Aug. 14, 1923. 1,465,045

M. H. KERN

CLOCK

Filed Nov. 29, 1921

Fig. 1.

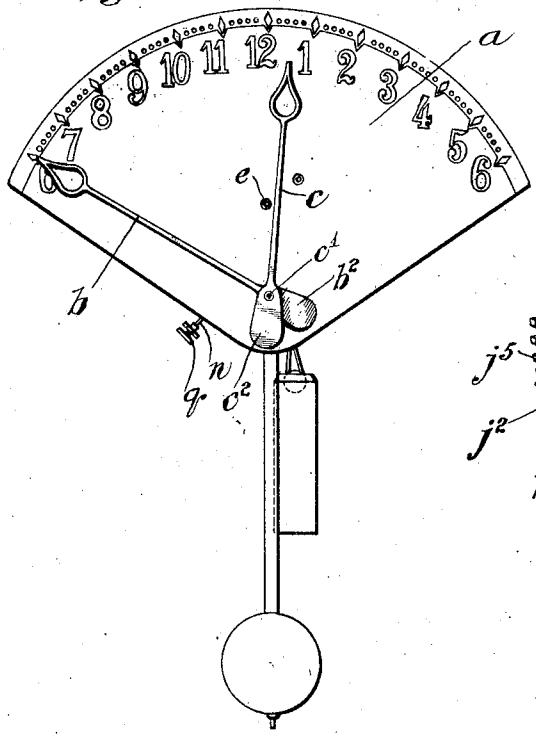


Fig. 4.

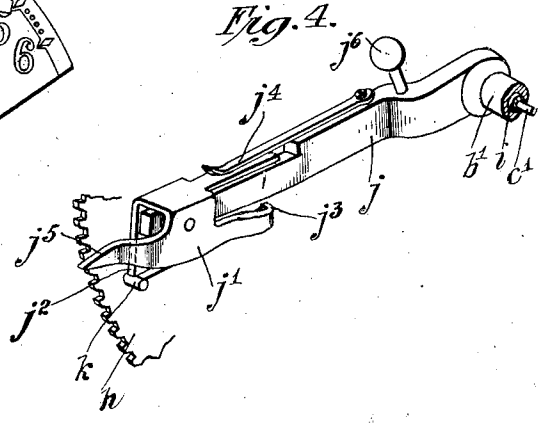


Fig. 2.

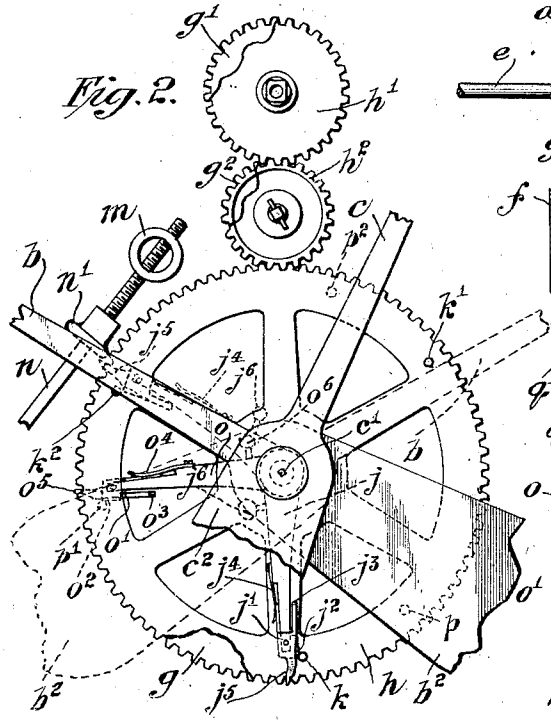
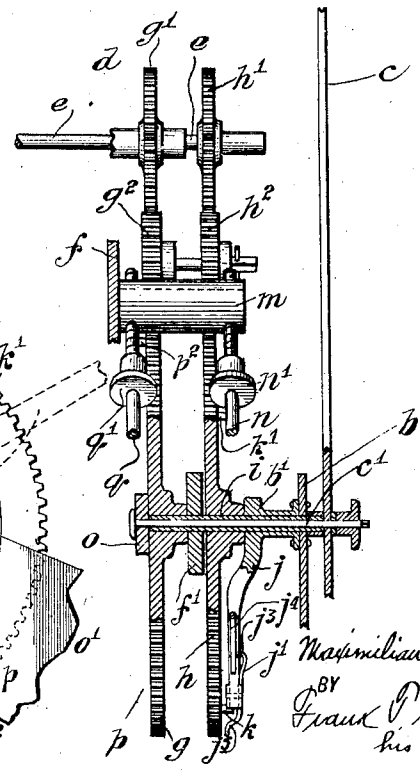


