Jan. 23, 1951 A. A. JOHNSON 2,539,138

CYCLOMETER CLOCK ALARM

Filed April 19, 1947 2 Sheets-Sheet 1

Fig. 1

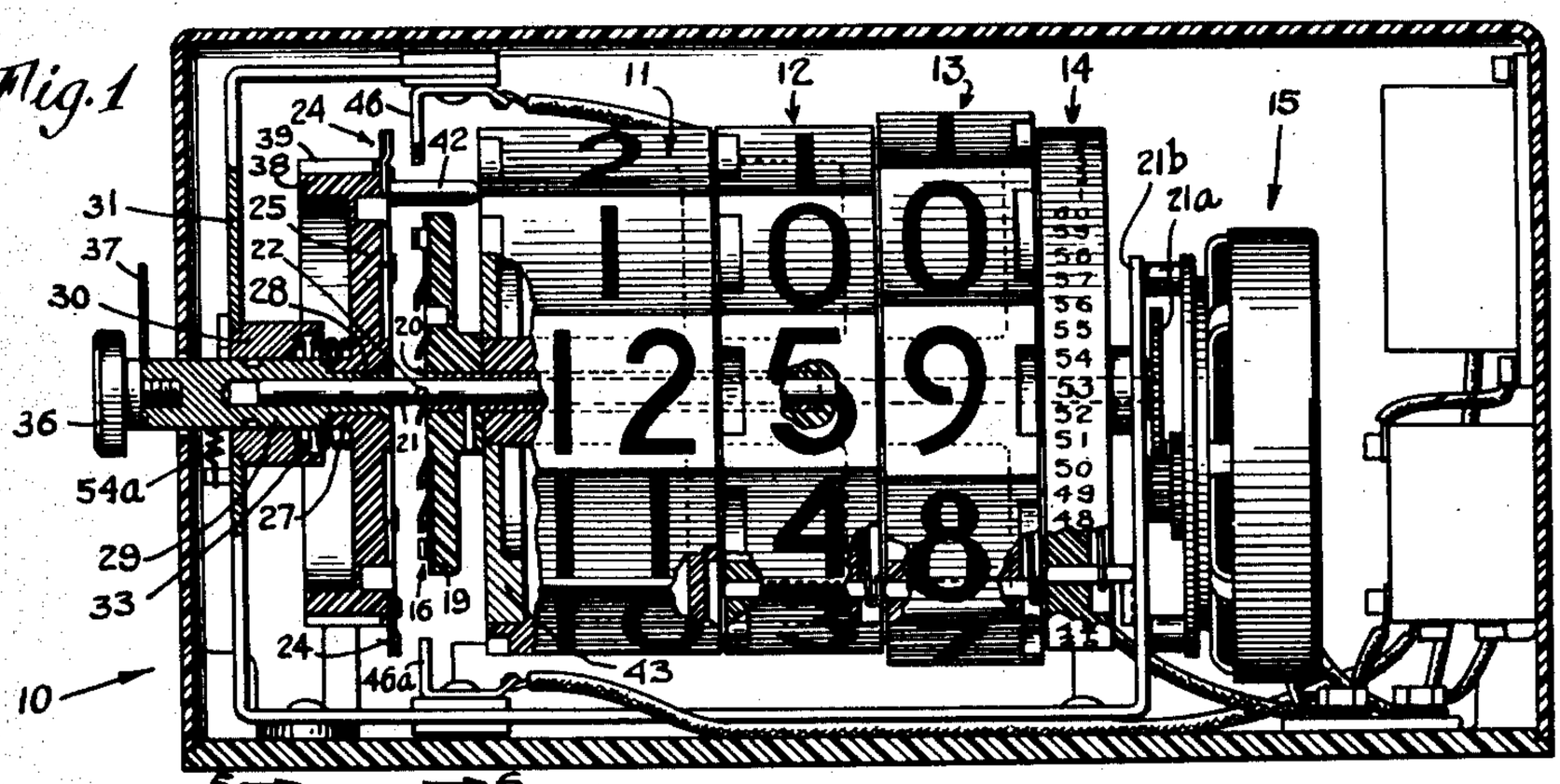


Fig. 2

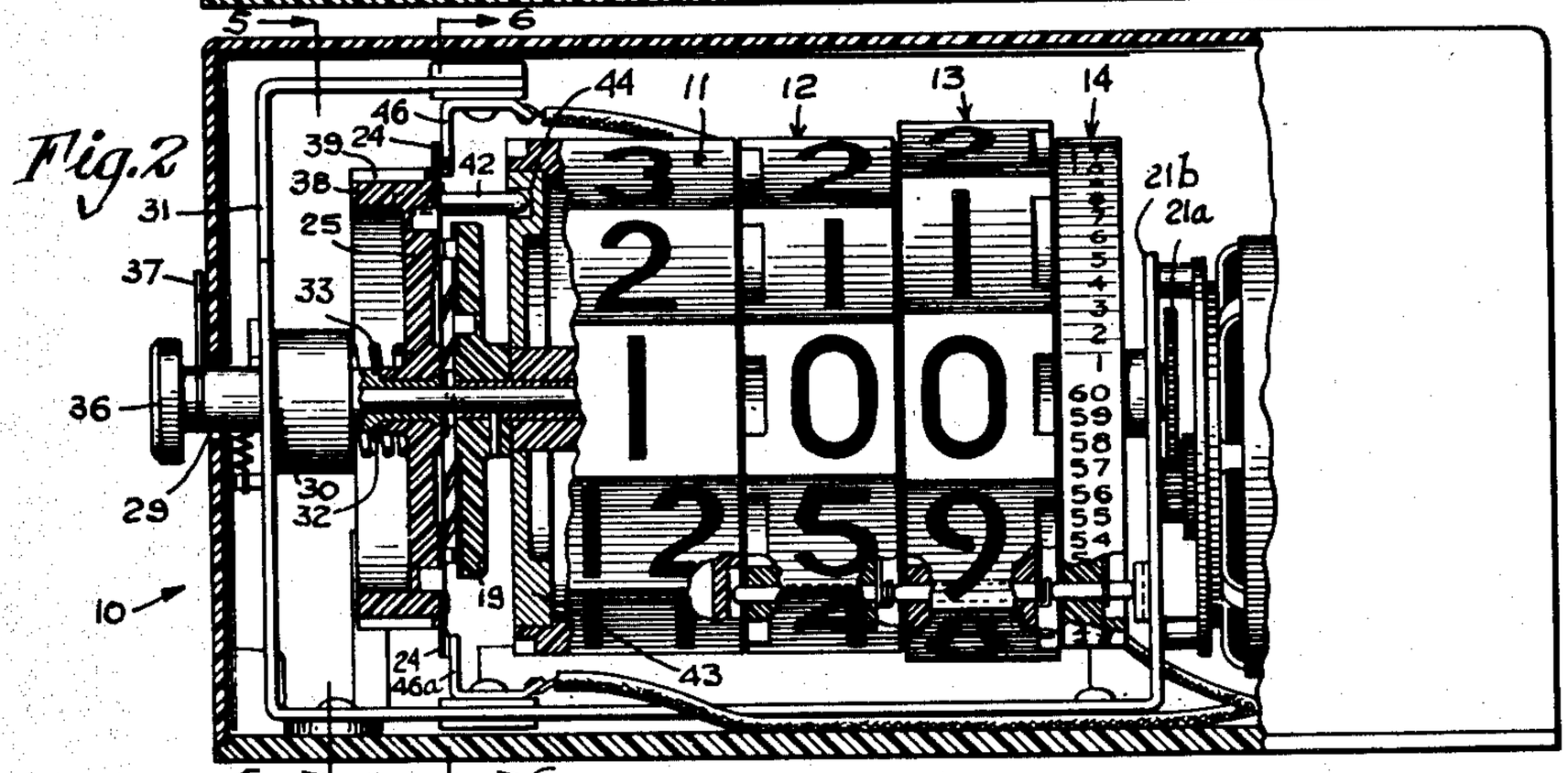
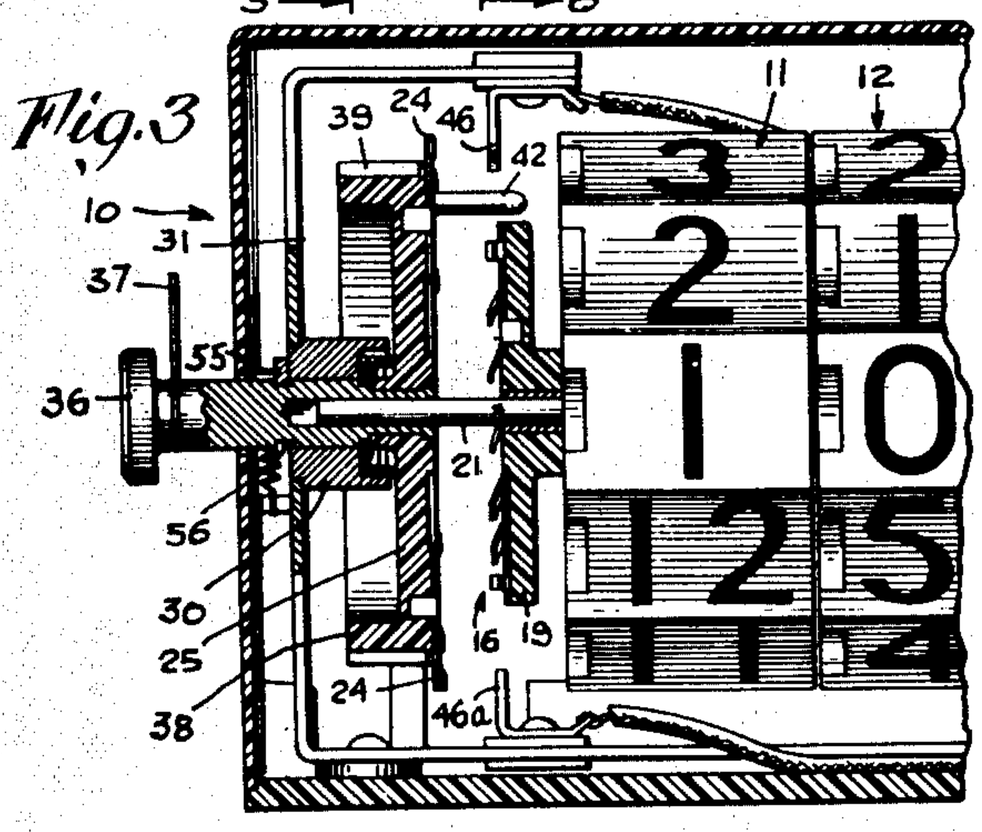


