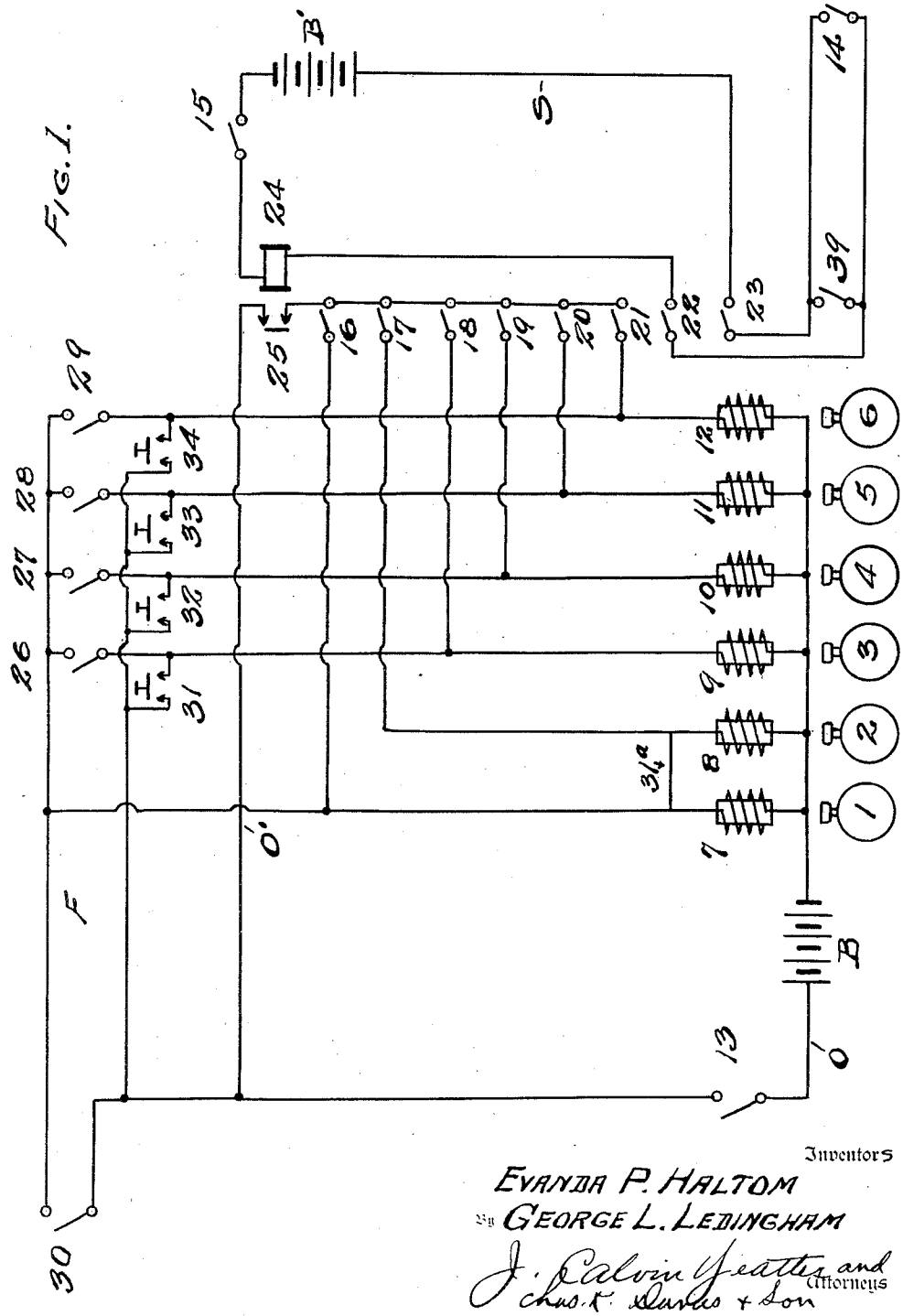
May 5, 1942. E. P. HALTOM ET AL 2,282,132

ELECTRICAL TIMING MECHANISM

Filed May 10, 1940 3 Sheets-Sheet 1

FIG. 1.



