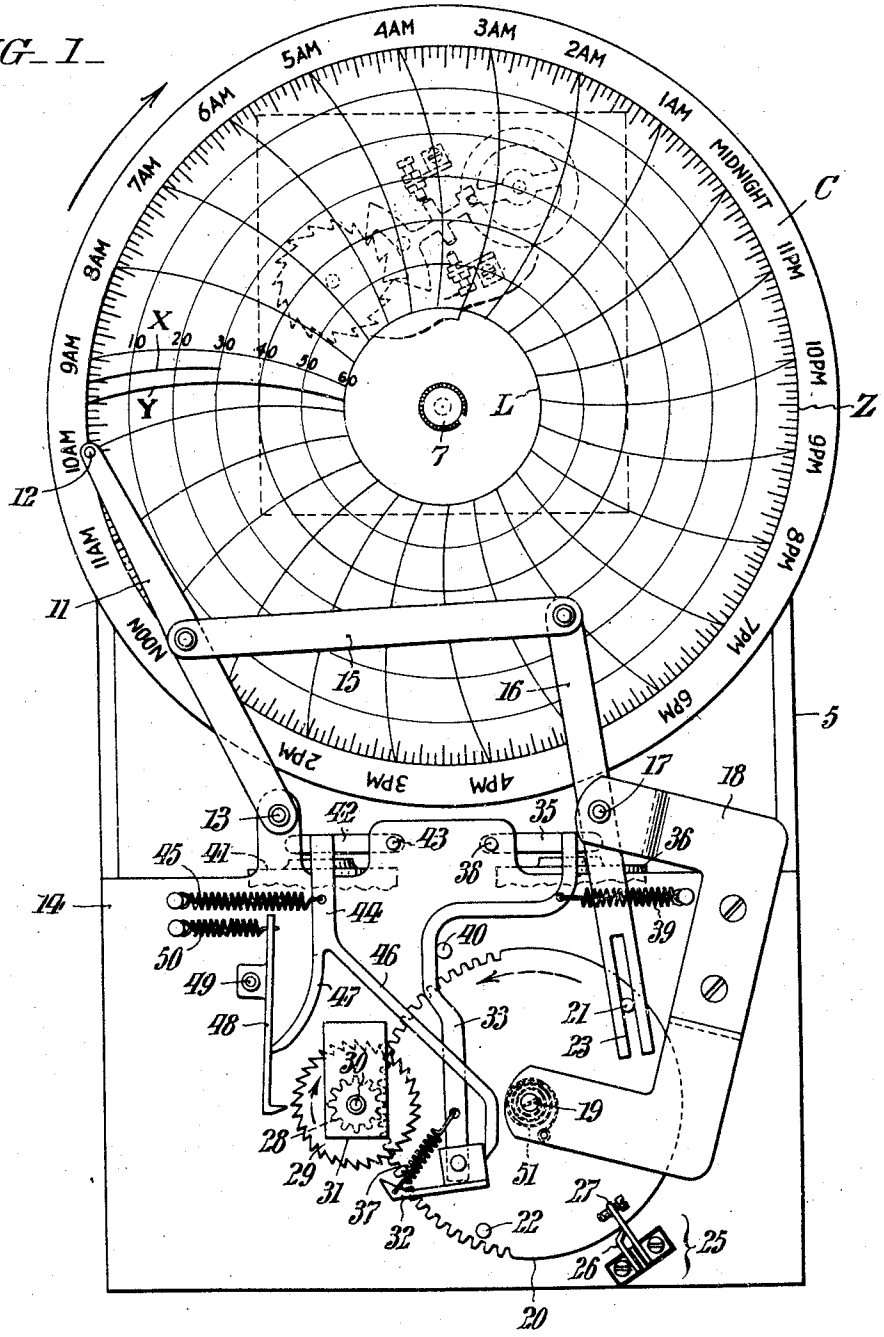
Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 1

FIG. 1.



WITNESSES:
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Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 2

FIG. 2.

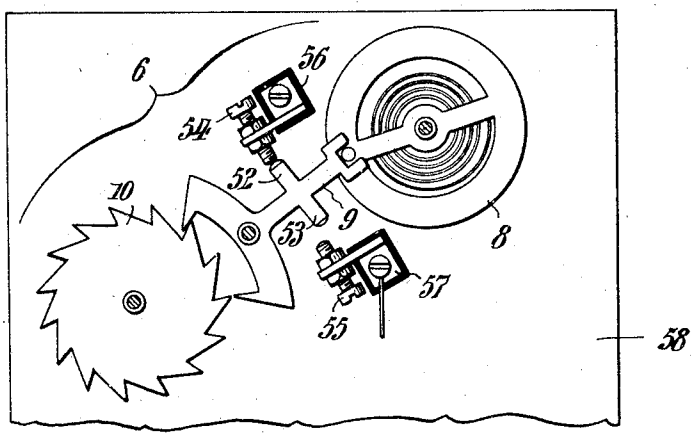
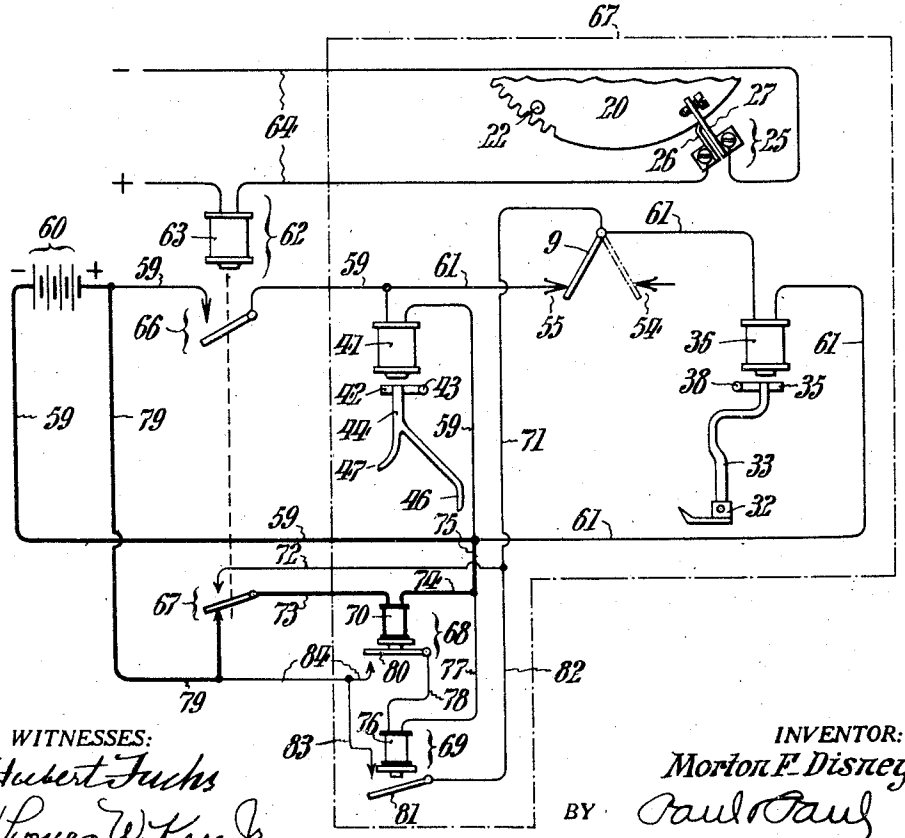


FIG. 3.