Fig. 3.



INVENTOR
Maximilian H. Kern
BY
Frank P. Wentworth
his ATTORNEY.

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UNITED STATES PATENT OFFICE.

MAXIMILIAN H. KERN, OF RIDGEWOOD, NEW YORK.

CLOCK.

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To all whom it may concern:

Be it known that I, MAXIMILIAN H. KERN, a citizen of the United States, residing at Ridgewood, in the borough of Queens, city of New York, county of Queens, and State of New York, have invented certain new and useful Improvements in Clocks, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to clocks, and more particularly to a clock having a segmental face and in which the hands are actuated through a sector of a circle only and have a return oscillatory movement at certain predetermined intervals.

In clocks it has been heretofore, a universal practice to have both hands describe a complete circle, clockwise, under the control of the clockworks and to have the figures upon the dial arranged in a circle.

A clock embodying my invention differs from the type of clocks above referred to in that while the clockworks operates in all respects like those heretofore used, the hands are driven by an intermediate mechanism which is operative to impart movement in the usual ratio to both hands through the sector only of a circle, the hands being capable of a return movement independently of said intermediate mechanism and of the clockworks, the dial figures being so arranged that notwithstanding this peculiar movement of the hands, a user may read the time as with an ordinary clock.

To secure the desired results, it is essential that the intermediate mechanism be so constructed as to impart positive movement to the hands which are idly mounted upon their spindles, in one direction, the operative connection between the hands and said intermediate mechanism being disengaged therefrom when the hand has described its full range of movement under the control of said mechanism, so as to permit a return movement of the hands independently of said mechanism and cause the automatic re-engagement of said mechanism with the hand when it has completed its full return movement.

The setting of the clock is accomplished through the minute hand spindle of the clockworks in the usual manner, and the trip mechanism for disengaging the intermediate mechanism from the hand is made adjustable so as to secure a proper timing of this disengagement so as to secure accuracy in the position of the hands with relation to the dial figures.

The invention consists primarily in a clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, an hour hand, a minute hand, each adapted to have clockwise and contra-clockwise movement, means whereby said hour hand and said minute hand are respectively operatively connected with a speed reducing gearing to positively actuate said hands clockwise, and means whereby said last means is disengaged from said speed reducing gearing when a hand has completed its full clockwise movement, to permit a return, contra-clockwise movement of the hand; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a front view of a clock embodying my invention;

Fig. 2 is a front view upon an enlarged scale, of the portion of the mechanism for actuating the hands;

Fig. 3 is a side view thereof partly in section; and

Fig. 4 is a perspective view of the actuating arm for one of the hands and its appurtenances.

Like letters refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, *a* indicates the dial of the clock which as noted is in segmental form, with the numeral 12 indicated at the central top thereof with the numerals 1 to 6 in sequence from the right thereof and the numerals 11 to 6 in sequence from the left thereof, there being the usual hour and minute indicia adjacent and between said numerals.