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FIG. 3.

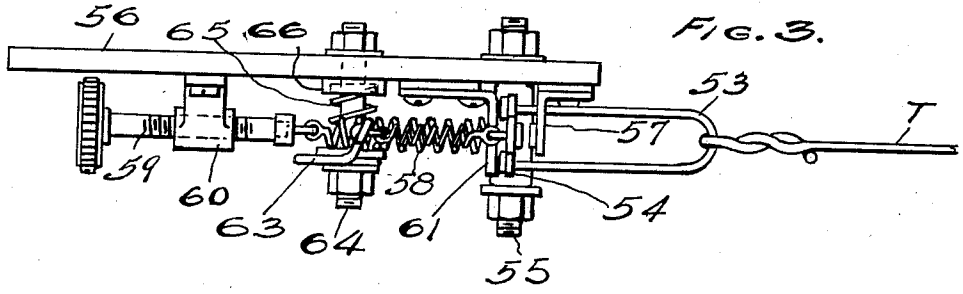


FIG. 4.

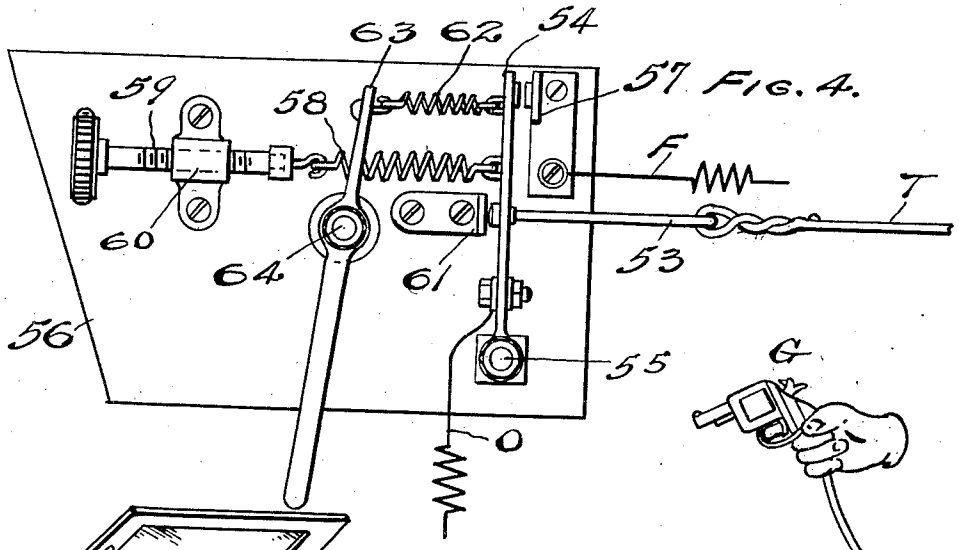
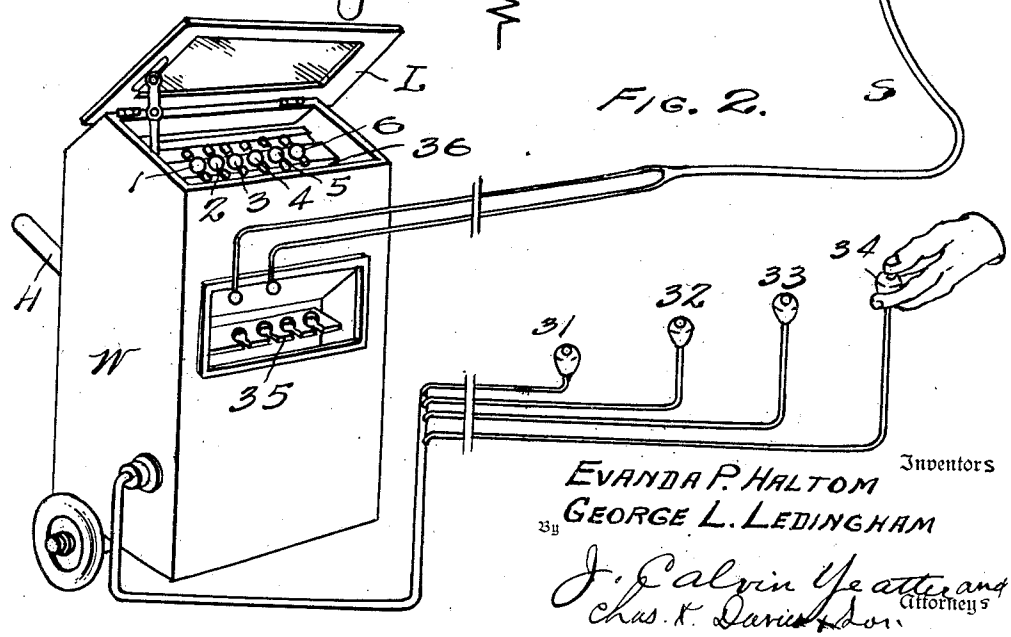