WITNESSES:
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Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 3

FIG. 4.

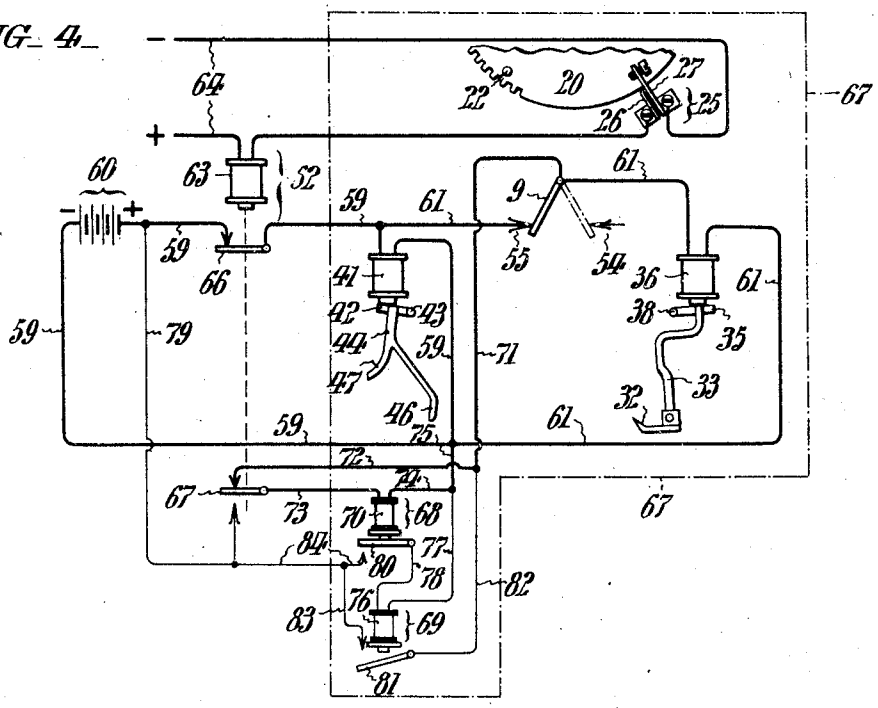
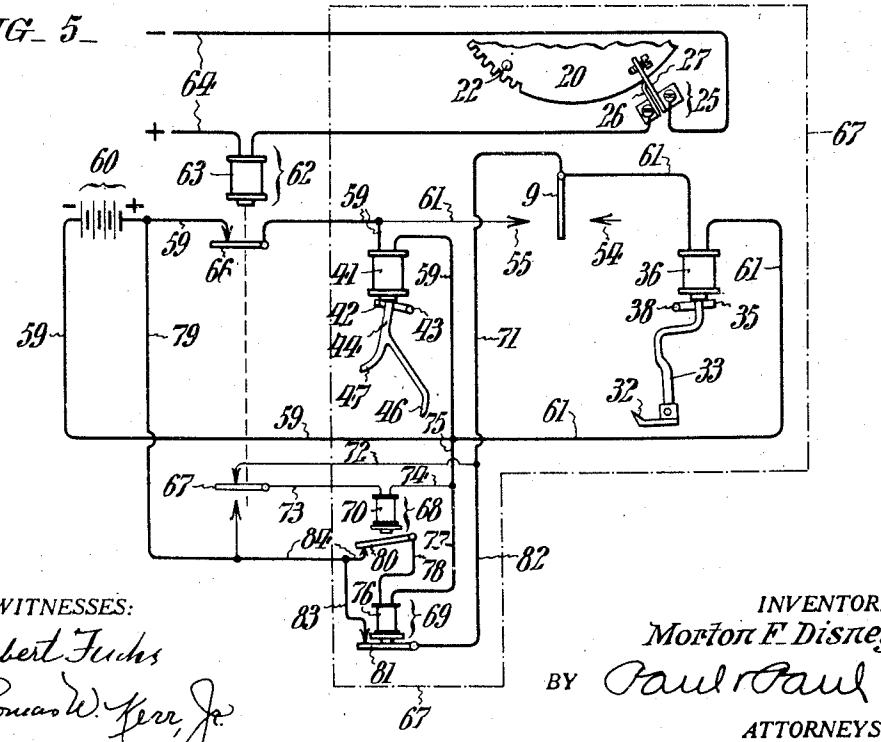


FIG. 5.



WITNESSES:
Hubert Fuchs
Thomas W. Kerr, Jr.

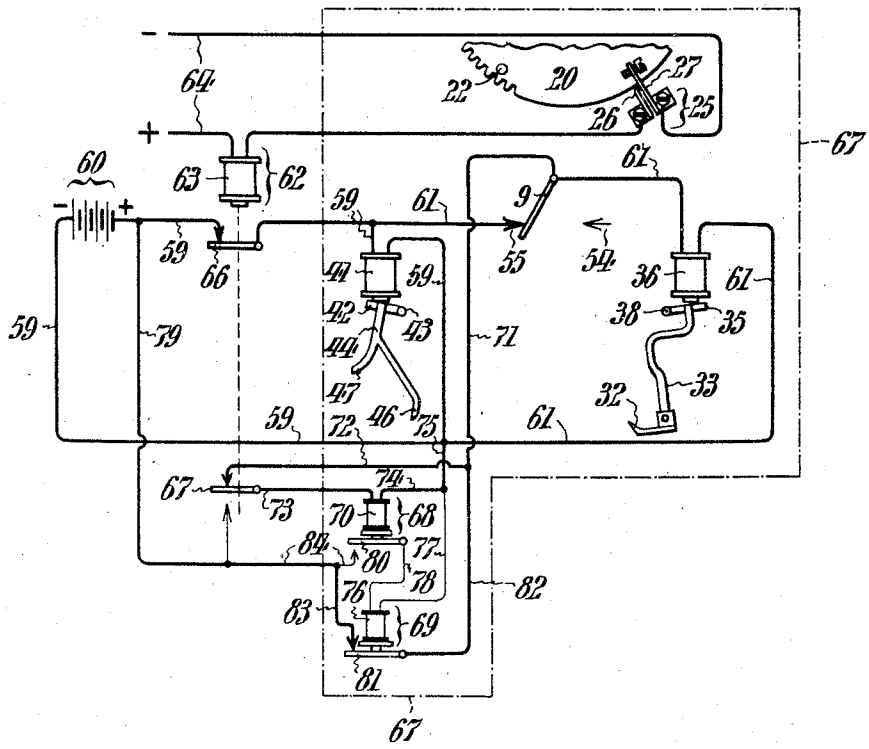
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Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 4

