

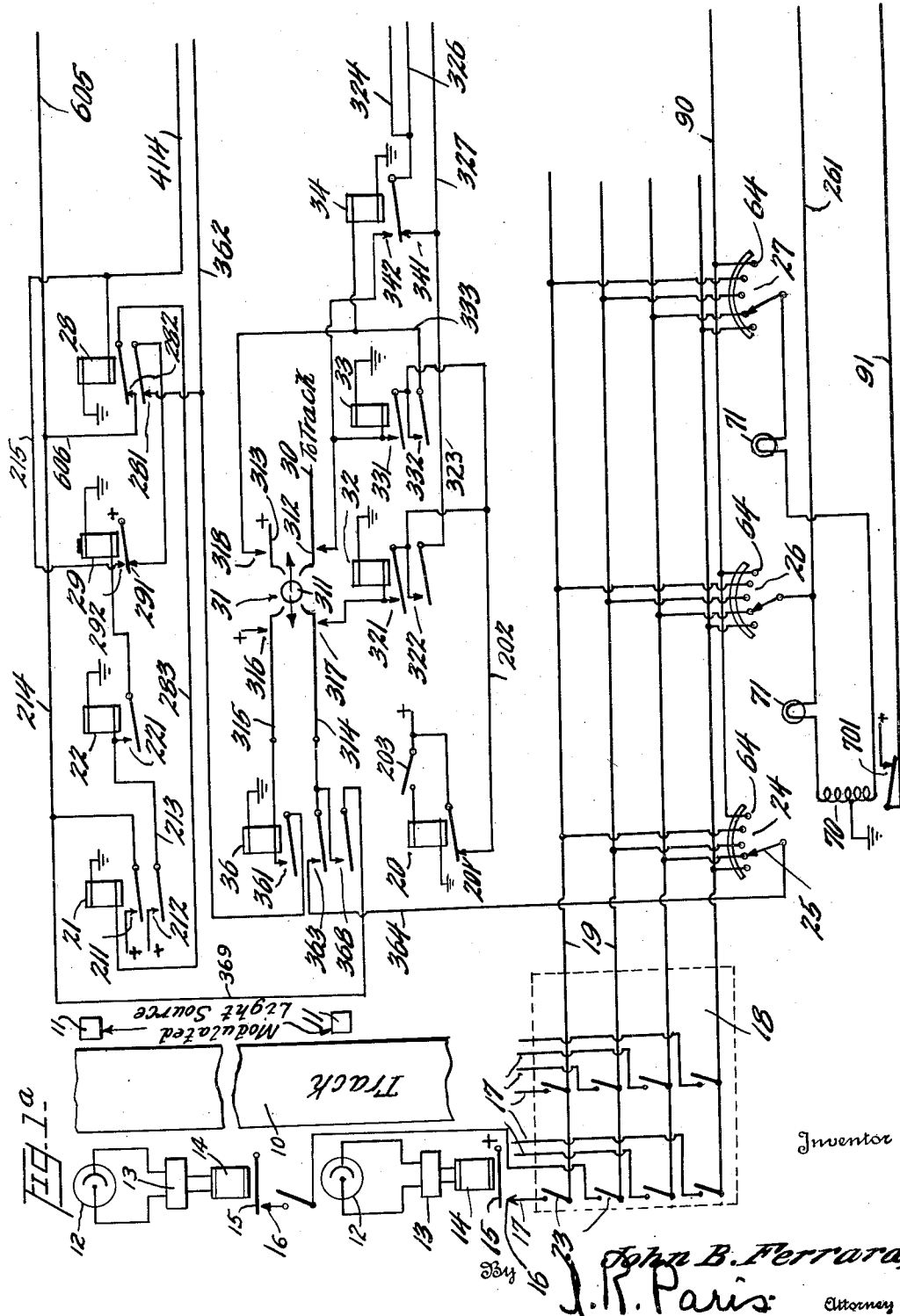
Feb. 14, 1950

J. B. FERRARA
RACE TIMING SYSTEM

2,497,541

Filed June 3, 1944

2 Sheets-Sheet 1



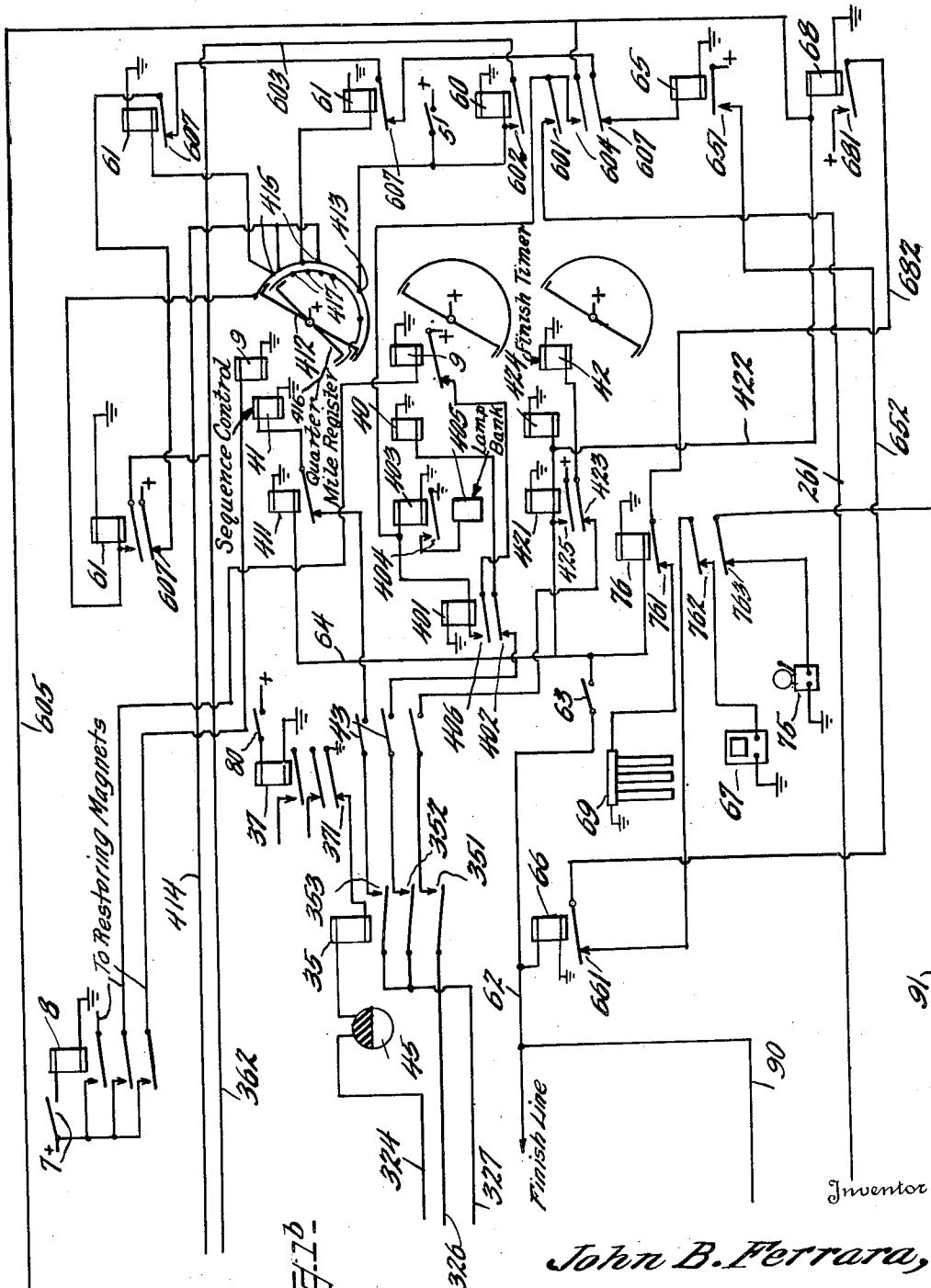
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2 Sheets-Sheet 2



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2,497,541

RACE TIMING SYSTEM

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Application June 3, 1944, Serial No. 538,679

19 Claims. (Cl. 161—18)

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The present invention relates to an electric timing system for timing races such as horse races and generally of the type disclosed and claimed in the patent to Belock No. 2,318,450.

Broadly described, the present system comprises a series of wayside devices disposed along the track, which operate to transmit an electric impulse when the leading race contestant passes. The system further comprises a central station receiving the track impulses. The central station includes a relatively small number of timing registers. These registers, which may be of any type desired, and are preferably of the rotary step-by-step switch type shown in the Belock patent, are operated by periodic impulses received from an interrupter or pulse generator at the central station. These registers are all started simultaneously at the start of a race and are permitted to run until they are stopped successively, as the leading contestant reaches the respective posts, such as quarter-mile post, half-mile post, etc., and the finish post, by the impulses transmitted by the corresponding wayside devices.

The main object of the present invention is to provide a timing system of this type which will operate effectively and correctly, which is not subject to errors occasioned by the common vicissitudes of the race track, and which, although operating automatically, is nevertheless substantially constantly under the control of an operator at the central station. It is also an object of the present invention to provide this system with a series of distinctive supervisory signals, which serve the purpose of keeping the operator informed of the operation of the system. By means of these signalling devices cooperating with the system the operator is informed when the system is operating properly. The system is also provided with means whereby the operator may, by the manipulation of switches, by-pass some of the automatic controls.