FIG. 2.



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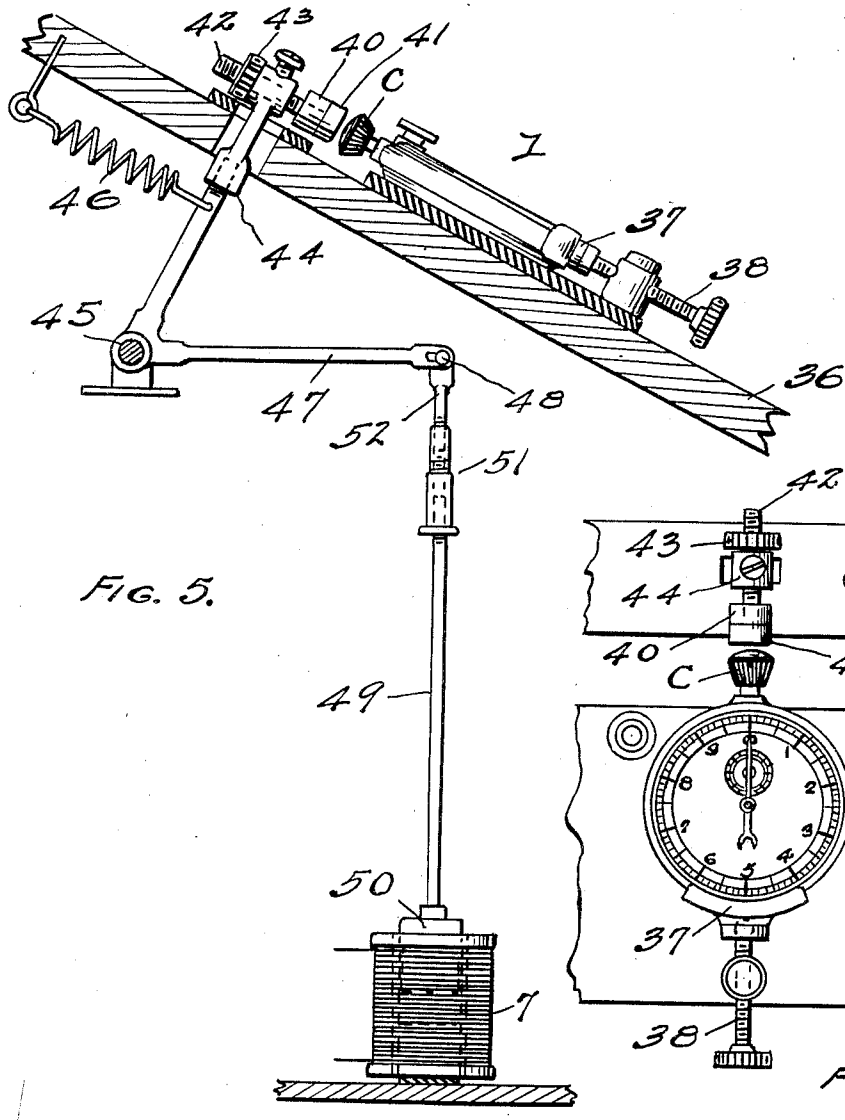


FIG. 5.

FIG. 6.

