is depressed to complete the electrical circuit including the motor 55 and is maintained depressed until the cam 76 has rotated far enough to cause engagement of the contacts 74 and 75, whereupon the push-button is released. By reason of the engaging of the contacts 74 and 75 the motor 55 continues to operate until the shaft 35 has made a complete revolution, whereupon the cam 76 allows the contacts 74 and 75 to separate, thus interrupting the supply of current to the motor, and stopping the device.

Because of this automatic stopping, the various movable parts of the device always come to rest in substantially the same positions. Obviously, it is necessary that the cam 76 be so arranged as to cause the device to continue in operation until the "go" signal has been given and the latch-bolt

29 released; and it is desirable that operation of the device be continued for a subsequent interval in order to permit the lobe of the cam 34 to move out of engagement with the cam-follower 33, or into the position indicated in full-lines in Fig. 5, and thereby condition the device for reinsertion of the eye-shank 28. The linear distance between the "go" signal and the initial warning signal on the sound track of the film 40 is sufficient to prevent reproduction of the initial warning signal before the devices come to rest following separation of the contacts 74 and 75.

The photo-sensitive device which is employed to detect false starts comprises a photo-electric cell 80, or an equivalent light-sensitive device, adapted to receive a beam of light projected across the barrier-opening from a light-source 81 at a height to be interrupted by a horse breaking through the barrier. Desirably, the lamp 81 and the photo-electric cell 80 are located on the same side of the track, the light-source emitting a beam of light which is projected across the track in one direction and reflected by a mirror 82 into the photo-electric cell 80. The photo-electric cell 80, desirably through the medium of an amplifier 83, controls the energization of a relay 84. The armature of the relay 84 is in the form of a bridge contact adapted, when the relay is energized, to establish an electrical connection between a pair of fixed contacts 85 and, when de-energized, to establish an electrical connection between a second pair of fixed contacts 86. The switch formed by the relay-armature and fixed contacts 85 is connected between the photo-electric cell 42 and the speaker or speakers 61, or otherwise arranged, so that when the relay 84 is de-energized and the armature out of engagement with the contacts 85 the speaker or speakers 61 will be silent irrespective of the action of the photo-electric cell 42.

Associated with the cam 76 are a second pair of normally open contacts 87 adapted to be closed by the cam 76 at substantially the same time the contacts 74 and 75 are closed. The switch formed by the relay armature and the two contacts 86 is connected in series with the switch formed by the two contacts 87 between the current-source and a recall signal shown as an electric bell 88.

If it should be desired, in the event of a false start, to prevent release of the barrier, I may provide the device with means for preventing release of the eye 18 when the lobe of the cam 34 passes under the cam-follower 33 on the bell-crank 32. As shown, this means takes the form of an auxiliary latch bolt 90 which is mounted beside the main latch bolt 29 and movable into and out of association with the eye-shank 28. The latch bolt 90 is ordinarily retracted, as indicated in Fig. 4, and is adapted to be advanced into co-operative association with the eye-shank 28 as by a solenoid 91 which is arranged, as will be clear from Fig. 7, to be energized jointly with the recall signal 88. Conveniently, the latch bolt 90 is connected to the core of the solenoid 91 by a pivoted lever 92 associated with which there is a spring 93 acting normally to maintain the latch bolt in retracted position. For a purpose which will hereinafter become apparent, there is also associated with the lever 92 a dash-pot 94 arranged to defer return of the latch bolt 90 to retracted position after it has been advanced by energization of the solenoid 91.

After the device has been used to start a race, the cam 34, bell crank 32, latch bolt 29, and follower 72 will be in the respective positions illus-