The system employs a plurality of equally spaced wayside devices along the track substantially of the same type as those disclosed and described in the Belock Patent No. 2,318,450. These wayside devices, which may be of any type desired, preferably include photo-electric devices which operate, when obscured by the passage of a contestant to transmit an impulse to a track wire. While any number of such wayside devices may be employed, the present system employs sixteen such devices equally distributed around an endless one mile track. There is also a way-side device at the seventy yard

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pole. Each way-side device is provided with its own track wire and these track wires serve to transmit the impulses from the way-side devices to the central station.

In addition to timing the entire race, means are also provided for timing portions of the race. For this purpose the race is timed at the quarter-mile, half-mile and three-quarter mile posts, etc. There are therefore at the central station several timing registers. One of these registers is designed to time the entire race from start to finish and the remaining registers are designed to time the desired portions of the race, such as the quarter-mile, half-mile and three-quarter mile. Thus the number of registers at the central station is considerably smaller than the number of way-side devices and track wires coming into the central station. This facilitates the employment of the present system in the timing of races of different lengths and having different starting points. It is therefore a further object of the present invention to provide a system of this type with readily manipulable devices for selectively associating the central station registers with the track wires. It will be understood that by means of the present invention the system is highly flexible and readily adaptable to a variety of circumstances. The apparatus at the central station is reduced to a minimum and, while a relatively large number of way-side devices is available along the track, only a relatively small number of them may be readily selected for operating the timing registers.