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Patented May 5, 1942 2,282,132

UNITED STATES PATENT OFFICE

2,282,132

ELECTRICAL TIMING MECHANISM

Evanda P. Haltom and George L. Ledingham,
Fort Worth, Tex.

Application May 10, 1940, Serial No. 334,500

1 Claim. (Cl. 161—18)

Our present invention relates to improvements in electric timing mechanisms, including electromagnetic means for controlling a series or number of stop watches, and involving a portable equipment adapted for use in connection with horse-races, boat-races, and other sporting events, as well as for timing industrial operations. For convenience in illustration and description of our invention we refer herein to the adaptation of the portable timing mechanism as employed at track meets, and especially the timing of a foot race.

For such an event the portable equipment may be situated at a desirable and convenient location adjacent the track, in order that the start of the race may be signaled by the use of the customary starting "gun," and the finish of the race indicated by the customary breaking of a tape, light cord, or other usual means.

For positive and accurate timing of the race, the firing of the starting gun automatically controls the starting of a number or series of stop watches through the instrumentality of complementary electro-magnetic control devices. Two of the series of stop watches are automatically controlled and stopped at the finish of the race by the winning contestant as he breaks the tape, or crosses the finish line, thus providing a dual indication of the time of the winner, and eliminating the chance of inaccurate timing.

The remaining stop watches, here shown as four in number, are stopped by means of manually operated switches or push-buttons manipulated by judges who stand in position to see the finish of the race, and thus give the time of each of the following contestants. While we have shown six stop watches, including the dual indicators for the winner of the race, it will be understood that the number of remaining stop watches may be increased or decreased in accord with the number of contestants in a race.

In the specific adaptation of our invention illustrated in the accompanying drawings we employ a standard type of stop watch, the hands of which are started, stopped, and re-set or returned to neutral position at will, and these functions of the series of watches are controlled by our novel combinations and arrangements of electrical equipment, as will be hereinafter more fully pointed out and claimed.

In the accompanying drawings we have illustrated one complete example of the psysical embodiment of our invention, but it will be understood that changes and alterations may be made in these exemplifying disclosures within the scope of our claim without departing from the principles of our invention.

Figure 1 is a conventionalized diagram of the electrical wiring and electrically operated control devices employed in carrying out our invention, all of the switches being shown in open position.

Figure 2 is a view showing part of the portable equipment of our invention, including the starting "gun" with its starting switch and the manually controlled stop switches for use at the finish of the race, together with a carriage or wheeled cabinet in which the equipment may be stored and from which the wires, cords, cables and other devices may be withdrawn for use.

Figure 3 is a top plan view of the balanced mechanical parts involved in the operation of the automatically controlled tape-switch at the finish of the race which switch controls two of the stop watches of the series.

Figure 4 is a face view of the tape-switch mechanism of Figure 3, showing the circuit wires connected thereto.

Figure 5 is an enlarged detail sectional view of an interior part of the portable cabinet, showing the electro-magnetic control devices of one of the stop watches.

Figure 6 is a top plan view showing one of the stop watches with its hammer that engages the crown of the watch for controlling the mechanism of the watch.

In the conventional diagram of Figure 1, the series of stop watches are designated as 1, 2, 3, 4, 5, and 6, and they are controlled by the complementary solenoids 7, 8, 9, 10, 11, and 12 that are included in the operating circuit O, which includes the battery B and a cut-out or battery switch 13, which is closed when the mechanism is in use.

The starting "gun" G (Fig. 2) has an automatically closed starting switch 14 (Fig. 1) included in a starting circuit S that includes the battery B' and the cut-out switch 15, which battery switch is also closed when the mechanism is to be used. The wires of the six solenoids and the lead wires of the starting switch 14 are connected with the starting circuit through the closing of eight circuit makers 16, 17, 18, 19, 20, 21, 22, and 23, and these circuit makers may be the usual hand switches as indicated, or if desirable one or two knife switches may be utilized for this purpose.

The main wire O' of the operating circuit O is connected with the starting circuit through the relay 24 in the starting circuit and the relay

switch 25, this relay being energized to close the switch 25 when the starting switch 14 is automatically closed as the signal gun G is fired for the purpose of starting the race.