Fig. 3



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Filed April 19, 1947 2 Sheets-Sheet 2

Fig. 5

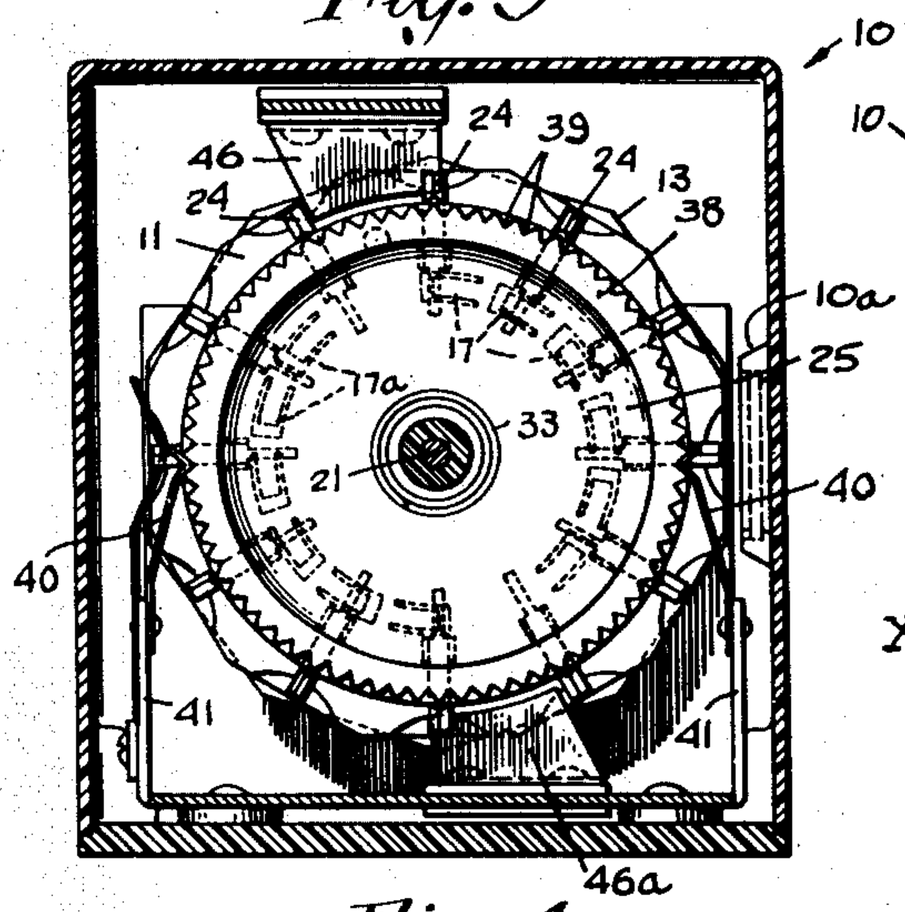


Fig. 6

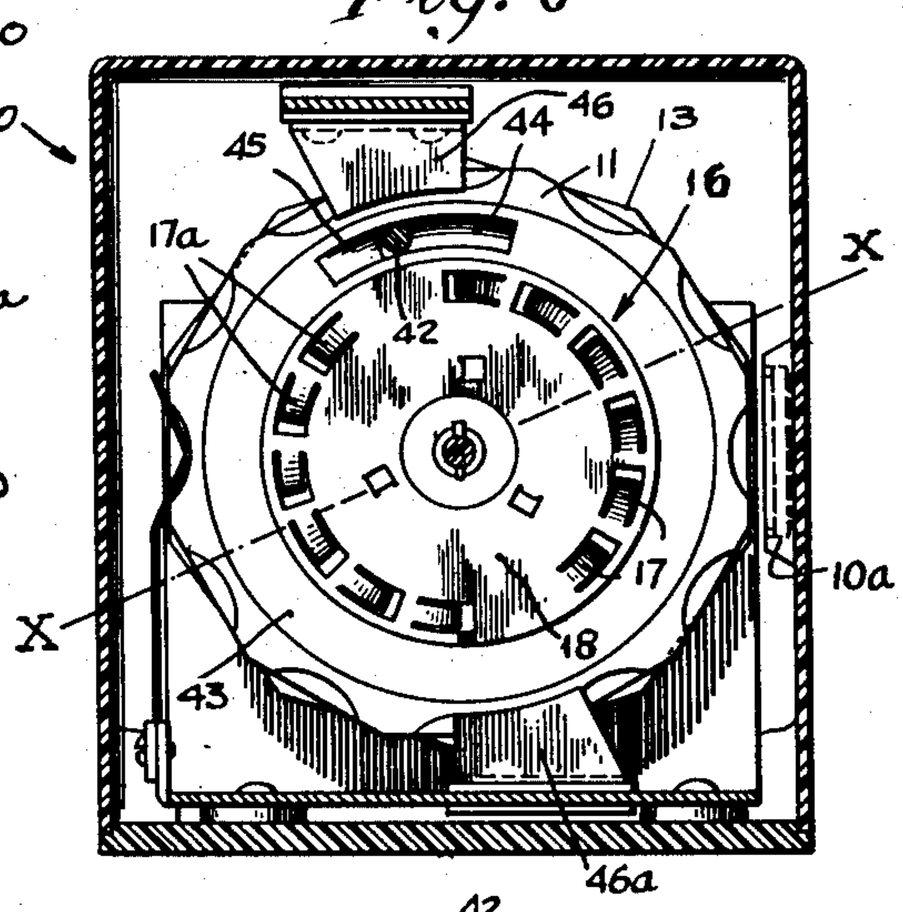


Fig. 4

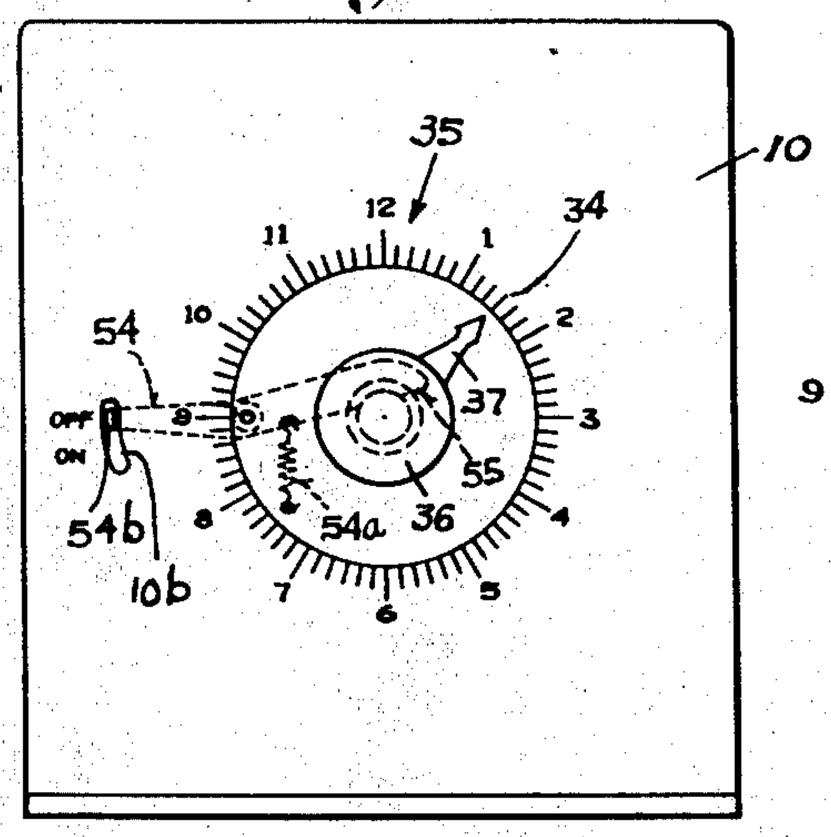


Fig. 7

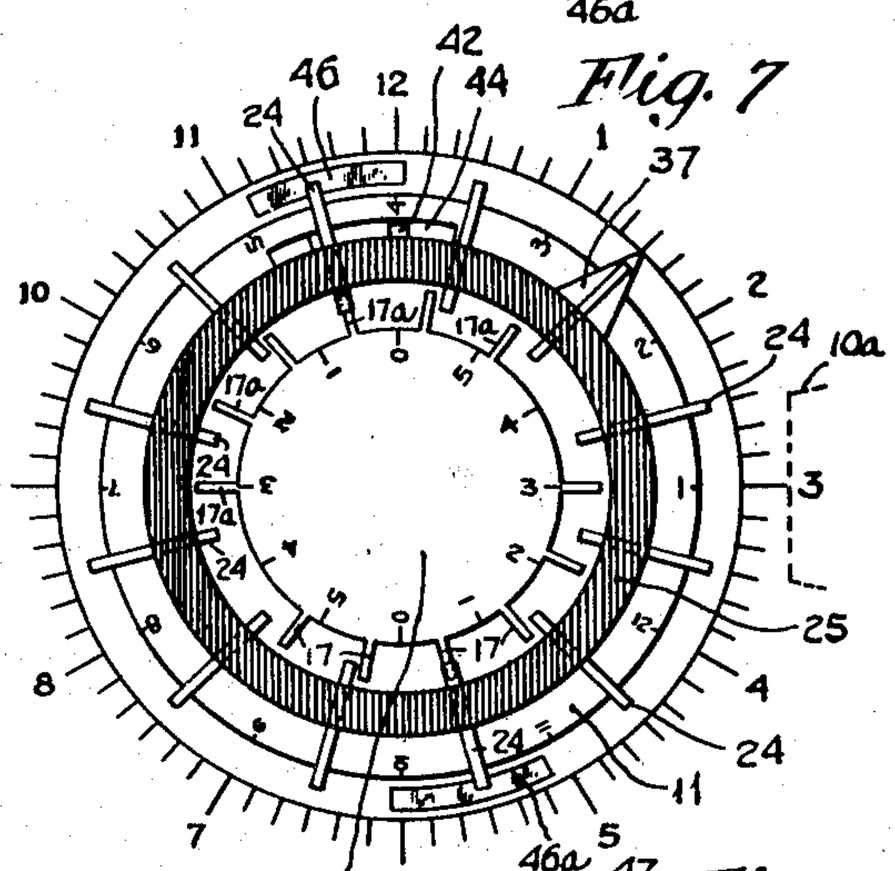


Fig. 8

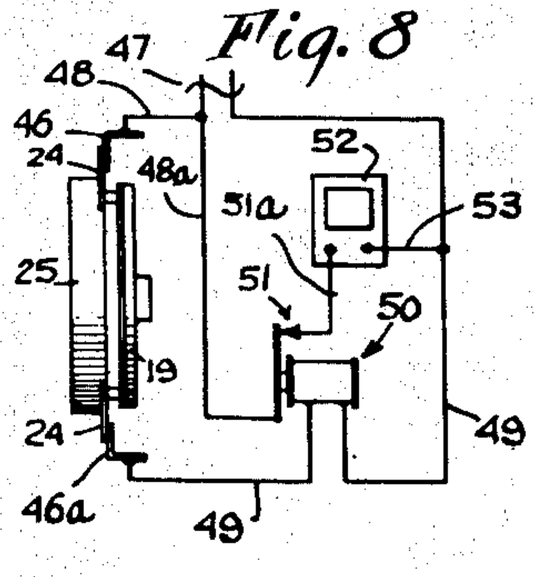


Fig. 9

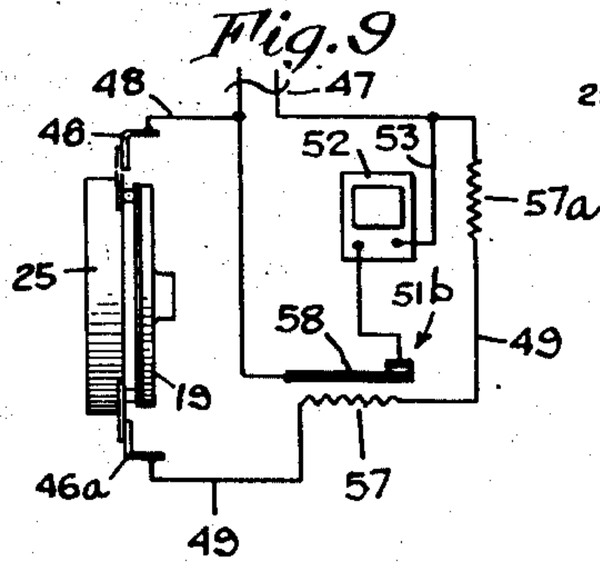
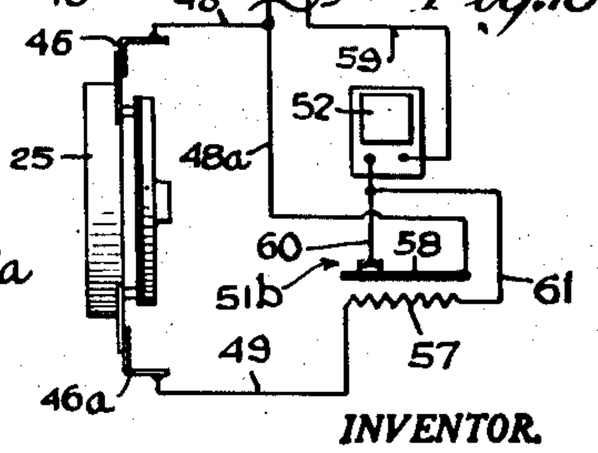


Fig. 10



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Patented Jan. 23, 1951 2,539,138

UNITED STATES PATENT OFFICE

2,539,138

CYCLOMETER CLOCK ALARM

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Application April 19, 1947, Serial No. 742,695

33 Claims. (Cl. 58—19)

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This invention relates to cyclometer devices, and more particularly to an alarm or switching mechanism for cyclometer clocks.

The invention is shown as embodied in an electric clock of the cyclometer or direct-reading type, for controlling the alarm mechanism thereof. However, it should be understood that the invention is not to be limited to a clock or to the specific embodiment shown, since it has utility in connection with cyclometer devices generally, wherein intermittently movable members or counters are provided having different rates of advance.

One of the objects of the invention is to provide in a cyclometer device, which may be a clock, an improved settable switching or alarm-control mechanism actuated by the device, said mechanism having but a single manually operable member which is settable by a simple, continuous movement, the setting of the member governing both the hour and minute interval at which the mechanism will be actuated by the device.

Heretofore I have provided a circuit control or alarm mechanism for cyclometer-type clocks, so organized that in setting it an operator was required to actuate or manipulate several settable members, and this made the setting operation more lengthy and somewhat more complex and susceptible of error than, for example, was the case in the usual clock having the conventional minute and hour