With the way-side devices disposed around the track it often happens that the device may be obscured by persons or other moving objects with a result that the indication given by the apparatus may be erroneous. The present system therefore provides for eliminating the difficulties that arise from this type of interference. For this purpose the timing registers, operated by the interrupter or impulse generator at the central station, are disconnected from their corresponding track wires until the contestants are just about to reach the corresponding post. At such times the presence of unauthorized persons or the like at the post is highly unlikely. For this purpose the present system includes a sequence control apparatus which serves to connect successively the several registers at the central station to their respective track wires only as the horses approach the corresponding posts or only a few seconds before they reach such posts. Thus any interference that may take place at the post

prior to such connection does not affect the central station apparatus.

Other objects and advantages of this invention will be apparent from the following specification and the accompanying drawing which illustrate one embodiment of the present invention.

Figs. 1a and 1b together illustrate the system.

In the drawings a plus (+) sign indicates a grounded source of current. A circuit is therefore complete when it includes a plus sign at one end and a ground at the other.

In the drawing reference character 10 indicates a race track which is provided with a plurality of way-side signalling devices disposed at intervals along the track preferably every one-sixteenth of a mile. These way-side devices may be of any suitable type desired and for present purposes are indicated schematically as comprising apparatus 11 disposed on one side of the track which includes a modulated source of light, illustrated in greater detail in the above-mentioned Belock patent, and a photo-electric cell 12 on the opposite side of the track exposed to the light 11. The current from the cell 12 is amplified by any suitable apparatus such as amplifier 13 and the relay 14 is normally energized. When the cell 12 is obscured the relay 14 is deenergized, its armature 15 drops to engage contact 16 and the track wire 17 thereby becomes connected to the grounded source of current (indicated by the plus sign) and the impulse is thus carried by the track wire to the central station.

For clarity only one of these way-side devices is shown in the drawings, but it will be understood that there are a plurality of such devices spaced equally around the track each having its own track wire 17 and a plurality of such track wires 17 are indicated in the drawings. Preferably these way-side devices are disposed every sixteenth of a mile around the track.

The route panel 18 is provided with four outgoing wires 19, and the track wires 17, divided into groups of four are connected through switches 23 to the wires 19, each group of track wires 17 being connected to these outgoing wires through four switches. The length and starting point of a race determines which group of three or four way-side devices will be employed in timing a race. Before each race therefore the operator closes selected three or four switches 23 and thereby connects the wires 19 with the selected group of way-side devices.

A rotary tap switch 24 has five contact points, four of which are connected to the four wires 19 and the fifth to the finish track wire by wire 90. The rotary contact 25 may be positioned so that it is connected with the track wire 17 leading from the starting post. Similar tap switches 26 and 27 may be positioned before each race so that they are connected to the proper way-side devices to provide for the timing of the one-quarter and half-mile respectively. Such tap switches are also provided for the three-quarter mile and one mile and are not shown herein.

In addition to the way-side devices whose track wires lead to the route panel 18 the present system also includes a way-side device at the seventy yard post and its track wire 30 does not enter the route panel 18 but instead is connected to the movable contact 312 of the double throw manual switch 31. This switch 31 is manipulated by the operator at the start of each race so as to establish electrical paths for the impulse which starts the timing registers of the system.

In the present system four registers are pro-

vided for timing the first quarter, half mile, etc. of each race. Because these registers are duplicates of each other only the quarter mile register is indicated at 40. In addition the system also includes the finish register 42 which times the entire race from start to finish. The rotary step-by-step switch type of timing register, illustrated in Belock is employed in the present system. Each of these registers is also provided with a bank of lamps as disclosed and described in the Belock patent. The registers are each also provided with a manual switch 43 which is closed by the operator before each race. Each of the registers contains an operating electromagnet, which is energized every fifth of a second and the rotary element is thereby moved one step every fifth of a second.

The sequence control switch 41 is also a rotary step-by-step switch of the same type as the timing registers. The impulses for the operation of these registers and for the operation of the sequence switch 41 flow from the interrupter relay 35 which is energized every fifth of a second by the rotary interrupter 45.

The timing registers and the sequence switch are all started at the start of the race. The timing registers are however disconnected from their respective track wires 17. Any untoward or accidental obscuration of the way-side devices will therefore not interfere with the timing registers. About twenty seconds after the start of the race the rotary arm 412 of the sequence switch supplies current to the one-quarter mile relay 60, which closes the contacts 601 and a circuit is thereby prepared for receiving the one-quarter mile track impulse delivered to the lock magnet 401 of the one-quarter mile timing register 40, opening the circuit and causing the bank of lights associated with the register to indicate the time.

Similarly a path is prepared for the impulse from the half mile pole and the others, some two to five seconds before they are reached, and when the leading contestant passes the pole this impulse stops the corresponding timer.

If desired the finish timer may be operated in the same manner. In practice however it is found that untoward obstructions are more likely to occur at the finish pole. For this reason the finish timer is not controlled by the sequence switch and instead a manual switch 31 is closed by the operator just as the leading contestant approaches the finish pole and the impulse from the way-side device at the finish pole stops the timer.

Having thus described in broad outline the operation of the system, a more detailed description thereof is in order.

