March 4, 1941. O. UHL, JR 2,233,756

TIMING DEVICE

Filed June 28, 1940 2 Sheets-Sheet 1

Fig. 1.

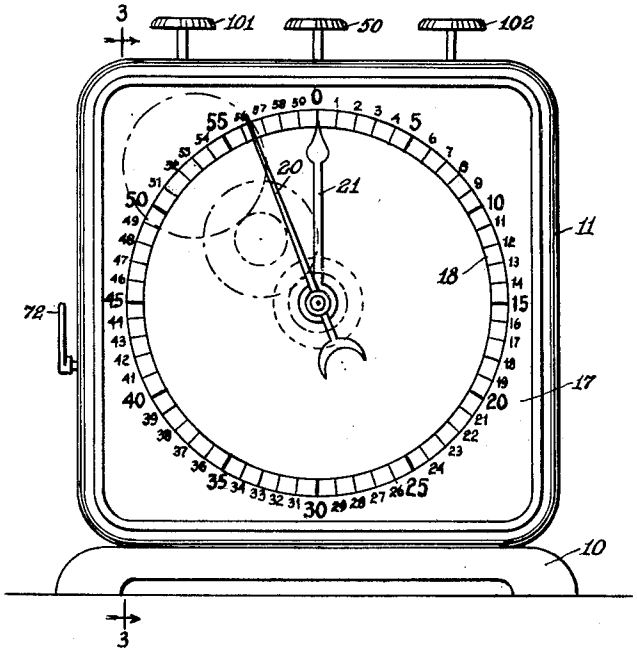
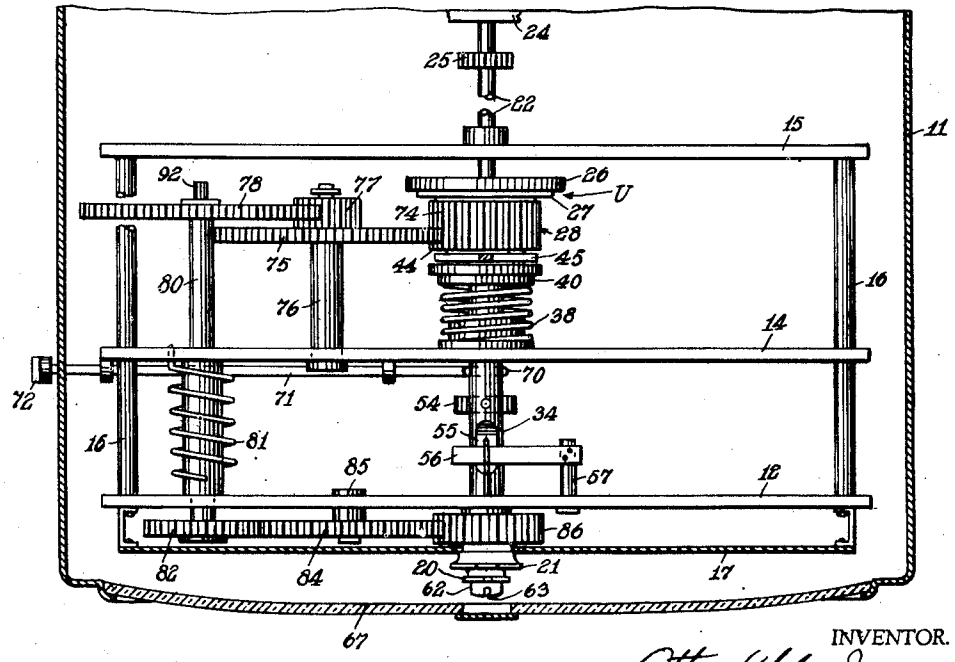


Fig. 2.



INVENTOR.

BY Otto Uhl, Jr.
Williams, Rich & Morse
ATTORNEYS

March 4, 1941. O. UHL, JR 2,233,756

TIMING DEVICE

Filed June 28, 1940 2 Sheets-Sheet 2

Fig. 3.

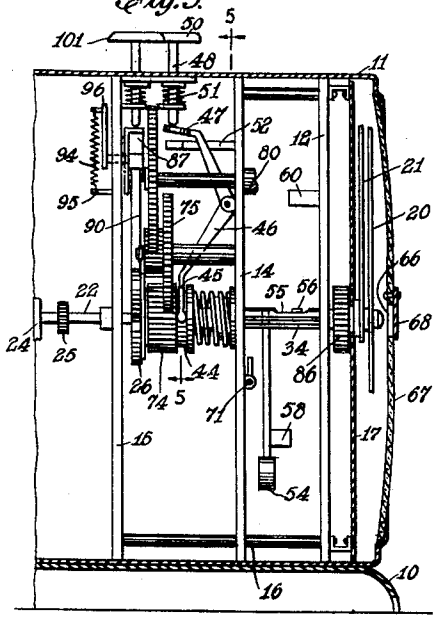


Fig. 4.

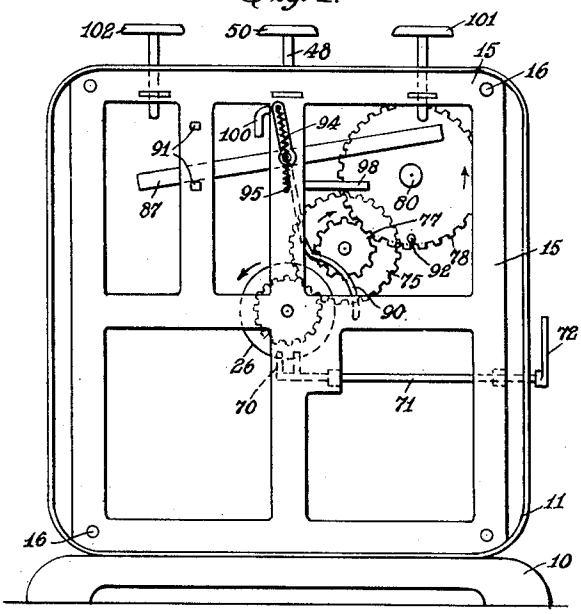


Fig. 5.