hands and numbered dial. In these conventional clocks, since a very slow-moving shaft was present (the "hour" hand shaft) which had a continuous rotation and which by its rotative position alone could indicate the time of day, it was a simple matter to provide a settable trip device which had but a single manually operable member, and to arrange the device to actuate the alarm with reasonable accuracy. In cyclometer-type clocks having intermittently movable parts, however, no such continuously and slowly rotatable member is present and therefore the usual trip device could not be employed. As a result, switching or alarm-control devices having a plurality of settable members were resorted to, and this as a consequence involved a more complicated and less convenient and accurate procedure in setting the alarm.

The present invention overcomes the difficulties and disadvantages of the prior cyclometer alarm control or switching devices by the provision of a novel switching mechanism cooperable with a plurality of related, intermittently movable members of the cyclometer and which is so arranged that but a single, manually settable member is required to set the alarm to the desired time.

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In the specific structure disclosed and illustrated herein this result is accomplished by the provision of rotatable and stationary sets of circularly disposed differentially spaced cooperable members in the form of contacts, the latter set while normally stationary being rotatable to different positions. The arrangement and control of the contacts is such that only certain preselected contacts of the sets are in engagement with each other when the intermittently movable members of the clock reach the at-rest positions wherein they indicate the particular time for which the manually settable member is positioned. In the structure shown the settable member is a pointer and knob, which is rotatable and cooperable with a simple 360° scale having hour and minute indicia thereon covering a twelve-hour period, the knob adjustment being accomplished with but a single and continuous movement.