Normal start

The operator having connected A. C. power to the wayside stations and having closed the selected switches 23 on the panel 18, having set the tap switches 24, etc., and closed the switches 43 for the timing registers, and having started the rotary interrupter 45, the system is ready for the start of the race.

The operator at the central station controls the starting of the system by the manual switch 31. This switch comprises a pair of resilient contacts 314, 315 disposed on one side of the pivoted handle 311 and a similar pair of resilient contacts 312, 313 on the other side of the handle 311. The handle 311 is biased to the intermediate inoperative position. Each of the resilient

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contacts is slightly spaced from a fixed contact as shown.

As the contestants leave the gate and are about to pass the starting pole the operator moves the handle 311 to the left and holds it there until the contestants pass the start pole. The contacts 314 and 315 are flexed to contact their fixed contacts and current is supplied from the fixed contact 316 to contact 315 and to start control relay 36, which becomes locked by the contacts 361, wire 362, normally closed contacts 281 of reset relay 28, normally closed contacts 291 of relay 29 and the source of current.

It is well to note here that relay 29, preferably a slow acting relay controls the supply of locking current to relay 36, this supply being also under the control of relay 28. It will be seen as the description proceeds that the same pair of relays 29 and 28 also supply, or control the supply of, locking current for the sequence relays 60, 61, etc. It will be understood, however, that if desired only one relay may be employed for this purpose. Energized relay 36 closes contacts 363, which together with contacts 314, 317, held closed manually by the operator, prepare a circuit for the track impulse receiving relay 32 ready to receive a track impulse from a track wire 17 through switch 23, wire 19 and tap switch 24.

When now one of the contestants passes the starting pole the impulse generated by the corresponding way-side device 12, energizes relay 32 by the following path: track wire 17, switch 23, wire 19, tap switch 24, wire 364, contacts 363, contacts 314, 317 to relay 32. Contacts 321 lock the relay 32, current being supplied through normally closed contacts 201 of power supply relay 20. Relay 32 thus becomes locked on receipt of the first impulse, remains locked until the finish of the race, when relay 20 is energized by manually closing switch 203. Thus any subsequent obscuration of 12 at the starting pole will not interfere with the operation of the system.

Relay 20 controls the contacts 201, which, when closed, provide power for the operation and control of the start circuits and the interrupter circuit.

At this point of operation, namely at the normal start which is now being particularly described, contacts 201 provide current for the interrupter circuit through wire 202, contacts 322, wire 323 normally closed contacts 341 of relay 34, wire 324, through the rotary interrupter 45, interrupter relay 35, and through contact 371 of relay 37 to ground. This constitutes the interrupter circuit which is supplied by current through contacts 201 and which supplies the impulses to the several timing registers and the sequence switch. The interrupter circuit remains closed throughout the race and the pulses caused by the interrupter relay 35 cause the timing registers and the sequence switch to step around. Thus the finish timer 42 is operated by the following circuit: source of current contacts 201, wire 202, contacts 322, wire 323, contacts 341 (normally closed), wire 326, contacts 351 of interrupter relay 35, closed switch 43, normally closed contacts 423 of lock relay 421 and finish timer 42.

The circuit just traced constitutes the operating circuit for finish timer 42 which remains available throughout the race so that this timer should indicate the full time of the race from start to finish. This circuit is interrupted every fifth of a second by the interrupter relay 35

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which acts on contacts 351, the relay 35 being energized every fifth of a second by the mechanical rotary interrupter 45. The rotary switch of the timer 42 thus is stepped around by its operating electromagnet.

At the same time that the finish timer is started in operation, the register 40 and sequence switch 41 are started by the following circuit: source of current, contacts 201, wire 202, contacts 322, wire 323 and wire 327. Here the circuit divides into several parallel circuits for operating the several timing registers 40 etc. and for operating the sequence switch 41. Contacts 352 of interrupter relay 35, closed switch 43, normally closed contacts of the locking magnets 401, and step-by-step timing register 40, complete the circuit for the quarter mile register; and the others, not shown, have similar parallel circuits. Contacts 353, contacts of locking magnet 411 and operating magnet of sequence switch 41 complete this circuit.

To recapitulate: In a normal start, after the selected switches 23 are closed and the race is about to start, the operator moves handle 311 to the left and holds it there until the first of the contestants passes the starting pole. The movement of the handle to the left prepares a circuit for the receipt of the track impulse by relay 32. As the leading contestant passes the starting pole, the track impulse energizes relay 32 which remains locked and paths are thereby completed for the operation of all the rotary step-by-step switches of the timing register and of the sequence switch. Power is supplied from contacts 201 of relay 20 and the interrupter 45 causes the step-by-step operation. The interrupter rotates at the rate of 300 R. P. M. thus providing an interruption every fifth of a second.

When the first of the contestants has passed the starting pole, the operator releases handle 311 and the switch returns to normal. The relays 32 and 36 however remain energized. The timing registers and the sequence switch continue in operation until they are stopped successively as will be described later.

Odd start

The operation thus far described is applicable to the start of all races, except the odd length race of one mile and seventy yards. In this race the start pole is seventy yards behind the finish pole. The system in this race operates to start the finish timing register 42 at the start of the race while the one-quarter mile and all other timing registers together with the sequence switch start when the contestants pass the finish pole.