trated in full lines in Fig. 5, the cam 76 will be in the position illustrated in Figs. 2 and 7, the contacts 74 and 75 will be separated as will also the contacts 87, and that portion of the film 40 intervening between the "go" signal and the first of the warning signals will be disposed in the gate 40' between the lamp 41 and the photo-electric cell 43. When it is desired to start a subsequent race, the barrier is lowered by manipulation of the cable 17 and the shank 28 of the eye 18 is inserted through the opening 27 in the top of the casing 25 to depress the follower 72 and to permit the latch bolt 29 to advance into latching position above the roller 28', as indicated in Fig. 4. When the race is ready to start, the push button 73 is depressed, thus causing the motor 55 to operate to move the film 40 and to rotate the cams 34 and 76, the push button 73 being held depressed until the cam 76 is rotated sufficiently far to close the contacts 74 and 75. Thereafter, the push button 73 may be released, the supply of current to the motor 55 being maintained through the closed contacts 74 and 75 until a complete revolution of the shaft 35 and a complete cycle of movement of the film 40 has occurred. As the film passes through the gate 40' the warning signals and the starting signal are successively reproduced by the speaker or speakers 61; and simultaneously with the enunciation of the starting signal the cam 34 raises the cam follower 33 and causes the bell crank 32 to retract the bolt 29, thereby releasing the barrier and starting the race.

In the event a horse breaks through the barrier before it is raised, the light beam from the lamp 81 will be interrupted, thus causing the photo-electric cell 80 which receives that light beam to de-energize the relay 84. De-energization of the relay 84 breaks the connection between the two contacts 85 and establishes a connection between the two contacts 86. Breaking of the former connection renders the speakers 61 inoperative to produce any further warning signals, while the establishment of the latter connection causes operation of the recall signal 88 and indicates to the officials and spectators that a false start has occurred. The operation of the recall signal continues until, in the rotation of the cam 76, the supply of current to it is interrupted by separation of the contacts 87.

It is desirable that separation of the contacts 87 should occur substantially simultaneously with the release of the barrier. If they separate before the barrier is released, an interval would be provided within which a horse could prematurely break through the barrier without causing the recall signal to sound. On the other hand, if the contacts 87 are not separated until after the barrier is released the recall signal might sound even if the first horse interrupting the light-beam from the lamp 81 had started after the barrier was raised. The contacts 74 and 75, however, should remain in engagement until after the barrier is released in order, as pointed out above, that the lobe of the cam 34 may be carried past the follower 33 before the device comes to rest. To secure this sequence of contact-separation in the arrangement illustrated, where the contacts 87 are controlled through the contacts 74 and 75, the trailing edge of the lobe of the cam 76 may be relieved as indicated at 76', such relief being sufficient radially to produce separation of the contacts 87 at the

instant of barrier-release, but insufficient to cause separation of the contacts 74 and 75.

If a false start has caused de-energization of the relay 84 during operation of the device, the retraction of the latch bolt 29 which occurs as the cam 34 raises the cam follower 33 does not cause release of the eye 18 and consequent raising of the barrier; because, simultaneously with the actuation of the recall signal, the solenoid 91 is energized to advance the auxiliary latch bolt 90 into latching relation with the eye-shank 28. It will be noted from Fig. 7 that the supply of current to the solenoid 91 is affected by the condition of the contacts 87, which, as pointed out above, must separate (and therefore de-energize the solenoid 91) not later than the instant at which the cam 34 retracts the latch bolt 29. In order to accomplish its purpose, however, the auxiliary bolt 90 must remain in engagement with the eye-shank 28 until the main bolt 29 is again advanced following its retraction by the cam 34. Therefore, it is necessary to retard retraction of the auxiliary latch bolt 90 upon de-energization of the solenoid 91. It is for this purpose that the dash-pot 94 is provided, such dash-pot acting to delay retraction of the latch bolt 90 for an interval long enough to permit the retraction and subsequent advance of the main latch bolt 29 as the lobe of the cam 34 passes beneath and beyond the cam follower 33.

In order to facilitate movement of the auxiliary latch bolt 90, its lower surface is desirably relieved as indicated at 97 in Figs. 4 and 6, so that when the main latch bolt 29 is in engagement with the roller 28' on the eye-shank 28 the auxiliary latch bolt can be advanced without engaging the roller 28' or anything else which might impede its movement. As a result of this relief, the eye 18 will rise slightly if the main latch bolt 29 is retracted when the auxiliary latch bolt is advanced; and accordingly the lower corner of the main latch bolt is beveled as indicated at 93 in Figs. 4 and 6 in order to force the roller 28' downwardly out of engagement with the relieved lower surface 97 of the auxiliary latch bolt as the main latch bolt is advanced.