In the present switching or control mechanism the adjusted rotative position of the stationary set of contacts is the sole determiner of the particular time at which the control mechanism may be actuated by the clock, and this arrangement thus makes it possible to associate the simple pointer in conjunction with the 360° graduated scale with the stationary set of contacts to indicate the setting of the mechanism.

In accomplishing this simplified control, the contacts of the one set are all equally spaced around a circle, whereas the contacts of the other set are grouped, along the circle and have individual spacings that are somewhat less than the spacing of the first set. Each contact of one set is juxtaposable and cooperable for engagement and disengagement individually with each contact of the other set, and to effect such engagement and disengagement the one set of contacts is axially shiftable toward and away from the other set. Thus the sets of cooperable contacts have a relationship much like that between the sets of graduations of a vernier device, in that contacts of but one pair are juxtaposed for engagement with each other at any one time—the time for which the control mechanism is set. To cause such juxtaposed contacts to engage each other in the desired hour interval, and to prevent such engagement during all other hourly intervals means are provided responsive to positioning of the hour wheel of the clock for automatically bringing one set of contacts collectively into cooperable engaging position with respect to the other set of contacts when the desired hour arrives.

In the illustrated embodiment of the invention, during the hour in which the alarm is to be given,

the contacts of one set engage each other momentarily during rotation of the minute wheel but only come to rest in engagement at the predetermined "minute" the alarm is to be given. To avoid a false alarm during these momentary engagements there is provided by the present invention delay-action means which prevents the closing of the circuit to the alarm device until the contacts have engaged for a longer time (as when at rest) than the brief interval when one contact wipes past the other.

Another object of the present invention is to provide an improved alarm or switching mechanism of the above type which is extremely simple is construction and economical to manufacture.

A feature of the invention is the provision of a switching mechanism as characterized above in which but very little drag is imposed on the cyclometer device when the mechanism is set for operation, and wherein no drag whatsoever is imposed on the device when the mechanism is not set for use.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a vertical axial section through a cyclometer clock and alarm-control or switching mechanism made in accordance with the invention, the cooperable, contact-carrying parts of the mechanism being temporarily in disengaged position.

Fig. 2 is a view like Fig. 1 but with the cooperable contact-carrying parts of the switching mechanism positioned for engagement.

Fig. 3 is a fragmentary vertical section of the switching mechanism showing the cooperable contact-carrying parts rendered inoperative by a shut-off device.

Fig. 4 is an elevation of the clock casing showing the manually operable member for setting the switching mechanism, and showing the scale for cooperation with said member.

Fig. 5 is a vertical transverse section taken on the line 5—5 of Fig. 2.

Fig. 6 is a vertical transverse section taken on the line 6—6 of Fig. 2.

Fig. 7 is a diagrammatic representation of the cooperable, contact-carrying parts of the switching mechanism and of the connector means therefor, and also a representation of the hour and tens-of-minutes wheels of the clock, and of the automatic axial-shifting device for the stationary set of contacts and the scale for the manually settable member.

Fig. 8 is a schematic diagram of an alarm circuit in which the switching mechanism is included.

Fig. 9 is a schematic diagram of a modified circuit including the switching mechanism, and

Fig. 10 is a schematic diagram of another modified circuit including the switching mechanism.

Referring to Figs. 1, 5 and 6, the cyclometer clock embodying the invention comprises a casing 10 with a window 10*a* having mounted therein in coaxial relationship an hour wheel 11 having numerals "1" to "12," a tens-of-minutes wheel 12 having numerals "0" to "5" and "0" to "5" and a units of minutes wheel 13, having numerals "0" to "9." In the form shown the mechanism includes a seconds wheel 14 which is continually rotating and is driven by a synchronous electric clock motor 15. The seconds wheel upon completing each revolution advances the units wheel 13 a tenth of a revolution and the latter upon

completing each revolution advances the tens wheel 12 one twelfth of a revolution, there being successive rows from "0" to "5" on the tens wheel, and the latter upon completion of each one-half revolution advancing the hour wheel 11 one-twelfth of a revolution.

Time is read by observing the line of numerals appearing through the window or sight-opening 10*a*.

The illustrated carry-over or driving mechanism between the wheels of the clock forms no part of the present invention and is described in detail in the copending application of Lucian Wuischpard, Serial No. 702,983, filed October 12, 1946; it will be understood that any suitable well-known type of intermittent drive or carry-over mechanism may be employed to advance the respective wheels of the clock in their proper sequence and hence no further description of the carry-over is given herein.

According to the present invention a simplified, novel and improved switching mechanism is provided within the casing 10 in conjunction with the numeral wheels whereby an alarm may be actuated or other circuit controlled at any of a large number of preselected times, the mechanism having but a single manually settable indicator member and cooperable scale, arranged so that by a simple continuous movement the setting of the mechanism may be conveniently and quickly accomplished. In the specific embodiment of the invention shown, referring to Figs. 1, 2, 3 and 6, this mechanism includes a set of contacts 16 divided into two groups of contacts 17, 17*a* which are duplicates of each other, and which are carried by a metal conducting plate 18, the latter being mounted on an insulating disk 19 supported by and pin-connected to a hollow shaft or sleeve 20 rotatably mounted on a main spindle 21 common to all the clock wheels, and passing freely through the hub of the hour wheel 11 and into the hub of the tens wheel 12 where it is keyed to the latter wheel for rotation therewith. A pin 22 driven through a hole in the main spindle 21 slidably engages the disk 19 so as to maintain the numeral wheels, sleeve 20 and disk 19 assembled on the spindle 21 against excessive lateral movement, the spindle itself being held against lateral or axial movement by a drive gear 21*a* fixed to the end of the spindle and engaging a bracket 21*b* forming a bearing for one end of the spindle.

As shown in Fig. 6, there are six contacts 17, and six contacts 17*a*, disposed in a circle having a common center with the shaft 20, and preferably the contacts are formed by lancing tongues from the metal plate 18, which latter is then made from a thin sheet of spring material such as phosphor bronze.

For cooperation with the set of contacts 16, which for convenience is termed the rotating set since it rotates intermittently during operation of the clock, there is provided a second set of contacts 24, Figs. 1, 2 and 3, which is termed a stationary set of contacts since they operate while at a standstill even though they are rotatable for purposes of setting the control mechanism. The set of contacts 24 are carried by a wheel 25 of insulating material, and are twelve in number, arranged in a circle along the periphery of the wheel 25. The wheel 25 has a hub 27 which is press-fitted on a reduced end portion 28 of a supporting sleeve 29 rotatably carried in a bearing collar 30 secured to an upright support 31 of the clock frame. The supporting sleeve 29 slid-

ably receives the adjacent end of the clock spindle 21 and forms a journal therefor.

The stationary set of contacts 24 is cooperable for engagement with the rotating set of contacts 16, and is disengageable therefrom by virtue of the supporting sleeve 29 being axially movable in the bearing collar 30. To limit the axial movement of the supporting sleeve 29, the latter has a retainer ring 32 engageable with the inner end of the bearing collar 30. The stationary set of contacts 24 is yieldably urged to a cooperable engaging position with the rotating set of contacts 16 by means of an epansion spring 33 engaging the wheel 25 and one end of the bearing collar 30, said engaging position being shown in Fig. 2.

Referring to Fig. 7 the supporting wheel 25 which carries the contacts 24 is diagrammatically designated by a circular band, and the contacts 17 and 17*a* respectively are diagrammatically shown as projecting radially from the plate 18 for clarity of illustration although in the actual structure they do not so project. The arrangement of the sets of contacts 16 and 24 is such that when the latter set is in the rotative position of Fig. 7 each contact thereof can individually engage one contact 17 of the rotating set without engagement simultaneously occurring between any other contact 17 and any other contact 24, and the same is true of the contacts 17*a* with respect to the contacts 24. The reason for this is that the contacts 24 are uniformly spaced about the periphery of the supporting wheel 25 so that between each adjacent pair of contacts an included central angle of 30° is formed, while between each adjacent pair of contacts 17 of 17*a* within the individual groups an included central angle of less than 30° is formed. Referring to Fig. 7 it will be seen that a much greater space exists between the end contacts 17 and 17*a* of the groups than exists between the pairs of adjacent contacts within the groups, and also that the contacts of the groups are symmetrically disposed with respect to a common diametric line X—X, Fig. 6, which is a bisector of said groups.

Thus the arrangement of the contacts 17 and 17*a* is such that each contact 17 may be paired with a different contact 17*a* whereby the contacts of the pairs are diametrically opposite each other. In addition to the above arrangement of the contacts 17, 17*a* and 24, the widths of the contacts are made relatively small so that each covers a relatively small arc, and this precludes overlapping of any one contact of one set simultaneously with an adjacent pair of contacts of the other set.