FIG. 6.



WITNESSES:
Hubert Fuchs
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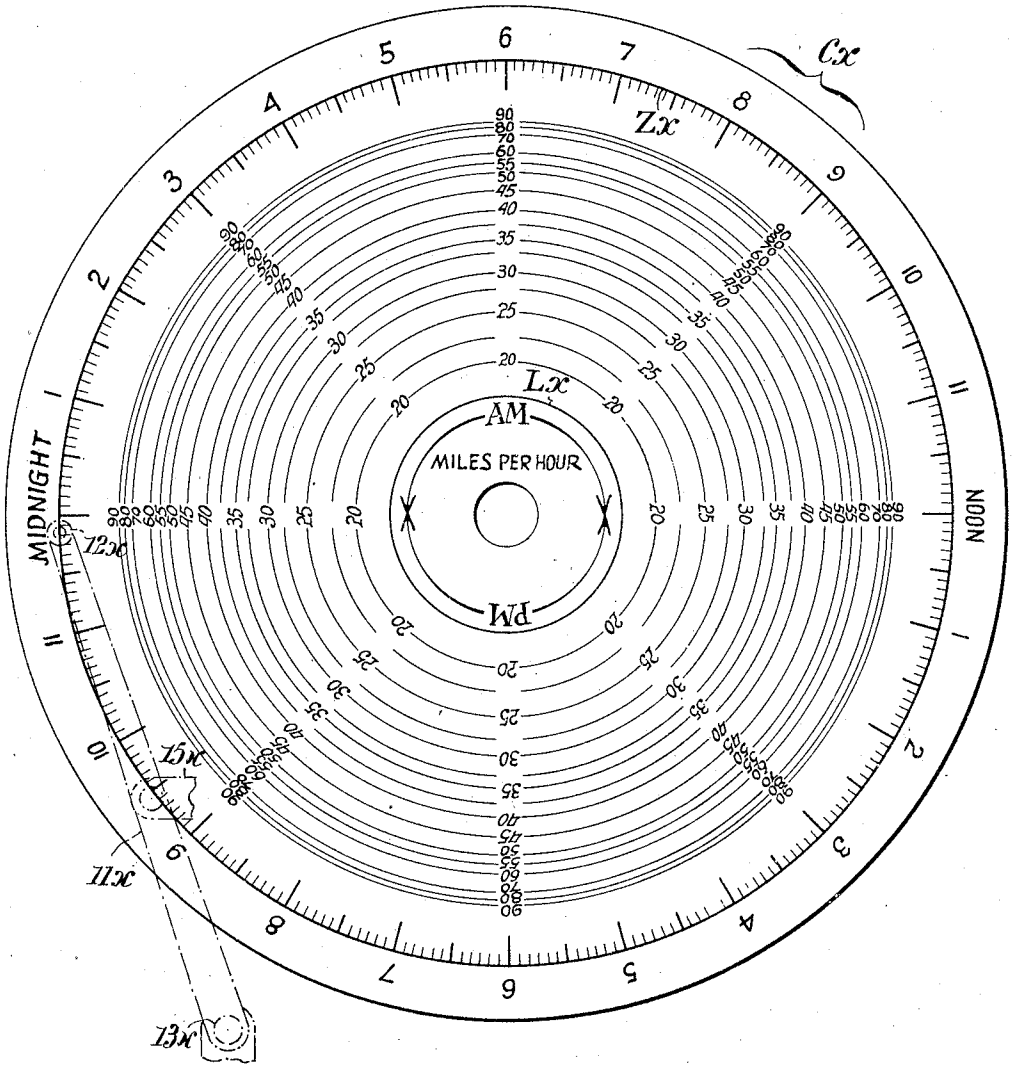
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Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 5

*FIG_7_*



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TIME RECORDING APPARATUS

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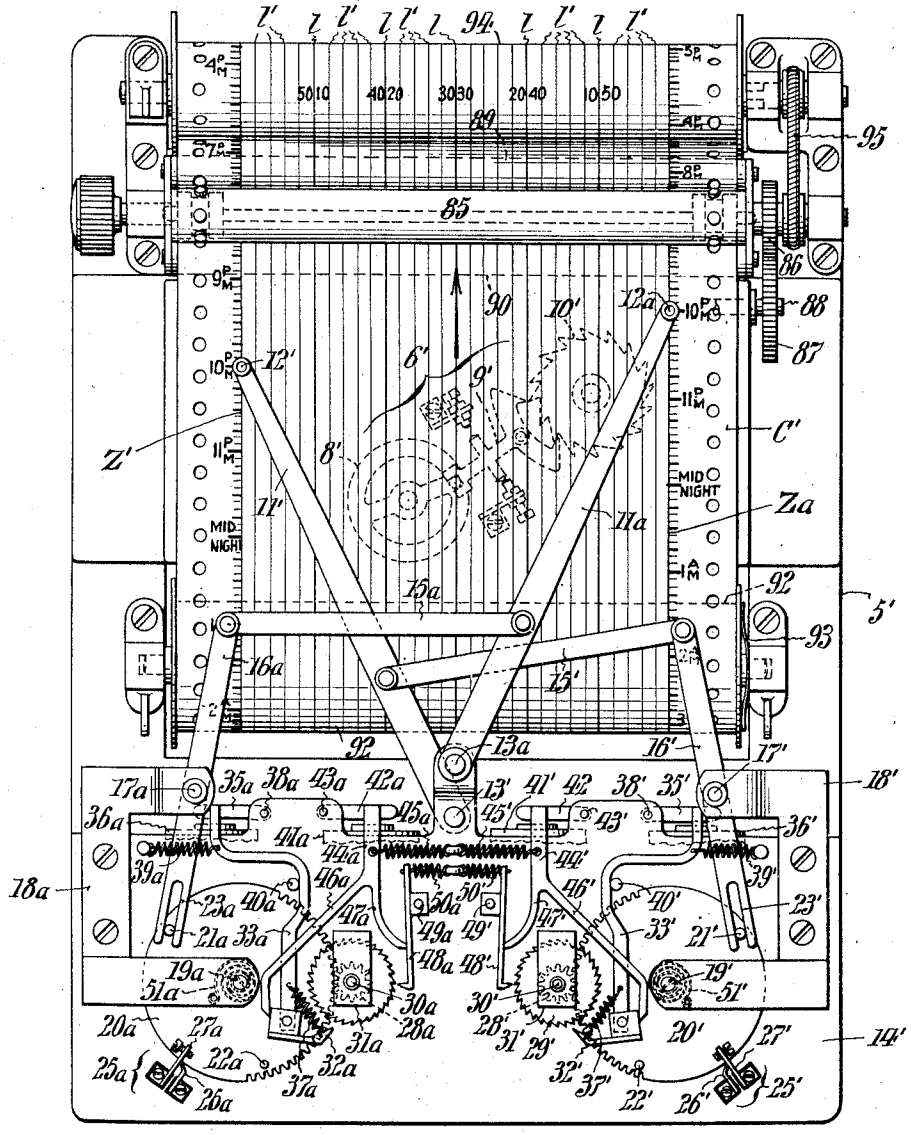