Provision is therefore made, whereby the finish timer operates alone for the few seconds between the start of the race and the finish pole. For this purpose a track wire 30, which is connected at the track end to the wayside device 12 at the 70 yard pole, enters the central station and is connected directly to resilient contact 312 of the switch 31, without being routed through the route panel 18 as the remaining track wires 17 are.

As the horses are about to leave the starting post the operator moves the handle 311 of the switch 31 to the right and holds it there until the first of the contestants passes the seventy yard pole. Relay 34 is energized by current from flexible contact 313 to contact 318 to relay 34. The energization of relay 34 picks up its armature and establishes contacts 342, breaking contacts 341, thus providing a circuit (as will be clear

later) which operates only the finish timer, but does not permit of operation of the other timers, nor of the sequence switch, which are to be put into operation, immediately at the end of the 70 yard run, when the horses reach the finish pole.

As the leading contestant passes the seventy yard pole, the track impulse from the device 12 is transmitted by track wire 30, switch contacts 312 to relay 33. The relay 33 then remains energized by the self locking circuit, which derives its source of current from normally closed contacts 201 of reset relay 20, wire 202, and contacts 331. The relay 34 also becomes locked by the same source of current through 201 of relay 20, contacts 332, and wire 333 to relay 34. The two relays 33 and 34 thus cooperate to permit the finish timing register 42 to operate during the seventy yard run, and prevent the other timing registers and the sequence switch from operating during this early portion of the race.

The interrupter circuit is supplied with current through contacts 201, wire 202, contacts 331, contacts 342, wire 324 and thence through rotary interrupter 45 and interrupter relay 35 and contacts 371 of relay 37 as previously described. The same current is available to contact 351, which controls operation of finish register 42, through wire 326 in parallel with the rotary interrupter and interrupter relay. Relay 32 being deenergized during the seventy yard run, contacts 322 are open and no current flows in wires 323 and 327 and the remaining registers and the sequence switch will not operate during the seventy yard run.

The finish timer 42, having started as the horses pass the seventy yard pole, it will remain in operation because relays 33 and 34 are locked. The operator now and before the horses reach the finish pole, shifts the handle 311 to the left hand position. The relay 36 now is energized as described in the normal start description. Relay 32 is energized by the track impulse as previously described, and current is now available to the contacts 352, 353, etc., of the interrupter relay and the one-quarter mile and all other timing registers are set into operation and the sequence switch 41 is also set into operation, all as described in the normal start operation.

The handle 311 is now released to its normal intermediate position and the switch 31 assumes normal position, with its contacts open. The relays 32, 33, 34 and 36 remain energized, the interrupters are provided with current, and all the timing registers and sequence switch operate step by step.

Sequence switch operation

The sequence switch 41 is of the rotary step by step switch type, the same as those employed for the timing registers. The timing registers include in addition to the rotary step-by-step switch, a group of relays and a bank of lamps which are selectively illuminated to indicate the time. These devices and structures are described and illustrated in more detail in the Belock patent and are well known in the art. For present purposes it is sufficient to illustrate the timing registers 40 and 42 as shown and to illustrate the sequence switch 41 as shown.

The sequence switch is employed for the purpose of eliminating interference with the timers of any untoward obscuration of the track apparatus. Each timing register is provided with a lock magnet, see 401 and 421, which is normally deenergized thus permitting its contacts to main-

tain the operating circuit of the register closed and upon energization to terminate the operation of the time register.

These locking magnets, and the locking magnets of the registers not shown, are connected with the preselected track wires 17, by the sequence switch 41, only a few seconds before the horses, or other race participants reach the corresponding post. Thus any prior obscuration of the photoelectric cell will not affect the timers because they are disconnected from the track wires, and any such obscuration after the contestants have passed the post will not affect the timers because they have already been stopped and the locking magnets remain locked by a self locking circuit.

The drawing illustrates the manner in which the sequence switch cooperates with the quarter mile timer and its cooperation with the remaining timers is the same and their operation need not be illustrated nor described.

Some twenty seconds after the sequence switch 41 has started, the quarter mile sequence relay 60 is energized by current from the rotary arm 412 through contact 413. The relay 60 becomes locked through contact 602, wire 603, wire 362 and normally closed contacts 281 and 291 of the deenergized relays 28 and 29 respectively and the source of current available at the contacts 291. The energized relay 60 closes contacts 601, and a path is thus prepared from the selected track wire 17 through the selected wire 19, then through the quarter mile tap switch 26, wire 261, contact 601 to lock relay 401. When the leading contestant now reaches the quarter mile pole, the corresponding track relay 14 is deenergized, contacts 15, 16 are closed and current is supplied along this circuit to energize relay 401. Its contacts 402 are opened and the timing register 40 is disconnected from the interrupter circuit and the register 40 ceases its step-by-step movement.

Contacts 406 provide locking current for the locking relay 401. The locking current arrives to contacts 406 through the normally closed contacts of the restoring magnet 9, which is part of each such step-by-step switch as is well known in the art.

The indicator relay 403, which is in parallel with the locking relay 401, becomes energized simultaneously with lock relay 401. By closing its contacts 404 ground is provided for the bank of indicator lamps, which are associated with the step-by-step switch and are controlled thereby in a manner well known in the art. These lamps indicate the time of the quarter mile to the entire attendance. The box 405 schematically illustrates the bank of lamps and the series of relays associated with it.