The relay 84 is a time-delay arranged so that movement of the armature away from the contacts 86 when the relay is energized is retarded. The retardation effected should be at least equal to the interval required for a complete rotation of the shaft 35 and a complete cycle of movement of the film 40. In consequence, if the light beam from the lamp 81 is once interrupted, even momentarily, the connection between the relay contacts 86 will not be broken and the connection between the contacts 85 will not be re-established until after the device has completed its cycle of movement and come to rest. As a result, even a momentary interruption of the light beam from the lamp 81 will render the recall signal operative and the speakers 61 inoperative for the balance of the duration of the cycle of operation of the starting device, and will prevent release of the barrier.

The speaker 61 may vary in number and location as desired. By way of example, I have shown two, mounted respectively on the posts 10. The bell 88 is conveniently mounted on the side of the casing 25, but may be mounted elsewhere if desired. The lamp 81 and photo-electric cell 80, the latter in a suitable housing, are shown as mounted on one of the posts 10 independently of the casing 25, but this is not essen-

tial. Other parts of the apparatus, such as are illustrated only diagrammatically in Fig. 7 may be mounted within the casing 25 which is desirably provided with covers (not shown) for its open sides.

I claim as my invention:

1. A device for starting a horse race, comprising a barrier, sound-reproducing mechanism adapted to reproduce successively a predetermined number of audible warning signals, and means for opening said barrier, said means operating automatically in timed relation with said sound reproducing mechanism to open said barrier after a predetermined number of warning signals have been reproduced.

2. A device for starting a horse race, comprising a barrier, sound-reproducing mechanism adapted to reproduce successively a predetermined number of audible warning signals, means for biasing said barrier for opening movement, a latch for retaining said barrier closed, and a latch-releasing means operating in timed relation with said sound-reproducing mechanism to release said latch after a predetermined number of warning signals have been reproduced.

3. The invention set forth in claim 2 with the addition of a casing enclosing said latch, said latch being inaccessible for release from without said casing.

4. A device for starting horse-races, comprising a sound-reproducing mechanism including a movable sound recording adapted as it moves through a complete cycle of movement, to cause said sound-reproducing mechanism to reproduce a predetermined number of audible warning signals at predetermined intervals, a barrier, means for moving said recording through a cycle of movement, and a device operated under the control of said recording-moving means for opening said barrier following the reproduction of the last of said warning signals and prior to the completion of a cycle of movement of said sound-recording.

5. The invention set forth in claim 4 with the addition of provisions for automatically stopping said recording-moving means upon the completion of a cycle of a movement of said sound-recording.

6. The invention set forth in claim 1 with the addition of means for projecting a light-beam across said barrier, a light-responsive device controlled by said light-beam, and mechanism controlled by said light-responsive device upon an interruption of said light beam for rendering said sound reproducing mechanism inoperative to reproduce further warning signals.

7. The invention set forth in claim 1 with the addition of means for projecting a light-beam across said barrier, a light-responsive device controlled by said light-beam, and mechanism controlled by said light-responsive device upon an interruption of said light beam for preventing opening of said barrier.

8. The invention set forth in claim 1 with the addition of means for projecting a light-beam across said barrier, a light-responsive device controlled by said light-beam, and a recall signal rendered operative by said light-responsive device upon an interruption of said light beam.

9. The invention set forth in claim 1 with the addition of means for projecting a light-beam across said barrier, a light-responsive device controlled by said light-beam, and mechanism controlled by said light-responsive device upon an interruption of said light beam for rendering said

sound reproducing mechanism inoperative to reproduce further warning signals, and a recall signal rendered operative by said light-responsive device upon an interruption of said light beam.

10. The invention set forth in claim 4 with the addition of provisions for automatically stopping said recording-moving means upon the completion of a cycle of movement of said sound-recording, means for projecting a light-beam across said barrier, a light-responsive device controlled by said light beam, a recall signal controlled by said light-responsive device, and means operated by said recording-moving means

for rendering said recall signal inoperative upon release of said barrier.

11. A device for starting a horse race, comprising a barrier, means for opening said barrier, timing mechanism controlling said barrier-opening means to cause opening of the barrier at a predetermined time, means for projecting a light beam across said barrier, and light-responsive mechanism controlled by said light beam and acting if said light beam is interrupted during operation of said timing mechanism for preventing opening of said barrier.

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