FIG_8_

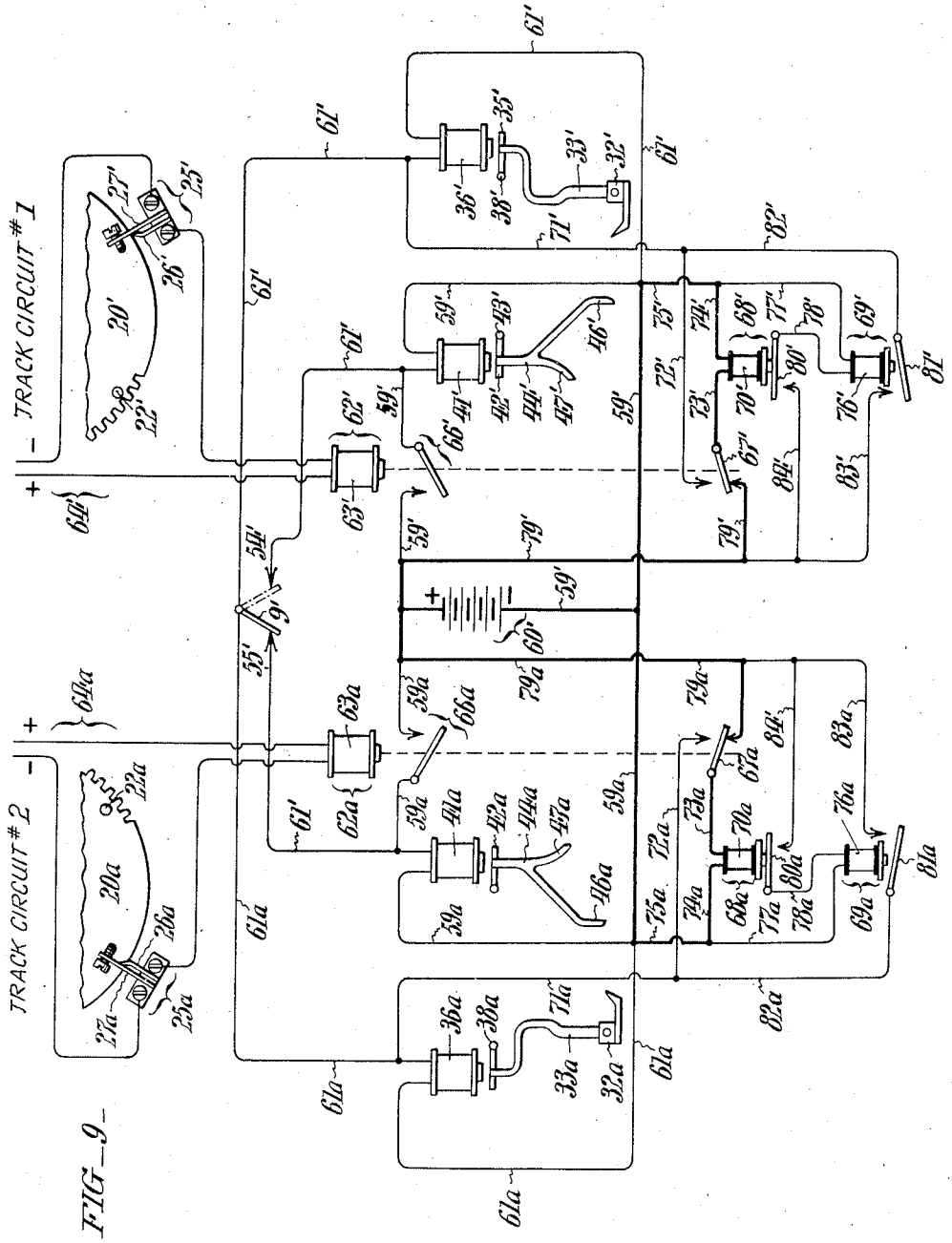
WITNESSES:
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Feb. 26, 1946. M. F. DISNEY 2,395,658

TIME RECORDING APPARATUS

Filed Sept. 10, 1942 7 Sheets-Sheet 7



FIG—9—

WITNESSES:
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Patented Feb. 26, 1946 2,395,658

UNITED STATES PATENT OFFICE

2,395,658

TIME RECORDING APPARATUS

Morton F. Disney, Baltimore, Md.

Application September 10, 1942, Serial No. 457,831

16 Claims. (Cl. 234—27.5)

This invention relates to recording apparatus useful more especially in railroading to automatically record, on suitable graph charts or sheets, information concerning the movements of trains. In order to obtain complete information regarding train movements over prescribed track sections, i. e., between designated points on straight or curved portions of tracks, on bridges, etc., and the speed of the trains or the time it took them to traverse such distances with recording apparatus heretofore available, it has been necessary to make calculations from data recorded on several different graph sheets or charts. The compiling of such information in this way was not only a tedious task and likely to be fraught with error, but time consuming as well.