It will be seen from an inspection of Fig. 7 that for any one position of the tens-of-minutes wheel, and position of the wheel 25 but a single one of the contacts 24 is juxtaposed for engagement with but a single one of the contacts 17, and that no other contact 24 engages any of the other contacts 17. Likewise for the same conditions but a single contact 24 engages one of the contacts 17*a* and no other contact 24 engages any of the other contacts 17*a*, this being due to the differential spacing of the contacts of the sets 16 and 24. This spacing is in the nature of a vernier wherein the graduations of one scale are spaced closer together than the graduations of the other scale so that at any one time but a single pair of graduations of the scales can be aligned.

Since there are twelve stationary contacts 24 and six contacts 17 spaced differently from the

contacts 24, a total of seventy-two different theoretical combinations or relative positions of the sets is possible wherein one contact 24 is juxtaposed for engagement with a contact 17, neglecting the connection of the contacts 17 and plate 18 with the tens-of-minutes wheel 12. In other words, one contact 24 may individually be juxtaposed for engagement with each of the six contacts 17, and therefore for each contact 24 there are six possible contacting conditions. Since the contacts 24 are twelve in number this makes seventy-two possible combinations or relative positions between the sets of contacts 24 and either of the groups of contacts 17 or 17*a*.

Use is made of this organization to enable the clock wheels to actuate an alarm or a control circuit at the beginning of any ten-minute interval throughout a twelve-hour period, there being seventy-two such intervals, since it will be understood that due to the plate 18 advancing one-twelfth revolution every ten minutes, one of the contacts 17 and a diametrically opposite contact 17*a* will always be aligned for respective engagement with a pair of opposite contacts 24 during a period of rest of the tens wheel 12, provided that the stationary set of contacts 24 is first properly rotatably set for registration. A total of seventy-two different rotative settings of the set of stationary contacts 24 is possible without duplicating engagement between the different opposite pairs of contacts of the sets 16 and 24, and these settings are therefore indicated by seventy-two graduations 34 making up a 360° scale 35 on the casing 10, as shown in Figs. 4 and 7. The scale 35 is divided into twelve equal divisions numbered from 1 through 12, representing the hours, and each division is in turn divided into six subdivisions so that each subdivision represents ten minutes. As shown in Fig. 4 the scale 35 on the exterior of the casing 10 is cooperable with a knob 36 and pointer 37 carried by the supporting sleeve 29 exteriorly of the casing, the sleeve extending through an aperture in the casing for this purpose.

Due to the contacts 17*a* being a duplicate of the contacts 17, this being done because the indicia of the tens wheel 12 are duplicated once on the faces of the wheel, the fact that a second set of seventy-two combinations of relative positions of the sets is possible and existent does not alter the dividing of the scale 35 into the basic seventy-two divisions, grouped in sixes covering one hour for each group.

Referring to Figs. 1 and 5 the supporting wheel 25 has an annular flange 38 the exterior periphery of which has seventy-two equi-spaced axially extending V-grooves 39, and detent springs 40 mounted on a bracket 41 are cooperable with the grooved periphery of the flange 38 so as to yieldably hold the wheel 25 in any of seventy-two different rotative positions wherein the pointer 37 is in alignment with one of the graduations 34 of the scale 35.

In an alarm mechanism it is desirable that the alarm be sounded at a certain time in a given hour interval and at no other time, and therefore means are provided for rendering the alarm inoperative during the remaining eleven hour-intervals.

According to the invention this means is automatically controlled by the hour wheel 11 and operates to hold the stationary set of contacts 24 in its non-cooperating position shown in Fig. 1, wherein no engagement is possible between the sets of contacts 16 and 24. This means com-

prises a pin 42 rigidly carried by the supporting wheel 25 and projecting toward the hour wheel 11, the said pin functioning as a cam follower and being held by the expansion spring 33 continually in engagement with a cam plate 43 carried by the hour wheel. The cam plate 43 has an arcuate recess 44 in its surface to accommodate the tip portion of the follower pin 42, the said recess being of uniform or full depth for a distance equal to an arc of 30° and having a sloping bottom portion 45, at one end of the arc, see Figs. 6 and 7, on which the follower pin 42 may ride up. The arrangement of the cam plate 43 and follower pin 42 is such that during one hour-interval in each consecutive twelve hours the set of contacts 24 is allowed to remain in cooperable engaging position with respect to the set of contacts 16 as shown in Fig. 2, and immediately following this hour-interval, the follower pin 42 will be made to ride up on the camming surface 45 of the recess 44 and during the next eleven hour-intervals the stationary set of contacts 24 will be maintained in the position of Fig. 1 out of cooperable relationship with the set of contacts 16.

Thus, depending on the rotative setting of the supporting wheel 25, in any twelve-hour interval the contacts 24 thereof may cooperate and engage the contacts 17, 17*a* of the set of contacts 16 solely during a single predetermined hour-period. For example, in Fig. 4 the pointer 37 is in alignment with the particular graduation 34 indicating a time of 1:30 o'clock. For this setting of the set of contacts 24 they will assume the operative position of Fig. 2 for a period of one hour, this occurring only when the hour wheel 11 is so positioned that the numeral 1 thereof shows through the window 10*a* of the casing 10. For all other positions of the hour wheel 11 the set of contacts 24 will be maintained in the inoperative position shown in Fig. 1.

Referring to Fig. 7 the window 10*a* of the casing 10 is indicated in dotted outline in the right portion of the figure, and it will be seen that the numeral 1 of the hour wheel 11 (indicated by the circular band having numbers from 1 through 12) is in alignment with the window 10*a*. For this position of the hour wheel 11, and for the 1:30 o'clock setting of the set of contacts 24 the relative positions of the cam recess 44 and cam follower 42 will be shown in Fig. 7. Also, when the number 3 of the tens wheel 12 is showing through the window 10*a* of the casing, as indicated in Fig. 7 by the contact 18 which is shown as having two sets of numbers from "0" through "5" so that it may represent the tens wheel, one of the contacts 17 of the rotating set will engage one of the contacts 24 of the stationary set. Also a contact 17*a* diametrically opposite the engaged contact 17 will engage a contact 24 of the stationary set diametrically opposite the engaged contact 24. Advantage is taken of this condition to close a control or alarm circuit, this being accomplished by providing a pair of contact shoes 46, 46*a* respectively at the top and bottom of the casing 10, these shoes being adapted to engage the diametrically opposite contacts 24 which are being engaged by the pair of contacts of the rotating set. Referring to Fig. 8 the contact shoes 46 and 46*a* may be connected with a current supply 47 by wires 48 and 49 respectively, the latter having included in its circuit the coil of a relay 50. The contacts 51 of the relay 50 are connected one by a wire 48*a* with the wire 48

and the other by a wire 51*a* with a buzzer 52 which is in turn connected by a wire 53 with the wire 49. Thus, when the contact shoes 46 and 46*a* are spanned so as to close the circuit through the relay 50 the latter will operate to energize the buzzer 52 and sound the alarm. The arcuate length of each of the contact shoes 46, 46*a* is such that they will still be engaged by the pair of opposite contacts 24 as shown in Fig. 7 if the stationary contact set is placed in any of the six rotative positions indicated by the graduations from 1:10 o'clock to 2 o'clock inclusive; for these six rotative positions the cam follower pin 46 will occupy and extend deeply into the cam recess 44 with the hour wheel 11 indicating 1 o'clock through the casing window 10*a*. This will be clearly evident from an inspection of Fig. 7 wherein, if the supporting wheel 25 be shifted 15° clockwise so that the pointer 37 rests on 2 o'clock, the same opposite contacts 24 will still be positioned for engagement with the contact shoes 46 and 46*a*, and if the supporting disk 25 be shifted 10° counterclockwise so that the pointer 37 traverses the two ten-minute graduations to the 1:10 o'clock setting, the contacts will continue in engagement with the shoes 46 and 46*a*.

Thus it will be seen that for any setting of the pointer 37 from 1:10 o'clock to 2 o'clock, but a single pair of diametrically opposite contacts 24 of the stationary set will be positioned for engagement with the opposite contact shoes 46, 46*a*, and such engagement will take place only when the hour wheel 11 is indicating 1 through the casing window 10*a*. Also, upon inspection of Fig. 7 it will be seen that when the pointer 37 is placed on the graduation indicating 1:30 o'clock a pair of diametrically opposite contacts 17, 17*a* of the rotating set 16 will only engage those contacts 24 of the stationary set which are in engagement with the contact shoes 46, 46*a* for an appreciable length of time when the tens wheel 12 is showing the numeral 3 through the window 10*a*. For all other at-rest positions of the tens wheel 12 engagement of the contacts 17, 17*a* will occur with contacts 24 which are not being engaged by the contact shoes 46. The same is true for the other five positions of the stationary set of contacts 24 in the first hour interval, except that for each different setting the corresponding numeral of the tens wheel 12 must show through the window 10*a* of the casing before engagement for any appreciable time occurs between the contacts of the rotating set 16 and the particular pair of diametrically opposite contacts 24 which are in engagement with the contact shoes 46, 46*a*.