Having movement across said face is a minute hand *b* and an hour hand *c*, each of which, as will more fully appear hereinafter, is moved under the control of the

clockworks, clockwise of said dial face, and has a return movement entirely independently thereof, so that these hands each have an oscillatory movement while the clock is running, the hand b having a return movement once each hour on the half hour, and the hour hand having a return movement once each twelve hours.

In the drawings the entire clockworks is not shown, since any form of clockworks may be used, the invention residing more particularly in the manner of operatively connecting the hands with the said clockworks mechanism so that each hand is idly mounted in relation to its spindle but receives positive clockwise movement therewith, and a timely release from its actuating mechanism, to permit a return movement of the hand contra-clockwise independently of said clockworks.

In ordinary clockworks, the minute and the hour hand gear trains are so arranged as to cause the minute hand spindle to make a complete rotation in one-twelfth of that required for the hour hand spindle to make a complete rotation, but when using a segmental dial it is apparent that while the speed ratio of the minute and the hour hands must be preserved, the hands themselves can describe but a portion of a circle within the time ordinarily required for them to describe a full circle. It will be apparent, therefore, that the clockworks embodied in my invention must differ from those ordinarily employed, in the respect that the gear train construction must be such as to impart a full cycle of operations to the minute and the hour hands respectively with only a partial cycle of the co-operating member of said clockworks, the extent of such modification being controlled by the length in arc of the segmental dial. If the arc of this dial be 180°, the cycle of each hand must be completed during one-half of the cycle of the said member; if the dial be but of 90°, during one-quarter of the cycle of said member; or if the dial be 120° in arc, as shown in the drawings, the cycle of the hands must be completed during one-third of the cycle of said member.

Hence, as compared with the ordinary clockworks gear trains, those of my invention must embody a speed reducing gearing so that within a given interval each hand will receive only a fractional movement as compared with the movement of the ordinary clock hands during the same interval.

In the accompanying drawings, I employ a main clockworks train (not shown) which differs in no respects from the ordinary clockworks, the spindle d representing the customary minute hand spindle, and the spindle e representing the customary hour hand spindle, of the ordinary clockworks.

The speed reducing gearing for actuating the hands which are supported from the plate f, consists of two gear trains g, g' and g^2, and h, h' and h^2, the gears g and h being adapted to apply power to the hands b and c, while the gears g' and h' are carried by the spindles d and e respectively, the intermediate gears g^2 and h^2 being merely employed for the purpose of causing the gears g' and h' and g and h to turn in the same direction. In the form of the invention shown, the ratio of the gears g—h and g'—h' is as three to one, since, as stated, the dial a is arranged in a segment of 120° in arc, thus requiring the hands to describe one-third of a revolution with each full revolution of the spindles d and e.

The gears g^2 and h^2 are idly mounted upon a stud carried by the frame f, while the gears g and h are idly mounted upon a hollow shaft i carried by a bridge f' upon said plate f, the gear g being upon one side of said bridge and the gear h upon the other side thereof.

The minute hand b is provided with a hub b' by means of which it is idly mounted upon the shaft i adjacent the gear h, said hub being provided with an arm j adjacent said gear provided with an oscillatory dog j' having a shoulder j^2 adapted to successively engage studs k, k' and k^2 arranged 120° apart upon the gear h, and a stop shoulder j^3 adapted to engage the underside of said arm. Said dog j' is acted upon by a spring j^4 to normally disengage said stop shoulder from said arm j while permitting a free oscillation of said dog to disengage it from a stud k, k' or k^2 when said hand b has completed its full cycle, or has reached the numeral 6 to the right of Fig. 1.

Also carried by the frame f is a post m having screw-threaded thereinto a rod n having a trip n' thereon arranged in the path of movement of a projection j^5 of the dog j', the adjustability of the rod n being for the purpose of permitting said trip n' to be so set as to secure accuracy in the timing of the release of the arm f and in the contra-clockwise movement of its hand b.