My invention is directed toward overcoming the drawbacks above referred to. In other words, I aim to enable recording, in one operation, of the exact moment of entrance of a train into the designated track section, the exact moment of its departure from such section, and either the total length of time consumed in the traverse, or its speed of travel, on a single chart from which the desired information can be directly read. This desideratum is realized in practice as hereinafter more fully disclosed, through provision of the recording apparatus of simple construction in which a clock movement is relied upon to continuously advance a graph chart or sheet which is calibrated in one direction to represent a time range of twenty-four hours, or a series of such ranges, and which is calibrated in the other direction to represent either a shorter time range, or a speed range, such time ranges being in synchronism; and in which a stylus is moved from a normal rest or zero position across the chart, said stylus being automatically started in its movement by a single indication when the train enters the prescribed track section and continuing in its travel as long as the signal indication is maintained, and being immediately returned to its original zero position when the signal indication is interrupted at the moment the train leaves said track section.

Another object of my invention is to secure the above advantages in a recording apparatus which will operate from a primary battery or other source of electric power, and which will automatically reset itself after a full stroke of the stylus in the event that a train is delayed or stalled in the section of the track being checked.

In connection with recording apparatus having the above attributes, it is a still further object of my invention to obviate false recording in the event either of failure or mal-functioning of the apparatus during the time that the train is within the block being checked, so that the engineer operating the train cannot be wrongly charged with infractions of operating rules. The latter advantage is attained, as also hereinafter more fully brought out, through provision of supplemental means whereby the stylus is caused to indicate such failure or mal-functioning of the apparatus at the time that the disturbance occurs in a way which will be readily recognized on the chart or sheet.

Another object of my invention is to make possible the concurrent recording, on a single sheet or chart, of the movements of trains running on different tracks.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein Fig. 1 shows the front elevation of a recording apparatus conveniently embodying my invention in one form, with the front cover of its casing removed to expose important parts which would otherwise be concealed.

Fig. 2 is a fragmentary detail view showing the clock mechanism which forms a part of the apparatus.

Fig. 3 is a wiring diagram of the apparatus with its component parts shown in their normal relationship.

Fig. 4 is a diagram like Fig. 3, showing the initiation of a recording phase of the apparatus.

Fig. 5 is a view in turn like Fig. 3 showing the relationship of the parts of the apparatus in the event of failure or derangement.

Fig. 6 shows the conditions immediately upon correction of the failure.

Fig. 7 shows an alternative form of my invention.

Fig. 8 is like Fig. 1, showing a modified embodiment which is capable of concurrently recording on a single chart the movements of trains running on different tracks; and

Fig. 9 is a wiring diagram of the modified embodiment shown in Fig. 8.

With more detailed reference first more particularly to Fig. 1 of these illustrations, the numeral 5 designates a plate which constitutes the back wall of a casing or housing whereof the front or cover portion has been removed to expose the parts at the interior of the recorder. Secured to the upper part of the plate 5 is a clock movement 6 having a stud shaft 7 for the mounting of circular recording charts of paper or the

like such as the one shown at C in Fig. 1. In the present instance the stud shaft 7 revolves but once in twenty-four hours, and accordingly, the chart C is sub-divided by curved radial lines into as many main sectors which are consecutively numbered to represent the hours of the day and night, each such sector being in turn sub-divided by five minute graduations at the outer or zero circle Z of the chart. Between its outer or zero circle Z and its inner or limit circle L, the chart is radially calibrated by intermediate concentric circles to represent in this instance a total range of one minute with ten second sub-divisions. The clock movement 8 may be of any approved construction, having a balance wheel 8, a pallet lever 9, and an escapement wheel 10 which cooperates with said pallet lever in a well known manner.

Arranged to move across the face of the recording chart C in the interval between the outermost and innermost circles in accordance with my invention, is an arm 11, which, at its free end, carries a marking stylus or pen 12 in contact with said chart, the swing of said arm being such as to carry the stylus radially from a normal position of rest at the outer or zero circle Z toward the inner or limit circle L and back again under conditions and in a manner presently explained. As shown, the stylus arm 11 is fulcrumed at 13 on a supplemental bearing plate 14 suitably secured to and spaced from the wall plate 5. By means of a link 15, the stylus arm 11 is coupled with the upper extremity of a lever 16 which is medially pivoted at 17 to one leg of a U-shaped bearing bracket 18 on the bearing plate 14. Journaled in the other leg of the bearing bracket 18 is the arbor 19 of a segmental spur gear wheel 20, which, at substantially diametrically opposite points, has stud projections 21 and 22 adjacent its periphery, the projection 21 being engaged with a longitudinal slot 23 in the lower extremity of the lever 16. The other stud 22 on the wheel 20 serves under certain conditions, also later explained, to open a switch 25 which includes a fixed contact 26 and a spring contact 27 both of which are suitably insulated from the plate 14 as conventionally shown. The gear wheel 20 meshes with a driving pinion 28 fastened together with a ratchet wheel 29, on another arbor 30 whereof one end is journaled in the supplemental plate 14 and the other end in an overreaching bearing bracket 31. The ratchet wheel 29 is arranged to be picked a tooth at a time by a pawl 32 which is pivotally connected to the lower end of an angular arm 33 pendent from the armature 35 of an electro-magnet 36, and which is subject to a spring 37, said armature being fulcrumed at 38 on the plate 14. The arm 33 is pulled by a spring 39 against a stop 40 and so normally held, with the armature 35 lifted from the magnet 36 and the pawl 32 retracted from the ratchet wheel 29 as shown. The magnet 36 is secured to the back of the supplemental plate 14 together with another electro-magnet 41 whereof the armature 42 is fulcrumed at 43 on said plate. Pendent from the armature 42 is an arm 44 which is normally maintained in the illustrated position by a spring 45 with said armature lifted from the magnet 41. The arm 44 has diverging branch extremities 46 and 47 whereof the first reaches over and behind the arm 33 to engage the pawl 32 and to normally hold it withdrawn from the ratchet wheel in the position shown against the pull of the spring 37. The other extremity 47 of the arm 44 engages a detent 48 pivoted at 49 on the supplemental plate 14 to hold it normally retracted from the ratchet wheel 29 against the pull of a spring 50. The volute spring indicated at 51 tends to rotate the gear wheel 20 clockwise. As shown in dotted lines in Fig. 1 and in full lines in Fig. 2, the pallet lever 9 of the clock mechanism 6 is provided with lateral projections 52, 53 which are adapted to alternately engage swing-limiting stops in the form of screws 54, 55 adjustably fixed supporting lugs 56 and 57 on the frame plate 58 of said mechanism, said lugs being suitably insulated from said plate so that either may be used as an electric contact in a manner which will presently be made apparent.