The same conditions for engagement of contacts of the sets 16 and 24 are true for settings of the pointer 37 in other hour intervals, except that other pairs of contacts 24 are involved in the engagement. In each instance, however, the carrier wheel 25 is maintained in the non-cooperable position shown in Fig. 1 during the eleven hourly intervals which are not designated by the pointer 37, and therefore an alarm may be given only in that interval in which the pointer 37 is resting, this being of course effected by the arrangement of the cam plate 43 and cam follower 42 as explained above.

It will be noted that during movement of the tens wheel 12 from one position to the next position, momentary incidental contact may be made between that pair of diametrically opposite contacts 24 which are in engagement with the contact shoes 46, 46*a* and pairs of diametrically op-

posite contacts 17, 17*a*, except those contacts 17, 17*a* intended to actuate the alarm. However, such incidental contact is of extremely short duration, whereas the period of engagement of the intended pair of contacts 17, 17*a* is of a ten-minute duration, and to prevent the buzzer 52 from sounding the alarm during such incidental contact the relay 50 is made to have a time delay, the time lag being such that the buzzer is not sounded for any fleeting energization of the relay.

When it is desired to shut off the alarm mechanism this is accomplished by pulling the knob 36 outwardly to the position shown in Fig. 3, whereupon a pivotal latch lever 54 provided for the purpose of shut-off swings under the action of a spring 54*a* so that a recessed portion 55 thereof engages an annular groove 56 in the supporting sleeve 29 and retains the latter and contact-carrying wheel 25 in the inoperative position. For the position of Fig. 3, obviously the cam follower 42 is prevented from engagement with the cam plate 43 and therefore the stationary set of contacts 24 is at all times prevented from engaging the rotating set of contacts 16.

When it is desired to again render the alarm effective, this is done by manually shifting downward a fingerpiece 54*b* extending through a slot 10*b* in the casing, Fig. 4, this raising the recessed portion 55 of the latching lever and releasing the sleeve 29 whereupon the coil spring 33 automatically axially shifts the sleeve and wheel 25 to the operative of Figs. 1 or 2.

An alternative form of control circuit is shown in Fig. 9 wherein the wire 49 has included in its circuit a heater 57 and a current-limiting resistor 57*a* instead of the coil of the relay 50, and wherein the buzzer 52 is controlled by contacts 51*b* actuated by a bimetallic switch arm 58 located in heat-receiving relation with the heater 57. When the circuit is closed through the heater by bridging of the shoes 46, 46*a* the heater 57 becomes hot and causes the contacts 51*b* to engage each other as shown. By this organization a time delay is provided which prevents operation of the buzzer 52 during incidental bridging of the contact shoes 46, 46*a* and associated pair of diametrically opposite contacts 26, since a certain amount of time is required for the bimetallic arm to be heated after closing of the circuit through the shoes 46, 46*a*.

Another alternative form of control circuit is shown in Fig. 10. In this circuit the supply 47 is connected by wire 48 to contact shoe 46, and by a wire 59 to the buzzer 52 the other terminal of which connects through a wire 60 with contacts 51*b* controlled by bimetallic arm 58. Arm 58 is connected by wire 48*a* to wire 48, and heater 57 is connected by wire 49 to shoe 46*a*, and by wire 61 to wire 60.

The resistance of the buzzer 52 is so great that the current passing through it and the series-connected heater 57 is insufficient to heat the latter to actuate the bimetallic arm, and therefore closing of the contacts 51*b* must be depended on to heat the heater 57 and arm 58. In the circuit of Fig. 9 heat causes the arm 58 to close the contacts 51*b*; however, in the circuit of Fig. 10 heat causes the arm 58 to open the contacts 51*b*, and such opening places the buzzer in series with the heater and the latter therefore cools off. This action again enables the arm 58 to close the contacts, so that a periodic opening and closing of the contacts occurs. The resistance of the heater 57 is sufficient to render inoperative the buzzer 52 when both of these are series connected across the line or supply 47, and as a consequence a periodic or repeated alarm is given when the desired time is reached.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In a cyclometer having a pair of related, relatively movable counters, selector means including a member having graduations corresponding respectively to various predetermined relative positions of the counters, said means including elements settable to sense any desired set of counter positions; and means including cooperating elements positioned by said counters for switching an electrical circuit when the counters come to the particular set of positions determined by the setting of said selector means.

2. In a cyclometer having a pair of related relatively movable counters, selector means including solely one movable manually operable member and including a cooperable fixed member, one of said members having graduations corresponding respectively to the various predetermined relative positions of the counters, said manually operable member including elements settable to sense any desired set of counter positions; and means including cooperating elements positioned by said counters for switching an electrical circuit when the counters come to the particular set of positions determined by the setting of the manually operable member.

3. In a cyclometer clock rotatable number-bearing hour and tens-of-minutes members, a time selector including a relatively movable pointer and dial, said dial having graduations for each hour and each tens-of-minutes in each hour; and means under the joint control of said selector and said hour member and tens-of-minutes member for switching a circuit when said members are respectively at the hour and tens-of-minutes for which the selector is set.

4. In an alarm clock having rotatable number-bearing hour and tens-of-minutes members, means, including a member graduated in hours and tens-of-minutes, settable to indicate the time when the alarm will be given; and means for switching on electrical alarm circuit when the hour member and tens-of-minutes member have come to the hour and ten-minute period for which the settable means is set.

5. In an alarm clock having rotatable number-bearing hour and tens-of-minutes members, means, including a member graduated in hours and tens-of-minutes, settable to indicate the time when the alarm will be given; and means including contact-controlling members actuated by the hour member and tens-of-minutes member for closing an alarm circuit when the hour member and tens-of-minutes member are at rest at the hour and ten-minute period for which the settable means is set.

6. In a cyclometer having a pair of relatively movable counters advanceable at different rates, a control mechanism comprising a first set of members which is intermittently movable as a unit in step with one of said counters, the spacing of the members being different from the extent of advance of the counters whereby each member comes to rest in a different arcuate position; a second set of members which are movable as a unit, the members thereof being individually juxtaposable and cooperable for engagement each with different individual members of the first set; means for manually arcuately set-

ting the second set of members in any of a plurality of predetermined positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual members of the second set each with different individual members of the first set, said juxtaposition occuring with said one counter occupying various positions of rest; and means for switching a circuit in response to engagement between a pair of juxtaposed members of the sets.

7. In a cyclometer having a pair of relatively movable counters advanceable at different rates, a control mechanism comprising a first set of members which is intermittently movable as a unit in step with one of said counters, the spacing of the members being different from the extent of advance of the counters whereby each member comes to rest in a different arcuate position; a second set of members which are movable as a unit, the members thereof being individually juxtaposable and cooperable for engagement each with different individual members of the first set; means for manually arcuately setting the second set of members in any of a plurality of predetermined positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual members of the second set each with different individual members of the first set, said juxtaposition occurring with said one counter occupying various positions of rest; means for switching a circuit in response to engagement between a pair of juxtaposed members of the set; and means controlled by said setting means and said other counter and automatically operable in an interval of rest of the latter for causing engagement between a pair of juxtaposed members of the sets in an interval of rest of said one counter.

8. In a cyclometer having a pair of relatively rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member whereby each contact comes to rest in a different arcuate position; a second set of contacts which are circularly arranged about said axis, said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable and cooperable for engagement each with different individual contacts of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual contacts of the second set each with different individual contacts of the first set, said juxtaposition occurring with said one member occupying various positions of rest; a control circuit, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; and means controlled by said setting means and said other member and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of contacts in an interval of rest of said one member.

9. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged consecutively about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are circularly arranged about said axis, said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable and cooperable for engagement each with different individual contacts of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual contacts of the second set each with different individual contacts of the first set, said juxtaposition occurring with said one member occupying various positions of rest; a control circuit, said circuit having means including a contact shoe engageable individually with each of the contacts of the second set for making connections to a pair of juxtaposed contacts, and said circuit being normally open; and means controlled by said other member and automatically operative in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of juxtaposed contacts in an interval of rest of said one member.

10. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are arranged about said axis, said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable each with each contact of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of individual contacts of the second set each with each individual contact of the first set, said juxtaposition occurring with said one member occupying in turn its positions of rest; means controlled by the other member and automatically operable in an interval of rest of the latter for causing engagement between any pair of contacts which are juxtaposed with each other in an interval of rest of said one member; and means for connecting the engaged contacts in a circuit.