As shown clearly in Fig. 3 of the drawings, the projection j^5 is so spaced away from the wheel h as to not engage the stud k, k' or k^2, thus permitting a free movement of said arm about the shaft i so as to ensure free contra-clockwise movement of the hand b immediately upon the disengagement of the dog j' from one of the studs k, k' or k^2 and its engagement with the succeeding stud in a direction counter to the rotation of the gear h.

The trip n' is positioned at the left of the vertical center of the gear h so that the overbalancing weight of the arm j will always be so positioned as to ensure a return movement of the hand b contra-clockwise, the arm j being provided with an eccentric

weight j^6 to ensure the full return movement of the arm and its hand. The hand b has a counterweight b^2 to ensure ease in the return movement thereof. It is apparent, however, that instead of relying upon gravity, and the weight of the arm j to impart the desired contra-clockwise movement to the hand b, any well known equivalent of said weight may be used.

The hour hand c is secured to and rotates with a shaft c' mounted in the hollow shaft i, which shaft has secured thereto an arm o similar to the arm j adjacent the gear g and adapted to co-operate with studs p, p' and p^2 carried by said gear and indicated in dotted lines in Fig. 2, two of said studs being shown in full lines in Fig 3.

The arm o is provided with a dog o' similar in construction to the dog j', having a shoulder o^2, stop shoulder o^3 and a projection o^5, said dog being acted upon by a spring o^4.

Adjustably mounted in the post m, in the same manner as the rod n, is a rod q having a trip member q' thereon adapted to co-operate with the projection o^5 upon the dog o'. The arm o and its appurtenances, has the same operative effect in relation to the gear g as the arm j, and its appurtenances, has in relation to the gear h, with the exception that the trip mechanism becomes operative at intervals of twelve hours instead of at intervals of one hour.

The hand c is provided with a counterweight c^2 and the arm o is provided with an overbalancing weight o^6 corresponding with the weight j^6, and for the same purpose.

The operation of the herein described clock is substantially as follows:—

While a clock is running, the spindles d and e will be rotated by the main clockworks gear trains in the usual speed ratio of twelve to one, the necessary power, in the form of the invention shown, being supplied by a weight controlled by a pendulum escapement mechanism, although these details are immaterial to the invention, since any desired source of power may be used and any desired form of escapement.

To simplify the description of the operation the cycle of the minute hand will first be described, it being understood that the hour hand is simultaneously actuated in the same manner as, but at one-twelfth the speed of, the minute hand.

At all times, excepting when a return contra-clockwise movement of the hand b is required, the shoulder j^2 of the dog j will engage one of the pins k, k' or k^2 upon the gear wheel h, which wheel will be turned in the same direction as the shaft e and its gear h' through the intermediate gear h^2, but in the speed ratio of one to three. So long as the said shoulder j^2 engages a stud as k, the hand b will be positively moved clockwise through the medium of the arm j, this movement being limited to a sector corresponding in degree with the sector of the indicia numbers upon the dial. Whether this movement be continuous or intermittent will be governed entirely by the clockworks, not shown.

As the hand b approaches the limit of its clockwise movement, or the numeral 6 to the right of the dial, the projection j^5 will engage the trip member n' and when this hand is accurately positioned with relation to the index associated with said numeral 6, the shoulder j^2 will be disengaged from the pin k. Instantly with the disengagement of the hand b and its appurtenances from the clockworks mechanism, the overbalancing weight of the arm j will cause said hand to describe a contra-clockwise movement until the shoulder j^2 engages the succeeding pin k', whereupon clockwise movement will be again imparted to said hand. The engagement of said shoulder j^2 with the succeeding pin, k', will occur when said hand is in exact alinement with the index associated with the numeral 6 to the left of the dial.

During the return movement of the hand b and its arm j, the spring j^4 will so oscillate the dog j' as to bring the shoulder j^2 in a position where it must inevitably engage said pin k'.