In the wiring diagram of Fig. 3, the above described parts of the apparatus are identified by the same reference numerals, and illustrated in the positions which they normally occupy when the track section which is to be checked is clear. As shown, the coil of magnet 41 is interposed in a primary circuit of which the component conductors are designated 59, with the battery 60; while the magnet 36 is connected in a parallel secondary circuit comprising conductors 61, in which the magnet 41 is in series with the pallet lever 9 and the stop contact 55 of the clock mechanism. A relay 62, whereof the magnet 63 is interposed in an auxiliary circuit 64 corresponding to a definite railway track section or block, operates a switch 66 in the primary circuit 59 of the recorder, said auxiliary circuit also containing the switch 25 which is normally closed.

In order to preclude false recording on the chart C by the stylus 12 in the event that the pallet lever 9 should fail to close against contact 55, as by intervention of dirt or through some other cause, and thus fail to register one or more pulses, I have added another switch 67 to relay 62, and provided two time relays 68 and 69 respectively with delay periods of one half second and one minute. The magnet coil 70 of relay 68 is connected in a branch circuit constituted in part by conductors 71, 72, 73, 74, 75 in which the normally open switch 67 of relay 62 is included. The magnet coil 76 of relay 69 is interposed in another branch circuit comprising conductors 77, 78, 79 and containing the normally open switch 80 of relay 68; while the switch 81 of relay 69 is connected in another branch circuit which includes conductors 82, 83, 84, and a portion of conductor 79. The parts bounded by the dotted rectangle 67 in Fig. 3 may all be enclosed within the casing of the recorder.

The operation of the recorder is as follows: As conventionally indicated by the heavy lines in Fig. 3, the circuit defined by the conductors 59, 75, 74, 73 and 79 is normally "live" and supplied with current from the battery 60, with the result that the switch 67 of relay 62 is held open, and the coil 70 of relay 68 energized to keep the switch 80 raised, the system being otherwise "dead" throughout. As a train enters the track section or block corresponding to the auxiliary circuit 64, the relay 62 will be actuated to simultaneously close the switches 66 and 67; the switch 80 being kept raised at this time due to the delay characteristic of relay 68, all as shown in Fig. 4. Under these conditions, current will flow from the battery 60 as conventionally indicated by the heavy lines in Fig. 4 to energize the magnet 41, with attendant attraction of the armature 42 of the latter, and movement of the attached arm 44 to release pawl 32 and the detent 48 to engage the ratchet wheel 29 as in Fig. 1. Thereupon, each time that the pallet lever 9 of the

clock mechanism 6 engages the stop contact 55, current will flow from the battery 60 to the magnet 36 with consequent attraction of the armature 35 of the latter magnet and actuation of the pawl arm 33 to pick the ratchet 29 by the distance of one tooth, while the detent 48 acts to hold said ratchet in its newly shifted position. The intermittent shifts thus imparted to the ratchet 29 are communicated by the pinion 28 to the gear wheel 20, with the result that the latter is rotated counter-clockwise, causing, through the pin 21, the lever 16, the link 15 and the arm 11, stepwise movements of the stylus 12 inwardly of the chart C from the zero circle Z. These intermittent movements of the stylus 12 will of course correspond to half-second intervals by reason of the fact that the operation is controlled by the pallet lever 9 of the clock mechanism 6, the ratio of the gear 20 and pinion 28 being such as to move the stylus each time through 1/20 of the distance by which the concentric circles on the chart are spaced. The described action will continue as long as the train remains in the track section or block and, as a consequence, a graph such as indicated at X in Fig. 1 is traced on the chart, which graph, by intersection with the lines and circles on said chart, will record the exact moment of entry of the train into the block, the exact moment of its departure from the block, as well as the time consumed in traversing said block. Fig. 1 shows that the chart was applied to its support at 8:00 A. M., and that at 9:15 A. M. a train entered the block and traversed it in thirty seconds as indicated by the graph X, the stylus 12 by virtue of being instantaneously returned under spring pressure to the zero circle leaving no mark in its reverse movement. During the action just described, the spring 51 is wound up and energy stored therein by the counter-clockwise rotation of the gear wheel 20. Upon opening of the auxiliary circuit 64 as the train leaves the block, the magnet 63 of the relay 62 will be de-energized to open the switch 66 in the primary circuit 59 of the recorder. Current flow to the magnet 41 will thereby be interrupted and the arm 44 moved back to its normal position by the spring 45 to withdraw the pawl 32 and the detent 48 from the ratchet wheel 29, whereupon the spring 51 will immediately re-act to reversely rotate the gear wheel 20 and instantaneously restore the apparatus to its normal or starting condition with the stylus 12 positioned on the outer or zero circle Z of the chart C in readiness for the repetition of the above cycle when another train enters the track section or block.

In the event that the train is detained or stalled in the track section or block, the recording action will continue until the stylus 12 has moved the full distance across the chart, when the pin 22 on the gear wheel will encounter the spring contact 27 of the switch 25 to open the latter and thereby interrupt current flow in the auxiliary circuit 64 in a manner readily understandable from Fig. 3. An occurrence such as just described is indicated by the graph Y in Fig. 1 which shows that another train entered the block at 9:30 A. M. and remained in said block for at least one minute.

If for any reason the pallet lever 9 of the clock mechanism fails to contact with the stop 55 as conventionally shown in Fig. 5, current flow from the battery will be as indicated by the heavy lines after the lapse of a half second for which the relay 68 is set to release the switch 80. By following the heavy lines of the current flow, it will be seen that the magnet 76 of the relay 69 is energized to hold the switch 81 closed, and that the magnets 36 and 41 are also energized with their armatures 35 and 42 attracted and fixed with the ratchet wheel 29 advanced by the distance of one tooth. As a consequence, the stylus 12 will also remain fixed in position and, as the chart C continues to revolve, an arc concentric with the chart center will be inscribed to indicate false registering by the apparatus, whereby the engineer operating the train of which the movements are being recorded will be absolved of what might otherwise be construed infractions of speed regulations or other traffic rule violations. The last described condition of the apparatus will obviously obtain so long as the pallet 9 fails to make metallic engagement with the stop contact 55. Re-establishment of such engagement will not however result in the immediate restoration of the apparatus to the operating condition of Fig. 4, since as shown in Fig. 6, the relay 69, due to its delay characteristic, will hold the switch 81 closed for one minute notwithstanding opening of the switch 80 by the relay 68 whereof the coil 70 is now energized as a consequence of re-engagement of the pallet 9 with contact 55 as shown in Fig. 6. Thus even a single failure in the functioning of the pallet 9 will be indicated by a concentric mark on the chart of a length corresponding to a time interval of at least one minute.