It will now be understood that the quarter mile timing register has been operating from the start of the race but has been disconnected from the quarter mile wayside device, and was connected to the quarter mile wayside device only a few seconds before the horses were due to reach the pole. This was accomplished by the sequence switch through the quarter mile sequence relay 60 and its contacts 601. When the horses reach the pole, the track impulse is received by the lock relay which stops and locks the step-by-step rotary switch of the timing register 40 and the lamp indicators associated with it are illuminated to indicate the time of the quarter mile.

While in the system as shown the lock relay 401 and indicator control relay 403 are shown as separate relays, it will be understood that the

lock relay 401 may also serve as the indicator control relay if desired.

The lock relay 401 and the indicator relay 403 are operated by current that flows from the field through the long track wire 17. For security in the operation of the relays 401 and 403 the present system also provides a shorter circuit contained within the central station for supplying operating current to these relays. This operating circuit is, of course, set up by the track current. For this purpose the track impulse, which arrives through tap switch 26 and wire 261 to contact 601 of the quarter mile sequence relay 60, is directed from this point to another circuit, in parallel with lock relay 401 to energize relay 21. This circuit includes contact 604, wire 605, wire 606, contacts 282, wire 283 and relay 21. This closes contact 211 which provides current to lock relay 401 and indicator relay 403 through wires 214, 605, contacts 604 and to relays 401 and 403.

The sequence relay 60 having performed its function of creating a path for the energization of lock relay 401 and lamp indicator relay 403, should be restored to its normal deenergized condition. Its locking circuit which is controlled by relay 28 and 29 should therefore be broken. The energization of relay 21, previously described, closes the pair of contacts 212, which with its power source energizes slow acting relay 22 through wire 213; and contacts 221 of relay 22 energize slow acting relay 29, which, by opening contacts 291, breaks the locking circuit of relays 60 and 36 and relay 21 by the energization of relay 28 through contacts 292, wire 215. The timer 40 with its lamp and indicator relays remain in set position. The relay 36, which was energized at the start of the race and was deenergized at the quarter mile, as just described, remains deenergized for the remainder of the race.

For clarity and simplicity of drawings and description only the quarter mile time register 40 is shown and described. The system, however, also includes a half mile, three-quarter mile and one mile time register, each having its own step-by-step rotary switch or switches, locking magnets, restoring magnets, etc. They are set into operation with the quarter mile register and are also under the control of the sequence switch and sequence relays, such sequence relays being indicated by the reference character 61.

Just prior to each quarter mile, therefore, another sequence relay 61 will be energized by the sequence switch, which will prepare a path for the transmission of an impulse to the lock and indicator relays of the corresponding time register. When the horses reach the corresponding post the track impulse will pass through the corresponding wire 19, the corresponding tap switch and through the closed contacts of the sequence relay 61 to the lock and indicator relays. Relay 21 which is a quick acting relay will also be energized by the track impulse, thus providing a local circuit for the lock and indicator relays, which by-passes the long track wire 17, thus assuring the instantaneous operation of the lock and indicator relays. At the same time the relay 61 is deenergized in the same manner as relay 60 was deenergized by the successive energization of slow acting relays 22 and 29. The latter are made slow acting so as to delay the deenergization of 60 or 61 and to provide ample time for the effective operation of the lock and indicator relays.

However, before relay 61 is energized by the

movable arm 412 of the sequence switch, the relays 21, 22, 28 and 29 have to be deenergized so as to provide locking current for the sequence relay 61 as previously described in connection with sequence switch 60. For this purpose relay 28 is connected by means of wire 414 to each of contacts 415 which precede the contacts to which the sequence relays 61 are connected. Relay 28 is thus momentarily energized and deenergized preferably about five seconds prior to the energization of relay 61. The breaking of contacts 282 deenergizes relays 21, 22, and 29 successively. Relay 28 also becomes deenergized when the arm leaves contact 415, with the consequence that locking current becomes available for sequence relay 61.

It will now be understood that after the energization of relay 61, the same series of events take place with reference to the half mile timer, and similarly for the three-quarter mile timer and so on. Thus each of the intermediate timing registers, which time portions of the race are stopped successively by the track impulse after the path for the receipt of such impulse has been prepared or completed by the operation of the sequence switch. The locking of the finish timer may also, if desired, be operated by the sequence switch in the same manner. It is found that untoward obstruction of the photocell at the finish line is likely to occur close to the finish of the race.

It is therefore preferred to prepare the path or circuit for the finish impulse manually. For this purpose track wire 62, which leads from the wayside device at the finish post, does not pass through the route panel, and leads directly to manual switch 63 and then to lock magnet 421 of the finish timing register 42. It is also preferably connected to a fifth contact 64 on each tap switch by wire 90.

This connection of the finish wire to the several tap switches is particularly useful when long races are run such as two mile races or the like. At such races the timing registers are employed to time each half mile. This is accomplished by the sequence switch having another rotary arm 416 and contacts 417 placed so that it energizes relay 60 after forty seconds from the start, and to energize sequence relay 61 just prior to each half mile.