11. In a cyclometer having a pair of related, intermittently movable counters, an indicating means including a member having graduations corresponding respectively to the various predetermined relative positions of the counters, said means being settable to indicate any desired set of at-rest positions; and means for switching an electrical circuit when both counters attain the particular set of predetermined at-rest positions indicated by the settable means, said switching means momentarily switching said circuit during movements of one counter when out of its said predetermined at-rest position and while the other counter is in its said predetermined at-rest position; and a time-delay device connected with said switching means for rendering ineffective said momentary switching.

12. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are uniformly spaced from each other and are arcuately arranged about an axis, said set of contacts intermittently rotating about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are uniformly spaced from each other and are circularly arranged about said axis, said second set of contacts being rotatable as a whole and the contacts thereof being individually alignable each with each contact of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by individual alignment of each contact of the second set with each contact of the first set with said one member occupying in turn all of its positions of rest; means controlled by the other member and automatically operable during an interval of rest of the latter for causing engagement between any pair of contacts which are aligned in an interval of rest of said one member; and means for connecting the engaged contacts in a circuit.

13. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, and having a casing enclosing said members, a control mechanism carried in the casing comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are circularly arranged about said axis, said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable and cooperable for engagement each with different individual contacts of the first set; means including but a single, manually operable member located exteriorly of the casing for rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual contacts of the second set each with different individual contacts of the first set, said juxtaposition occurring with the said one member occupying various positions of rest; a control circuit in the casing, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; means controlled by said other member and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of contacts in an interval of rest of said one member; and a scale carried by the casing adjacent said manually operable member for cooperation therewith, said scale having divisions corresponding to the intervals of rest of said other member, and having subdivisions corresponding to the intervals of rest of said one member.

14. In a cyclometer having a pair of indicia-carrying intermittently rotatable members advanceable at different rates and having positions of rest corresponding in number respectively to the number of indicia carried, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members and being equal in number to the number of indicia of the member, the angular spacing of the contacts being different from the angular spacing of said indicia; a second set of contacts which are circularly arranged and equi-spaced about said axis and are equal in number to the number of indicia of the other member said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable and cooperable for engagement each with different individual contacts of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of each different individual contact of the second set with each different individual contact of the first set, said juxtaposition occurring with the said one member occupying in turn all of its positions of rest; a control circuit, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; and means controlled by said other member and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of contacts in an interval of rest of said one member.

15. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are arranged about said axis, said second set of contacts being rotatable and axially movable as a unit and the contacts thereof being individually juxtaposable each with each contact of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of individual contacts of the second set each with each individual contact of the first set, said juxtaposition occurring with said one member occupying in turn its positions of rest; means controlled by the other member and automatically operable in an interval of rest of the latter for axially shifting the second set of contacts and causing engagement between any pair of contacts which are juxtaposed with each other in an interval of rest of said one member, said means including a cam and follower associated with the second set of contacts; and means for connecting the engaged contacts in a circuit.

16. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of twelve contacts disposed about an axis and intermittently rotating as a unit in step with one of said members; a second set of twelve contacts cooperable with the first set, the contacts of the second set being rotatable as a unit and individually juxtaposable and cooperable for engagement each with each contact of the first set; means for manually rotatably setting the second

set of contacts in any of seventy-two different rotative positions about the said axis, both said sets of contacts being so arranged that for each different setting of the second set the contacts of two predetermined different oppositely located pairs of contacts of the first and second sets are juxtaposed for respective engagement with each other, said juxtapositioning occuring solely during periods of rest of said one member; a control circuit, said circuit having means for connection with the juxtaposed contacts, and said circuit being normally open; and means controlled by the other member and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through the juxtaposed contacts in an interval of rest of said one member.

17. In a cyclometer clock having an hour wheel and an intermittently rotatable tens-of-minutes wheel, a control mechanism comprising a set of six contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with the tens-of-minutes wheel, and the angular spacing of the contacts being different from the angular advance of the wheel; a set of twelve contacts which are circularly arranged about said axis, said twelve contacts being rotatable as a unit and being individually juxtaposable and cooperable for engagement each with different individual contacts of the set of six; means for manually rotatably setting the set of twelve contacts in any of seventy-two predetermined rotative positions, said positions corresponding respectively to seventy-two relative positionings of the sets determined by juxtaposition of each contact of the set of six with each contact of the set of twelve, said juxtaposition occurring with the tens-of-minutes wheel occupying various positions of rest; a control circuit, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; and means controlled by the hour wheel and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of contacts in an interval of rest of said tens-of-minutes wheel.

18. In a cyclometer clock having an hour wheel and an intermittently movable tens-of-minutes wheel having twelve at-rest positions, a control mechanism comprising a first set of twelve contacts generally circularly disposed about an axis and arranged in two groups of six consecutive contacts each, said contacts being symmetrical about a common diameter bisecting the groups, the contacts in the groups being uniformly spaced apart by equal arcs different from 30°, and said set of contacts intermittently rotating about its axis as a unit in step with the tens-of-minutes wheel; a second set of twelve contacts cooperable with the first set, the contacts of the second set being uniformly spaced from each other and circularly arranged about said axis and being rotatable as a unit and individually juxtaposable and cooperable for engagement each with each contact of the first set; means for manually rotatably setting the second set of contacts in any of seventy-two different, uniformly spaced rotative positions about the said axis, both said sets of contacts being so arranged that for each different setting of the second set the contacts of two predetermined different oppositely located pairs of contacts of the first and second sets are juxtaposed for respective engagement with each other, said juxtapositioning occurring solely during periods of rest of the tens-of-minutes wheel; a control circuit, said circuit having means for connection with the juxtaposed contacts, and said circuit being normally open; and means controlled by the hour wheel and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through the juxtaposed contacts in an interval of rest of the tens-of-minutes wheel.

19. In a cyclometer clock having an hour wheel and an intermittently movable tens-of-minutes wheel having twelve at-rest positions, an alarm mechanism comprising a first set of twelve relatively fixed contacts disposed in a circle about an axis and arranged in two groups of six consecutive contacts each, said contacts being symmetrical about a common diameter bisecting the groups, the contacts in the groups being uniformly spaced apart by equal arcs of less than thirty degrees, and said set of contacts intermittently rotating about its axis in step with the tens-of-minutes wheel; a second set of twelve relatively fixed contacts cooperable with the first set, the contacts of the second set being uniformly spaced from each other and circularly arranged about said axis and being rotatable as a whole and individually alignable in an axial direction each with each contact of the first set; means for manually rotatably setting the second set of contacts in any of seventy-two different, uniformly spaced rotative positions about the said axis, both said sets of contacts being so arranged that for each different setting of the second set the contacts of two predetermined, different, oppositely located pairs of contacts of the first and second sets are positioned for respective engagement with each other, said positioning occurring solely during periods of rest of the tens-of-minutes wheel, and said sets of contacts being relatively axially movable as a whole between a position wherein the contacts of said pairs are engageable with each other during said periods of rest, and a position wherein no contacts are engageable with each other; means controlled by the hour wheel for automatically relatively axially shifting the sets of contacts to engageable position and maintaining said position for an interval of between 50 and 60 minutes' duration once during each twelve-hour interval; and means for connecting engaged pairs of contacts of the sets in an alarm circuit for operating the alarm.

20. A cyclometer type clock having number wheels independently settable to the correct time reading, an alarm mechanism including a single settable member for predetermining in hours and fractions thereof the time when the alarm is to be given, and separate means for each of a plurality of said number wheels separately settable and movable therewith and cooperating with said single settable member for causing an alarm to be given at a time predetermined for the setting of said member.

21. A cyclometer type clock having number wheels independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and movable and settable therewith; and an alarm-time selector comprising a single member settable to a position for predetermining the time at which the alarm is given, said single member cooperating with said independent alarm controlling means for giving the alarm at said predetermined time.

22. A cyclometer type clock having number

wheels independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and movable and settable therewith; an alarm-time selector comprising a single member settable to a position for predetermining the time at which the alarm is given, said single member cooperating with said independent alarm controlling means for giving the alarm at said predetermined time and a dial and pointer one of which is movable to set the member.

23. A cyclometer type clock having number wheels independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and movable and settable therewith, said means including electric contacts; and an alarm-time selector comprising a single member carrying electric contacts and settable to a position to be engaged by a contact on said means when said number wheels and their means come to rest at a predetermined alarm-time.

24. A cyclometer type clock having number wheel independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and movable and settable therewith, said means including electric contacts; an alarm-time selector comprising a single member carrying electric contacts and settable to a position to be engaged by a contact on said means when said number wheels and their means come to rest at a predetermined alarm-time, said contacts engaging momentarily during movement of the number wheels, and means for preventing the giving of an alarm during such momentary engagement.

25. A cyclometer type clock having number wheels independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and movable and settable therewith; an alarm-time selector comprising a single member settable to a position for predetermining the time at which the alarm is given, said single member cooperating with said independent alarm controlling means for giving the alarm at said predetermined time; and means for manually moving said single member to a position out of cooperation with said means when the alarm is to be shut-off or not given.

26. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are circularly arranged about said axis, said second set of contacts being rotatable as a unit and the contacts thereof being individually juxtaposable and cooperable for engagement each with different individual contacts of the first set; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions corresponding respectively to a like plurality of relative positionings of the sets determined by juxtaposition of different individual contacts of the second set each with different individual contacts of the first set, said juxtaposition occurring with said one member occupying various positions of rest; a control circuit, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; means controlled by said other member and automatically operable in an interval of rest of the latter for causing said circuit to be closed and continuous through said pair of contacts in an interval of rest of said one member; and a time-delay device associated with the control circuit, for rendering ineffective momentary closing of the latter.

27. A cyclometer type clock having number wheels independently settable to the correct time reading; a plurality of independent alarm controlling means each connected to one of said number wheels and rotatable and settable therewith, said means including electric contacts; an alarm-time selector comprising a single member carrying electric contacts and rotatably settable to a position to be engaged by a contact on said means when said number wheels and their means come to rest at a predetermined alarm-time, said single member being axially movable between a first operative position, wherein engagement of said contacts can occur, to a second position wherein said contacts are separated and not engageable; and manually operable detent means for releasably holding the member in said second position.

28. In a cyclometer having a pair of relatively movable counters advanceable at different rates, a control mechanism comprising a first set of members which is intermittently movable as a unit in a step with one of said counters, the spacing of the members being different from the extent of advance of the counters whereby each member comes to rest in a different arcuate position; a second set of members which are movable as a unit, the members thereof being individually juxtaposable and cooperable for engagement each with different individual members of the first set; means including a manually operable part for arcuately setting the second set of members in any of a plurality of predetermined positions, said positions representing respectively a like plurality of relative positionings of the sets determined by juxtaposition of different individual members of the second set each with different individual members of the first set, said juxtaposition occurring with said one counter occupying various positions of rest, said second set of members being axially movable between two positions one of which enables juxtaposed members of the sets to be engaged and the other of which maintains juxtaposed members separated; means for switching a circuit in response to engagement between a pair of juxtaposed members of the sets; and means for maintaining said second set of members in either of said two axial positions.

29. In a cyclometer having a pair of intermittently rotatable members advanceable at different rates, a control mechanism comprising a first set of contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with one of said members, and the angular spacing of the contacts being different from the angular advance of the member; a second set of contacts which are circularly arranged about said axis, said second set of contacts being movable to either of two axially-spaced positions, rotatable as a unit whereby for one of said axial positions they are individually juxtaposable and engageable each with different individual contacts of the first set, and for the other axial position the contacts of the sets are

maintained separated; means for manually rotatably setting the second set of contacts in any of a plurality of predetermined rotative positions, said positions corresponding respectively to a like plurality of relative positionings of the sets determined by juxtaposition of different individual contacts of the second set each with different individual contacts of the first set, said juxtaposition occurring with said one member occupying various positions of rest; a normally open control circuit, said circiut having means for connection with a pair of juxtaposed contacts, and said circuit being closed when juxtaposed contacts engage each other; means controlled by said other member and automatically operable in an interval of rest of the latter for axially shifting said second set of contacts to cause engagement of juxtaposed contacts in an interval of rest of said one member; and manually releasable means for holding said second set of contacts in said other axial position wherein the contacts of the sets are separated, thereby to prevent closing of the control circuit.

30. In a cyclometer clock having an hour wheel and an intermittently rotatable tens-of-minutes wheel, a control mechanism comprising a set of six contacts which are arcuately arranged about an axis and are uniformly angularly spaced from each other, said set of contacts intermittently rotating as a unit about said axis in step with the tens-of-minutes wheel, and the angular spacing of the contacts being different from the angular advance of the wheel; a set of twelve contacts uniformly spaced from each other and circularly arranged about said axis, said twelve contacts being rotatable as a whole and being individually juxtaposable each with each of said six contacts; means for manually rotatably setting the set of twelve contacts in any of seventy-two predetermined rotative positions, said positions corresponding respectively to seventy-two relative positionings of the sets determined by juxtaposition of each contact of one set in turn with each contact of the other set with the tens-of-minutes wheel occupying various positions of rest; means controlled by the hour wheel and automatically operable for an interval not greater than one hour for causing engagement between any pair of contacts which are juxtaposed with each other in an interval of rest of the tens-of-minutes wheel; and means for connecting the engaged contacts in a circuit.

31. In a cyclometer clock having an hour wheel and having an intermittently movable tens-of-minutes wheel, a circuit control mechanism comprising a set of six contacts which are fixed with respect to, and are uniformly spaced from each other and are arcuately arranged about an axis, said set of contacts intermittently rotating about said axis in step with the tens-of-minutes wheel and the angular spacing of the contacts being less than the angular advance of said wheel; a set of twelve contacts which are fixed with respect to, and are uniformly spaced from each other, said twelve contacts being circularly arranged about said axis and rotatable as a whole, and being individually alignable each with each of said six contacts, said sets of contacts being relatively movable as units into and out of cooperable relationship with each other; means for manually rotatably setting the second set of contacts in any of seventy-two predetermined rotative positions, said positions corresponding respectively to seventy-two relative positionings of the sets determined by individual alignment of

each contact of the second set in turn with each contact of the first set with the tens-of-minutes wheel occupying various positions of rest, engagement of aligned contacts taking place only when the sets of contacts are in the said cooperable relationship; means controlled by the hour wheel for automatically relatively moving the sets of contacts into said cooperable relationship and maintaining said relationship for a predetermined interval, of not more than one hour, once during each twelve-hour interval; and means for connecting contacts of the sets, when engaged, in a circuit.

32. In a cyclometer clock having an hour wheel and an intermittently rotatable tens-of-minutes wheel, and having a casing enclosing said wheels, an alarm control mechanism carried in the casing and comprising a set of six contacts which are arranged about an axis, said set of contacts intermittently rotating as a unit about said axis in step with the tens-of-minutes wheel, and the angular spacing of the contacts being different from the angular advance of the wheel; a set of twelve contacts which are circularly arranged about said axis, said twelve contacts being rotatable as a unit and being individually juxtaposable and cooperable for engagement each with different individual contacts of the set of six; means including a single, manually operable member located exteriorly of the casing for rotatably setting the set of twelve contacts in any of seventy-two predetermined rotative positions, said positions corresponding respectively to seventy-two relative positionings of the sets determined by juxtaposition of each contact of the set of six with each contact of the set of twelve, said juxtaposition occurring with the tens-of-minutes wheel occupying various positions of rest; an alarm circuit in the casing, said circuit having means for connection with a pair of juxtaposed contacts, and said circuit being normally open; means controlled by the hour wheel and automatically operable in an interval of rest of the latter for causing said alarm circuit to be closed and continuous through said pair of contacts in an interval of rest of said tens-of-minutes wheel; and a scale carried by the casing adjacent said manually operable member for cooperation therewith, said scale having hourly divisions and ten-minute subdivisions covering a twelve-hour period.

33. In a cyclometer clock having an hour wheel and an intermittently movable tens-of-minutes wheel having twelve at-rest positions and having a casing enclosing said wheels, an alarm mechanism carried in the casing comprising a first set of twelve relatively fixed contacts disposed in a circle about an axis and arranged in two groups of six consecutive contacts each, said contacts being symmetrical about a common diameter bisecting the groups, the contacts in the groups being uniformly spaced apart by equal arcs of less than 30°, and said set of contacts intermittently rotating about its axis in step with the tens-of-minutes wheel; a second set of twelve relatively fixed contacts cooperable with the first set, the contacts of the second set being uniformly spaced from each other and circularly arranged about said axis and being rotatable as a whole and individually alignable in an axial direction with each contact of the first set; means including but a single manually operable member located exteriorly of the casing for rotatably

setting the second set of contacts in any of seventy-two different, uniformly spaced rotative positions about the said axis, both said sets of contacts being so arranged that for each different setting of the second set the contacts of two predetermined different oppositely located pairs of contacts of the first and second sets are positioned for respective engagement with each other, said positioning occurring solely during periods of rest of the tens-of-minutes wheel, and said sets of contacts being relatively axially movable as a unit between a position wherein the contacts of said pairs are engageable with each other during said periods of rest, and a position wherein no contacts are engageable with each other; means controlled by the hour wheel for automatically relatively axially shifting the sets of contacts to engageable position and maintaining said position for a predetermined interval of approximately one hour duration once during each twelve-hour interval; means in the casing for connecting engaged pairs of contacts of the sets in an alarm circuit for operating the alarm; a 360° scale carried

by the casing adjacent said manually operable member for cooperation therewith, said scale having hourly divisions and ten-minute subdivisions covering a twelve-hour period; and a detent for yieldably holding the second set of contacts in any of said seventy-two rotative settings.

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