The solenoids 7 and 8 simultaneously control the stop watches 1 and 2 to time the winner of the race, and the remainder of the stop watches 3, 4, 5, 6, controlled by the solenoids 9, 10, 11, and 12, are adapted for selective use, depending upon the number of contestants in the race. Numerals 26, 27, 28, 29, indicate manually controlled switches, and 30 is the tape switch in the finish circuit F. These four switches 26, 27, 28, 29 are closed if and when it is desired to stop all of the watches when the tape is broken by the winner, and thus time the winner with a plurality of watches. The primary use of the invention, however, is to employ the switch 30 for dual control in simultaneously and automatically stopping watches 1 and 2 to time the winner; and thereafter individually time the succeeding runners as they also finish the race. The runners who finish after the winner are timed by time-keepers who hold in their hands manually controlled switches 31, 32, 33, 34. Thus if there were five contestants in the race (the maximum number that may be timed by the equipment herein indicated) the four manually operated switches 26, 27, 28, and 29, are left open in preparation for the timing operations.

The four selective circuit closers or switches 31, 32, 33, 34, as shown are connected with the respective solenoids 9, 10, 11, and 12, and they are also connected with a wire of the finish circuit F that includes the open, balanced tape-switch 30 that is automatically closed when the winner breaks the tape at the finish of the race, and thereby stops the stop watches 1 and 2, to indicate the time of the winner.

The timing of the other four contestants in the race is indicated by the stopping of the remaining four watches 3, 4, 5, and 6 under control of four push button switches 31, 32, 33, and 34.

All of the stop watches continue in operation until the winner of the race crosses the finish line, or breaks the finish tape T (Figs. 3 and 4) and the breaking of the tape results in the closing of the open tape-switch 30. The wires of solenoids 7 and 8 are connected by a shunt wire 31*a*, and the wire of solenoid 7 is extended to wire F' of the finish circuit, therefore it will be obvious that closing of switch 30 will energize solenoids 7 and 8 resulting in another action which stops these dual-controlled watches 1 and 2 thereby timing the winner of the race.

Assuming that the four remaining contestants finish or cross the line successively, the four judges holding the push button switches 31, 32, 33, and 34, close these switches successively to close the individual circuits of the push buttons, and energize the respective solenoids 9, 10, 11, and 12, thereby stopping the watches 3, 4, 5, and 6, to time the losers of the race.

As indicated in Figure 2 all of the circuits or wires are connected to terminals within a carriage or wheeled cabinet W which may be trundled to a suitable spot with relation to the track by use of handles, one of which is indicated at H and the cabinet has a hinged lid or window L so that the watches are readily visible when the lid is closed. A pocket is provided in the front of the cabinet, and a suitable rack 35 is mounted therein to receive the push buttons 31, 32, 33, and 34. Portions of the wires of the starting circuit, and other wires, cords, or cables may be wound upon a reel, or reels, that may be rolled along the ground to their desired locations for use in the timing operations.

The stop watches are mounted on the upper face of a board or plate 36 located in the upper part of the cabinet and adjustable holders 37 for the watches are provided with adjusting screws 38 for use in accurately placing the watches. The crown C of each watch is depressed to start, stop, and reset the watches, and in Figure 1 a re-setting switch 39 is shown in the starting circuit, which switch when closed causes the several solenoids to actuate the operating mechanism that depressed the crowns C.

This operating mechanism includes a hammer 40 (Figs. 5 and 6) having a rubber or cushioned head 41 located in position to contact with and depress the crown C, and by means of an adjusting screw 42 and nut 43 the head is mounted in the upper end of arm 44 of a bell crank pivoted on a suitable support at 45. A spring 46 is connected to the lever arm and anchored to the board 36 for holding the head out of contact with the crown, and for quickly retracting the head after it has imparted a hammer blow to the crown thus permitting prompt recoil of the crown. The other arm 47 of the bell crank lever is pivotally connected at 48 to a longitudinally adjustable, and substantially long connecting rod 49 rigid with the armature 50 of the solenoid (as 7) and a turnbuckle 51 couples this rod with the pivot link 52.