In Fig. 7, the chart Cx has a zero circle Zx adjacent its outer edge and a limit circle Lx at the center, said zero circle being marked off like the chart C of Fig. 1, into twenty-four main subdivisions to correspond with the twenty-four hours of a day. The annular space between the zero and limit circles Zx and Lx is not, however, divided for time as before, but for speed up to ninety miles per hour, by circles, certain of which are numbered for five mile intervals. In Fig. 7, the stylus 12x is carried at the end of an arm 11x which may be an extension of the arm 16 of the instrument shown in Fig. 1, so that said stylus is moved rightward in Fig. 7 from the zero circle Zx toward the limit circle Lx during the recording. With this arrangement, a direct reading in miles per hour is obtained, without necessitating mathematical computation.

In the alternative embodiment of my invention, illustrated in Fig. 8, there is a strip chart C' which is advanced by a feed roll 85 having stud projections adjacent its opposite ends to engage perforations adjacent the edges of said chart. As shown, said feed roll is driven, through intermeshing gears 86 and 87, from a shaft 88 suitably incorporated in the clock mechanism. Associated with the roll 85 are idler rolls 89 and 90 which assist in the feeding in a manner readily understood by those conversant with this art. The sheet C' is drawn from a supply roll 92 which is subject to the influence of a brake spring 93, and wound upon a take-up roll 94 which is driven by a slip belt 95 from the shaft of the feed roll 85. As further shown, the sheet C' is sub-divided transversely between zero lines Z' and Za adjacent its edges by heavy lines 1, with the intervening spaces corresponding to ten second intervals, and said additional lines 1 sequentially numbered with respect to said zero lines. Each of the intervening spaces is in turn sub-divided by lighter lines 1' into intervals representing two second periods; while the zero lines adjacent each side of the chart are sub-divided into twenty-four hours of the day by heavy grad-

uations, the lighter graduations intermediate the heavy ones indicating suitable fractions of an hour. The stylus shown at 12' and corresponding to the stylus 12 of the first described embodiment is carried by an arm 11' pivoted at 13' and operated through a link 15' and lever 16' pivoted at 17' by a pin 21' on a wheel 20'. The other parts to the right of the vertical center line in Fig. 8, as well as the parts of the wiring diagram to the right of the vertical center of Fig. 9, are identical with those shown in Figs. 1 and 3, and, in order to preclude the necessity for repetitive description, are identified by the same reference numerals, with the addition of a prime in each instance for convenience of distinction. The arrangement thus far described in Figs. 8 and 9 is adapted to record the movements of trains in a track block of which the auxiliary or track circuit is indicated as "Track circuit #1" in the last mentioned illustration. Thus, incident to travel of a train on such circuit, the stylus 12' will record its movements by swinging inward from the left-hand zero line Z' in Fig. 8 toward the right-hand zero line Z*a* and back again, in exactly the same manner as described in connection with Fig. 1. The second stylus 12*a* in Fig. 8 is carried by an arm 11*a* which is pivoted at 13*a* somewhat above the pivot 13' for the arm 11', and elevated somewhat above the latter. The arm 11*a* is thus capable of clearing the arm 11' in case they are concurrently swung the full distance toward each other to the limit line Z'. The swing of arm 11*a* is of course from right to left and confined to the distance between two zero lines Z*a* and Z'. The mechanism for actuating the second stylus arm 11*a* is in turn identical with that for the stylus arm 11' except for being reversely disposed and located to the opposite side of the vertical center of Fig. 8. This is also true of the arrangement of the parts of the diagram in Fig. 9, with said parts numbered as before but with addition in each instance of the exponent *a*. The added mechanism serves as a means for recording the movements of trains moving on another track of which the track circuit is designated as "Track circuit #2" in Fig. 9. Although dependent upon the action of the pallet 9' of a single clock movement and powered by a single battery 60', the two electric systems incorporated in the embodiment of Fig. 8, are capable of functioning either simultaneously or independently as is believed to be evident from Fig. 9 without the need of further description.

Having thus described my invention, I claim:

1. In a recorder of the character described having a clock movement, mechanism comprising a chart-support continuously driven by the clock movement, and marking means; normally quiescent mechanism responsive to signal impulses and operable by the clock movement for shifting the marking means over the chart on the support from a normal or zero position thereon including a racking element and interposed connections, a normally retracted pawl adapted to pick the racking element and a normally retracted detent adapted to cooperate with said element in holding the marking means in shifted positions, means automatically operative upon inception of signal impulses to effect release of the pawl and the detent for the initiation of a recording cycle, and means automatically operative upon cessation of the signal impulses to withdraw the pawl and detent from the racking element thereby to allow return of the marking means to normal or zero position.

2. The invention according to claim 1, further including means automatically operative upon completion of a full stroke by the marking means likewise to return it to starting position.

3. In a recorder of the character described having a clock movement, mechanism including a chart supporting means continuously driven by the clock movement, the chart being graduated in the direction of its movement to represent a definite range of values, and graduated at right angles to its movement to represent a different range of values, and at least one stylus; mechanism responsive to signal impulses for shifting the stylus crosswise of the chart in respect to a normal rest or zero position thereon including a gear wheel, a pivoted stylus actuating arm connected to the gear wheel, a pinion meshing with the gear wheel, a ratchet secured in co-axial relation to the pinion, a pivoted arm carrying a pawl for picking the ratchet, means controlled from the clock movement for intermittently oscillating the arm to cause picking of the ratchet by the pawl, yielding means for resisting such rotation of the ratchet and the wheel, a detent for holding the ratchet in successive shifted positions, and means automatically operative upon cessation of the signal impulses to withdraw the detent and the pawl from the ratchet so that the latter and the wheel are reversely rotated by the yielding means and the stylus thereby restored to its normal zero of rest position on the chart.

4. The invention according to claim 3, further including means operated by the gear wheel upon completion of a full stroke by the stylus to effect withdrawal of the pawl and the detent for return of said stylus to starting position.