The stop shoulder j^3 is provided merely to prevent an overthrow of the dog j', and is merely in the nature of a precautionary attachment, since the slow traverse of the arm j will preclude any great tendency toward an overthrow of said dog. It is possible, however, that sufficient overthrow might occur to cause a binding of the dog, but with the use of this stop shoulder such is positively prevented.

It will be noted that the projection j^5 is so formed as to be out of the path of the pins k, k' and k^2.

The weight j^6 is used merely as a compensating device to ensure the desired accuracy in the overblancing effect of the arm j.

If it be found that the hand b does not exactly register with the index associated with the numeral 6 when the shoulder j^2 is released from the pin k, k' or k^2, the stem n may be adjusted toward or from the post m so as to cause an earlier or later tripping of the dog j' according to whether the hand has passed the said index, or does not reach same, when its clockwise movement is arrested and its contra-clockwise movement initiated.

Since the pins k, k' and k^2 are arranged the same number of degrees apart as to each other, and since the distance equals in degrees that between the numerals 6 to the right and left of the dial, it is apparent if the releasing of the shoulder j^2 occurs when

the hand b is in exact register with the index associated with the numeral 6 to the right, that the hand upon the conclusion of its return or contra-clockwise movement will be arrested in exact register with the index associated with the numeral 6 at the left of the dial.

The operation of the hour hand c under the control of the gear train g, g' and g^2 and shaft d will be identical with that heretofore described, said hand being moved through the engagement of the shoulder o^2 of the dog o' with the stud p, p' or p^2, the projection o^5 engaging the trip member q' to disengage the hand from the clockworks and permit its return contra-clockwise movement in the same manner as heretofore described in relation to the minute hand, it being understood that the minute hand b has this return movement once every hour while the hour hand c has this return movement once every twelve hours.

The shape of the dial is immaterial, as is the exact arrangement of the numerals or characters thereon, so long as the hour and minute indicia in the approximate sector of a circle corresponds with the number of degrees between succeeding pins k, k' and k^2, or p, p' and p^2, it being merely necessary that the same numeral be repeated at the right and the left extremities of the indicia upon the dial.

While in the drawings the speed reducing gearings g, g' and g^2 and h, h' and h^2 are shown as being arranged outside of the main clockworks plates, it is apparent that they may be included between said plates and arranged in any desired manner to secure the operative effect herein described.

It is not my intention to limit the invention to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having means therein receiving continuous unidirectional movement and adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will import a part cycle to said hands respectively, an hour hand, a minute hand, each adapted to have clockwise movement with and contra-clockwise movement independently of said means and means whereby said hour hand and said minute hand are respectively operatively successively connected with said means having continuous, unidirectional movement, whereby each hand receives positive clockwise movement, and when a hand has completed its full clockwise movement, a return, contra-clockwise movement of the hand is permitted.

2. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein receiving continuous, unidirectional movement, and adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, means whereby said hands may be successively operatively connected with the last gear of said gearings respectively to have positive clockwise movement therewith or contra-clockwise movement independently thereof, and means whereby said last named means is disengaged from said gear when it has completed its clockwise movement to permit a return contra-clockwise movement of the hand.

3. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, studs on the last gear of each of said gearings respectively circularly arranged about said gears and spaced apart a number of degrees corresponding with the degrees of the sector occupied by the dial indicia, means carried by said hands adapted to be successively engaged with, and disengaged from, said studs, whereby said hands will receive positive clockwise movement with said gears and be permitted to have contra-clockwise movement independently thereof, and means whereby said last named means will be disengaged from a stud when its hand has completed its clockwise movement, to permit such return or contra-clockwise movement of the hand.

4. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft

upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted, to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said last named means to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, and means whereby each of said dogs is disengaged from said means upon its associated gear when the hand carrying said dog has completed its clockwise movement, to permit a return contra-clockwise movement of the hand.

5. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, studs on the last gear of each of said gearings respectively circularly arranged about said gears and spaced apart a number of degrees corresponding with the degrees of the sector occupied by the dial indicia, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said studs successively to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, and means whereby each of said dogs is disengaged from said studs upon its associated gear when the hand carrying said dog has completed its clockwise movement, to permit a return contra-clockwise movement of the hand.

6. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a hollow shaft upon which the last gear of each of said gearings is idly mounted, an hour hand idly mounted upon said shaft, a shaft idly mounted in said hollow shaft, a minute hand carried by said last named shaft, said hour hand and said minute hand being adapted to have clockwise and contra-clockwise movement, means whereby said hands may be operatively connected with the last gear of said gearings respectively, to have positive clockwise movement therewith, and means whereby said last named means is disengaged from said gear when it has completed its clockwise movement to permit a return contra-clockwise movement of the hand.

7. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, an hour hand, a minute hand, each adapted to have clockwise and contra-clockwise movement, means whereby said hour hand and said minute hand are respectively operatively connected with a speed reducing gearing to positively actuate said hands clockwise, means whereby said last means is disengaged from said speed reducing gearing when a hand has completed its full clockwise movement, to permit a return, contra-clockwise movement of the hand, and adjustable means cooperating with said last named means whereby the disengagement of said hands respectively from said gearing may be accurately timed.

8. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearing therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said last named means to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, means whereby each of said dogs is disengaged from said means upon its associated gear when the hand carrying said dog has completed its clockwise movement, to permit a return contra-clockwise movement of the hand, and adjustable means arranged in the path of movement of the dog carried by each of said arms, whereby the disengagement of said dogs from said studs may be accurately timed.

9. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, studs on the last gear of each of said gearings respectively circularly arranged about said gears and spaced apart a number of degrees corresponding with the degrees of the sector occupied by the dial indicia, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said studs successively to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, means whereby each of said dogs is disengaged from said studs upon its associated gear when the hand carrying said dog has completed its clockwise movement, to permit a return contra-clockwise movement of the hand, and adjustable means arranged in the path of movement of the dog carried by each of said arms, whereby the disengagement of said dogs from said studs may be accurately timed.

10. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, studs on the last gear of each of said gearings respectively circularly arranged about said gears and spaced apart a number of degrees corresponding with the degrees of the sector occupied by the dial indicia, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said studs successively to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, means whereby each of said dogs is disengaged from said studs upon its associated gear when the hand carrying said dog has completed its clockwise movement, to permit a return contra-clockwise movement of the hand, rods adjustably mounted adjacent said gears respectively, and a trip member carried by said rods in the path of movement of said dog, whereby accurate timing of the disengagement of said dog from said studs may be secured.

11. A clock embodying therein a face having hour and minute indicia thereon arranged in the sector of a circle, clockworks having speed reducing gearings therein adapted to respectively actuate an hour hand and a minute hand whereby a full cycle of the clockworks will impart a part cycle to said hands respectively, a shaft upon which the last gear of each of said gearings is idly mounted, an hour hand, a minute hand, said hands being idly mounted to have movement about said shaft so as to be adapted to have clockwise and contra-clockwise movement, studs on the last gear of each of said gearings respectively circularly arranged about said gears and spaced apart a number of degrees corresponding with the degrees of the sector occupied by the dial indicia, an arm carried by each of said hands, a dog pivotally mounted upon each of said arms, means carried by the gear adjacent each of said arms, said dogs respectively being adapted to be alternately engaged with, and disengaged from, said studs successively to cause positive clockwise movement of its hand therewith and permit a return movement of said hand independently of said gear, and means whereby each of said dogs is disengaged from said studs upon its associated gear when the hand carrying said dog has completed its clockwise movement to permit a return contra-clockwise movement of the hand, the arms carried by said hands respectively being so weighted eccentrically of the axis of said hands so as to ensure a complete return movement of the hands by gravity.

In witness whereof I have hereunto affixed my signature, this 4th day of November, 1921.

MAXIMILIAN H. KERN.