The stop watch is thus mounted at a substantial distance from the magnetic field of the solenoid to prevent magnetic interference with the operation of the watch movement, and the adjustable turnbuckle is utilized for varying the length of the connecting rod to adjust the stroke of the solenoid plunger or armature.

The hammer-head is also adjustable with relation to the crown of the watch for the purpose of insuring accuracy in the control of the operation of the watch.

In Figures 3 and 4 we have disclosed one form of support for an end of the tape T, which includes a balanced or equalized arrangement of the open switch 30 that is automatically closed, when the tape is broken, to cause solenoids 7 and 8 to be energized and simultaneously stop the dual watches 1 and 2. The tape is fastened to a horizontally extending and comparatively long U-shaped yoke 53, which is rigidly mounted on a switch-arm 54 that is pivoted at 55 on a supporting board or plate 56. This board or plate is a stationary support fixed in suitable manner at the finish line of the race track, and the electric wires from this tape-switch are of suitable length to extend to terminals in the portable cabinet or carriage in which the stop watches are mounted. The movable switch arm 54 is provided with a contact point complementary to a stationary contact point mounted on a suitable bracket 57 fixed to the supporting board 56.

The movable switch-arm 54 is balanced with the tape-switch open, by means of a spring 58 connected at one end with the arm, and the other end of the spring is connected to the adjoining end of an adjusting screw 59 mounted in a nut 60 fixed on the board 56. The tension of the spring may be adjusted for accurately positioning the lever or switch-arm, and a stop 61 prevents undue movement of the pivoted arm. In order to insure a delicate adjustment of, and

precision in, the closing movement of the tape-switch, a second weaker spring **62** is also connected at one end to the switch arm near its free end, and the other end of this spring is anchored to a balancing lever **63**, pivoted at **64** on the board **56**. This lever is loosely pivoted at **64**, but it is provided with a friction brake in the nature of a spring **65**, coiled about the pivot **64** and interposed between the hub-portion of the lever and a flanged washer **66**. Thus the friction or braking action applied to the lever by tension of the spring **65** may be varied to adjust the tension of the auxiliary or balancing spring **62**.

By adjusting the screw **59** to vary the tension of spring **58** the tape T may be stretched taut with the pivoted switch arm balanced and the tape-switch open. After the switch arm is thus balanced the auxiliary spring **62** may be slightly extended by movement of the resiliently held friction lever **63** to impose a slight extra or over-balancing tension on the tape, which will resist pressure of wind on the stretched tape and thus prevent accidental closing of the tape switch.

As before pointed out, the tape-switch is closed when the winner of the race hits the tape and pulls the contact point of the pivoted switch arm into contact with the stationary contact point, thus closing the circuits of the two solenoids **7** and **8** and stopping the dual watches **1** and **2**. Immediately after contact has been made it is broken by action of the springs **58** and **62** which pull the movable switch-arm into position of Figure 4.

While we have thus fully illustrated and described one complete physical embodiment of our invention as applied to and used in timing a foot race involving five contestants, it will be understood that the equipment may be adapted for timing different numbers of entrants in such a race; and further, the timing equipment may be adapted to be utilized in other contests and sporting events and similar timing purposes. While we have illustrated and described specific mechanical devices in connection with the electrical equipment of our invention, it will be understood that changes and alterations may be made within the scope of our appended claim without departing from the principles of our invention.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:

An electric race-timing mechanism including a series of stop watches, a source of electricity, means including a group of solenoids each adapted to start and stop one of said watches, a solenoid-operating circuit connected to said source and said solenoids being connected in parallel relation in said circuit, manually operated switches in said solenoid operating circuit, one switch for each solenoid, a relay-operated switch in said solenoid-operating circuit, a relay-operating circuit for energizing said relay including a switch to be closed at the starting of a race, a tape-operated finish switch in series with said source and with two of said solenoids, said tape-operated switch being in parallel with the relay-operated switch and the said manual switches, whereby said two solenoids are energized by the winner upon reaching the finish-tape.

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