The operator closes switch 63 as the leading contestant is about to reach the finish line and the impulse generated by the wayside device at the finish line as it is obscured by the leading horse energizes lock magnet 421 of the finish timer and the time of the race is indicated by its bank of lamps. Wire 64 also leads from switch 63 so that the track impulse also energizes lock magnet 411 of the sequence switch 41, and the sequence switch stops with the finish timer at the end of the race. The same finish impulse also energizes the lamp bank indicator relay 424 which carries the illumination of the selected lamps to indicate the time of the race in a well known manner. Contacts 425 correspond to contacts 406 of locking relay 401 and serve to provide locking current for relays 421 and 424, this locking current being under the control of the restoring relay as explained earlier.

Supervisory circuits

The present system includes supervisory circuits which provide several distinctive signals informing the operator of the operation of the system.

All sequence relays 60 and 61 have normally closed contacts 607 in series with each other and with sequence supervising relay 65 so that the latter is normally energized when the system is in operation, and all the sequence relays are deenergized. When a sequence relay 60 or 61 becomes energized, relay 65 deenergizes, its contacts 651 close, and buzzer 67 is energized by the circuit from contacts 651, wire 652, contacts 661 (normally close), contacts 762 (normally closed) and buzzer 67 to ground. This informs the operator that the timing register is ready to receive an impulse from the wayside station which is being approached by the contestants, that the sequence relay (one-quarter mile or, half mile, etc.) has energized and that a path for receiving the track impulse has been prepared. Should the buzzer fail to operate the operator would then close switch 5 which would supply energy to the sequence relay and energize it.

Another distinctive signal such as a chime, informs the operator that the track impulse has come through. For this purpose the track impulse, which at the start passes through contacts 363 of relay 36, and at the one-quarter mile passes through contacts 601 of relay 60 (and so on at one half mile etc.), branches off at those contacts as through wires 369, 214, and 605 coming from contacts 368, or directly through wire 605 coming from contact 604 of relay 60, and similarly from the relays that correspond to other posts. These branch circuits all lead to the relay 68 which is energized by the track impulse. Its closed contacts 681 then energize, through wire 682 and contact 761, the distinctive signal 69 which informs the operator that the track impulse has come through. Similarly wire 422 also permits the finish track impulse to operate the chimes by energizing relay 68.

Should an undesired obscuration of one of the selected track devices take place the operator is informed by the sound of another distinctive signal 75. For this purpose a double winding relay 70 is connected to a pair of adjacent tap switches as shown and this relay will be energized. Contacts 701 will deliver energy to signal 75 through wire 91 and contacts 763. Lights 71 will be illuminated to indicate where the obscuration has taken place.

The finish impulse, preferably, disconnects the signals from the source of current. Thus the finish track impulse energizes relay 76. Its contacts 761 are opened and circuit for the chime 69 is opened, and similarly the contact 762 and contacts 763 interrupt the signals 67 and 75.

Restoration

After the time indicators have been on display for an adequate time, the manual switch 8 is held in closed position until all the rotary step-by-step switches have been restored to normal, and all the locking magnets have been deenergized. Closing switch 7 energizes master restoring relay 8. Its contacts are closed and current is supplied to all restoring magnets 9. The latter, as is well known in the art, operate to restore the step-by-step rotary switches to normal and also to restore all its magnets and relays to normal. Manual switch 203 is then temporarily closed to energize relay 20 and to open contacts 201 thereby breaking the locking circuit for relays 32, 33 and 34. The system is now ready for the next race.

Relay 37 is used for test purposes only, to check the stepping performance of all rotary switches.

What I claim is:

1. An electrical timing system comprising a plurality of timing registers, a source of periodic timing impulses for said registers, means for establishing an electrical path between said source and said registers for simultaneously starting the operation of said registers in response to a single predetermined event, a group of devices operable successively in response to successive events to stop said register successively and means operated by said timing impulses for normally maintaining said registers unresponsive to said devices and operating to render said registers successively at predetermined intervals responsive to said devices.

2. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of timing registers, and unitary sequence control means for normally maintaining said registers unresponsive to said impulses and operating to render said registers successively at predetermined interval responsive to impulses from corresponding wayside devices to stop said registers.

3. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a plurality of timing registers, means operable by the impulse of one of said devices to start all of said registers, and means for thereafter maintaining said registers unresponsive to said impulses and operating to render said registers successively at predetermined intervals responsive to impulses from corresponding wayside devices to stop said registers.

4. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a plurality of timing registers, means, operable at the start of a race, for temporarily rendering said registers responsive to one of said devices to start said registers, and means for thereafter maintaining said registers unresponsive to said impulses and operating to render said registers successively at predetermined intervals responsive to impulses from corresponding wayside devices to stop said registers.

5. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of timing registers, and sequence control means operable to render said registers successively responsive to impulses from corresponding wayside devices only after the lapse of time from the receipt of the preceding track impulse sufficient to permit the contestants to traverse a major portion of the distance between adjacent corresponding wayside devices.

6. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of rotary step by step timing registers, and a rotary step by step sequence controller, a periodic impulse generator for operating said registers and controller, means operable in response to an impulse from one of said wayside

devices to start said controller and registers by connecting the same to the periodic impulse generator, and means operable in response to predetermined positions of the sequence controller to render said registers successively responsive to impulses from corresponding wayside devices to stop said registers.

7. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of rotary step by step timing registers, and a rotary step by step sequence controller, a periodic impulse generator for operating said registers and controller, means operable in response to an impulse from one of said wayside devices to start said controller and registers by connecting the same to the periodic impulse generator, and relay means operable in response to predetermined positions of the sequence controller to render said registers successively responsive to impulses from corresponding wayside devices to stop said registers.

8. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of rotary step by step timing registers, and a rotary step by step sequence controller, a periodic impulse generator for operating said registers and controller, means operable in response to an impulse from one of said wayside devices to start said controller and registers by connecting the same to the periodic impulse generator, and relay means operable successively at predetermined intervals to render said registers successively responsive to impulses from corresponding wayside devices to stop said registers.

9. In a race track timing system having a plurality of rotary step by step timing registers, a plurality of circuits each including a register and a wayside device operable by the passage of contestants to transmit a track impulse to the register to stop the same, said wayside devices being disposed at intervals along the track, means maintaining said circuit open until the approach by the contestants to the corresponding wayside devices, said means comprising a normally open switch in each circuit, a control relay for each switch, and a rotary step by step sequence control switch, said relays being connected at spaced intervals to said sequence control switch and operable thereby to close their respective switches.

10. In a race track timing system of the character described, the combination of a plurality of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station, a track wire leading from each device to said central station and transmitting the impulse thereto, a group of timing registers at the central station smaller in number than the number of track wires, manual switching means at the central station interposed between the track wires and said registers for the preparation of paths between selected registers and selected track wires, and means for successively closing said paths as contestants approach the selected wayside devices, thus subjecting said registers to control by the selected wayside devices.

11. In a race track timing system of the character described, the combination of a plurality of wayside devices disposed at intervals along the

track and operable by the passage of a contestant to transmit an electric impulse, a central station, a track wire leading from each device to said central station and transmitting the impulse thereto, a group of timing registers at the central station smaller in number than the number of track wires, switching means at the central station interposed between said track wires and said registers for selective connection of any register to any of said wires to permit control of said registers by preselected wayside devices.

12. In a race track timing system of the character described, the combination of a plurality of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station, a track wire leading from each device to said central station and transmitting the impulse thereto, a group of timing registers at the central station smaller in number than the number of track wires, a switch board receiving said track wires and having an outgoing group of wires corresponding in number to the number of said registers, manual switch means connecting said outgoing wires with selected track wires, and manual means for selectively rendering said registers subject to control by said outgoing wires, whereby said registers may be controlled by an equal number of selected wayside devices.

13. In a race track timing system, the combination of wayside devices disposed at equal intervals along the track, an additional wayside device disposed at the odd starting position, said devices being operable by the passage of a contestant to transmit an impulse, a finish register for timing the entire race and additional registers for timing predetermined portions of the race, selective means for associating said registers with selected wayside devices dependent upon the length of the race being timed, a two position switch, and electric circuit means operable to start all registers by the impulse of the device at the starting position of the race when the switch is in one position, and electric circuit means operable to start only the finish timer when the switch is in the second position.

14. In a race track timing system, the combination of wayside devices disposed at equal intervals along the track, an additional wayside device disposed at the odd starting position, said devices being operable by the passage of a contestant to transmit an impulse, a finish register for timing the entire race and additional registers for timing predetermined portions of the race, selective means for associating said registers with selected wayside devices dependent upon the length of the race being timed, a two position switch, electric circuit means operable to start all registers by the impulse of the device at the starting position of the race when the switch is in one position, and electric circuit means operable to start only the finish timer when the switch is in the second position and selective control means rendering said registers responsive to impulses from selected wayside devices to stop the same.

15. A race track timing system having a plurality of circuits each including a timing register and a wayside device operable by the passage of a contestant to transmit an impulse to stop said register, a normally open switch in each circuit, a relay for each switch operable to close said switch, means for successively operating said relays to close said switches as the contestants approach corresponding wayside devices thus pre-

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paring said circuits for the receipt of said impulses, and a signal operable to indicate that the circuit is properly prepared.

16. A race track timing system having a plurality of circuits each including a timing register and a wayside device operable by the passage of contestants to transmit an impulse to stop said register, a normally open switch in each circuit, a relay for each switch operable to close said switch, means for successively operating said relays to close said switches as the contestants approach corresponding wayside devices thus preparing said circuits for the receipt of said impulses, a signal operable to indicate that the circuit is properly prepared and a manual switch for preparing said circuit in the event the signal does not operate.

17. A race track timing system having a plurality of circuits each including a timing register and a wayside device operable by the passage of contestants to transmit an impulse to stop said register, a normally open switch in each circuit, a relay for each switch operable to close said switch, means for successively operating said relays to close said switches as the contestants approach corresponding wayside devices thus preparing said circuits for the receipt of said impulses, a signal operable to indicate that the circuit is properly prepared and a second signal operable by the track impulse to indicate that the impulse has come through to the register.

18. A race track timing system comprising a plurality of wayside devices operable to transmit

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an impulse on obscuration of the same by the passing contestants, timing registers operable to receive said impulses, means for preventing said registers from receiving impulses from said devices prior to the due time of the contestants, and signal means operable by any obscuration prior to such due time.

19. In a race track timing system, the combination of wayside devices disposed at intervals along the track and operable by the passage of a contestant to transmit an electric impulse, a central station receiving such impulses and comprising a plurality of timing registers, and unitary sequence control means for normally maintaining said registers disconnected from said devices and unresponsive to their impulses and operating to connect said registers to said devices only during the due time of the contestants at the corresponding devices and to render said registers responsive to the impulses of the corresponding devices to stop said registers.

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25 The following references are of record in the file of this patent:

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