5. In a recorder of the character described, a clock movement, means adapted to support a chart continuously advanced by the clock movement, and means for marking the chart on the support; normally quiescent control mechanism including an intermittently actuated racking element and intermediate connections for progressively shifting the marking means over the chart from a starting position, a normally retracted pawl adapted to pick the ratchet element and a normally retracted detent adapted to cooperate with the racking element in holding the marking means in shifted positions; a magnet operative upon energization of a normally open circuit to release the pawl and the detent for the initiation of a recording cycle; and a second magnet for actuating the aforesaid shifting means interposed in a secondary circuit with a make-and-break switch operable by the clock movement.

6. The invention according to claim 5, further comprising means automatically operated upon cessation of the signal impulses to withdraw the pawl and detent from the racking element and thereby allow return of the marking means to starting position.

7. In a recorder of the character described, mechanism including means for supporting and continuously moving a graduated chart; at least one marking stylus; means for producing recurrent signal impulses during a recording period or cycle of the recorder; means responsive to the signal impulses for progressively shifting the stylus across the chart and for holding the stylus against movement during the intervals between impulses; and means operative, in the event that the impulse-producing means should for any reason become temporarily deranged during a recording

period or cycle, to hold the stylus against shifting for an interval somewhat longer than usual at the first impulse following the restoration of said impulse producing means, for the purpose of indicating such failure upon the chart.

8. In a time recorder having a clock movement, a chart support constantly driven by the clock movement, and at least one marking stylus; normally quiescent mechanism controlled from the clock movement, incident to successive recording of different time periods, for moving the stylus over the chart from a normal rest or zero position thereon, said mechanism including a carrier for the stylus, an actuating wheel to which the stylus carrier is connected, racking means for intermittently rotating the wheel, yielding means for resisting such rotation, and check means for holding the wheel in successive shifted positions, and means automatically operative upon expiration of each time period being recorded to withdraw the check means so that said wheel is reversely rotated by said yielding means and the stylus thereby instantaneously restored to its normal rest or zero position on the chart.

9. In a time recorder having a clock movement, a chart support constantly driven by the clock movement, and at least one marking stylus; normally quiescent mechanism controlled from the clock movement, incident to successive recording of different time periods, for moving the stylus over the chart from a normal rest or zero position thereon, said mechanism including a carrier for the stylus, an actuating wheel to which the carrier is connected, means for rotating the wheel stepwise, an electro-magnet connected in circuit with a make-and-break switch means operated from the clock movement to effect intermittent actuation of the wheel rotating means, yielding means for resisting rotation of the wheel, means for holding the wheel in successive shifted positions, and an electro-magnet in another circuit with a switch which is opened at the expiration of the time period to effect withdrawal of the holding means from the wheel so that the latter is reversely rotated by said yielding means and the stylus thereby instantaneously restored to its normal rest or zero position on the chart.

10. The invention according to claim 9, in which the switch means in the circuit of the first mentioned magnet is actuated under the governance of a half-second beat element of the clock movement.

11. In a recorder of the character described, a clock movement, means adapted to support a chart continually advanced by the clock movement, and at least one stylus for marking the chart; normally quiescent control mechanism including means capable of progressively shifting the stylus over the chart, normally retracted check means capable of holding the stylus in successive shifted positions; an actuating magnet for the check means operative upon energization of a normally-open electric circuit to initiate a recording cycle, and a second magnet for actuating the stylus shifting means interposed in a secondary circuit with a make-and-break switch operable by the clock movement.

12. In a recorder of the character described, a clock movement, means adapted to support a chart continually advanced by the clock movement, and at least one stylus for marking the chart; normally quiescent control mechanism including means capable of progressively shifting the stylus over the chart, normally retracted check means for holding the stylus in successive shifted positions, an actuating magnet for the check means energized upon closing of a normally open electric circuit to initiate a recording cycle, a second magnet for actuating the stylus shifting means interposed in a secondary circuit with a make-and-break switch operable by the clock movement, a relay having a delay period corresponding to the time period of the make-and-break switch and energized each time said switch is closed during the recording cycle, a second relay having a delay period longer than that of the first relay connected in a branch circuit which is closed upon deenergization of the first relay in the event of failure of the make-and-break switch, and another branch circuit closed upon energization of said second relay to temporarily maintain current flow through the actuating magnet for the check actuating means thereby to afford said switch an opportunity to recover with attendant dwell of the stylus to indicate the failure on the chart.

13. In a time recorder having a clock movement, a chart support constantly driven by the clock movement, and a marking means, normally quiescent mechanism including racking means controlled from the clock movement incident to successive recording of different time periods on a chart on said support, for progressively moving the marking means crosswise of the chart in one direction from a normal rest or zero position thereon; means for resisting such movement of the marking means; check means associated with the racking means for holding the marking means in successive shifted positions; and means automatically operative at the termination of each time period to withdraw the check means and thereby permit instantaneous restoration of the marking means to starting position on the chart by said yielding means.

14. In a time recorder having a clock movement, a chart support constantly driven by the clock movement, and marking means; normally quiescent mechanism including racking means controlled from the clock movement incident to successive recording of different time periods on the chart on said support, for moving the marking means crosswise of the chart in one direction from a normal rest or zero position thereon, yielding means for resisting such movement of the recording means, check means associated with the racking means for holding the marking means in successive shifted positions, an electro-magnet for actuating the racking means, a switch in circuit with the electro-magnet, said switch being normally open but closed upon initiation of a recording cycle, a make-and-break switch operated by the clock movement to periodically open and close the circuit, means actuated by the magnet for intermittently shifting the marking means as aforesaid, and means for withdrawing the check means at the termination of each time period to permit instantaneous restoration of the marking means to starting position on the chart by said yielding means.

15. In a recorder of the character described, having means for supporting a chart, and plural marking styli adapted to be independently moved crosswise of the chart on the support from different normal zero or rest positions; a single clock movement for continually advancing the chart, means for producing different recurrent signal impulses during different recording periods or cycles of the recorder, and separate means responsive to such different signal impulses and controlled from the single clock movement for in-

dividually moving the responsive styli crosswise of the chart as aforesaid.

16. In a recorder of the character described, means for supporting a chart, and plural marking styli adapted to be individually moved from normal zero or rest position crosswise of the chart on the supporting means; a single clock movement for continuously advancing the chart, normally quiescent mechanism including separate means for progressively shifting the individual marking styli as aforesaid, separate normally-retracted check means for holding the styli in successive shifted positions, actuating electro-magnets for the respective check means operative upon energization of different normally open circuits to initiate different recording cycles, and other electro-magnets for actuating the separate styli shifting means interposed in secondary circuits with a single make-and-break switch operable by the clock movement.

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