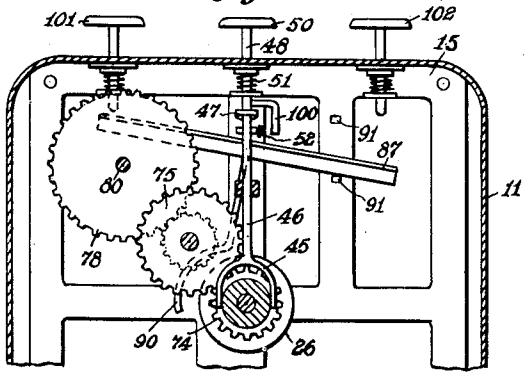


Fig. 6.

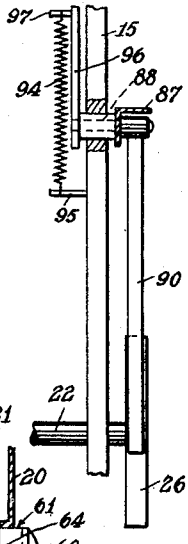
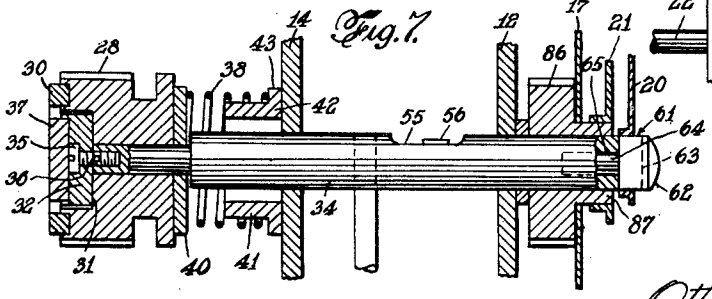


Fig. 7.



INVENTOR.
Otto Uhl, Jr.
BY Williams, Rich & Morse
ATTORNEYS.

Patented Mar. 4, 1941 2,233,756

UNITED STATES PATENT OFFICE

2,233,756

TIMING DEVICE

Otto Uhl, Jr., Flushing, N. Y.

Application June 28, 1940, Serial No. 342,914

10 Claims. (Cl. 161—15)

This invention relates to timing clocks, and has for its object to provide a simple, inexpensive, reliable and generally improved timing device which is adapted for use to advantage in many lines of work.

The manner in which the foregoing and other important objects of the invention are attained will become apparent from the following description when taken in connection with the accompanying drawings, which illustrate one embodiment of the invention and in which—

Fig. 1 is a front view of a timing device embodying the present invention;

Fig. 2 is an enlarged sectional view showing in plan the mechanism employed in driving the second and minute hands at the required relative speeds;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1, portions of the driving mechanism being omitted.

Fig. 4 is a rear view of the timing device;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is an enlarged, fragmental, sectional view showing details of the brake mechanism appearing in Figs. 3 to 5; and

Fig. 7 is an enlarged fragmental view partly in section and partly in elevation of a clutch unit through the medium of which the hands of the timing device are normally driven.

Referring particularly to the drawings, the timing device, herein illustrated as embodying the present invention, includes a base 10, with which is associated a suitable housing 11 within which are provided a plurality of frame members 12, 14 and 15, the frame members being suitably held within the housing and connected together in spaced relation by a plurality of tie rods 16. To the frame member 12 there is suitably connected a dial 17, provided with a scale 18, the graduations of which scale are indicative respectively, of units of time, namely, minutes and seconds. The scale 18 is employed in connection with a second hand 20 and a minute hand 21, which, as will hereinafter more clearly appear, are adapted to rotate according to a ratio of 60 to 1. Thus it will be understood that during such time as the second hand 20 completes one revolution, the minute hand 21 will move from one graduation to another during the course of a one-minute period.

The mechanism by which the second and minute hands 20 and 21 are normally rotated in a clockwise direction, includes a shaft 22, one end of which is journaled in the frame member 15 and the other end of which is associated with a thrust bearing 24. The shaft 22 is equipped with a gear 25 by which such shaft may be conveniently connected to a suitable power source, such as the motor (not shown)) of a conventional clock mechanism of the spring-actuated type. The shaft 22 is equipped at one end with a clutch disk 26, provided on its face with a suitable frictional and shock-absorbent material 27, such as cork or leather, the clutch disk being adapted to cooperate with a clutch head 28 to effect rotation of the second and minute hands 20 and 21, respecively, through the medium of suitable gearing hereinafter more particularly described. The clutch head 28 is provided on its face with an annular groove, within which is secured a ring of suitable frictional and shock-absorbent material 30, such as cork or leather. As shown most clearly in Fig. 7, the clutch head 28 is provided with a central recess 31 adapted for the reception of a clutch plate 32, with respect to which the clutch head is adapted to rotate under conditions of operation hereinafter more particularly described. The clutch plate 32 is secured to the end of the reduced portion of a shouldered shaft 34, journaled in the frame members 12 and 14 and adapted to be displaced longitudinally of itself, as and for the purpose hereinafter explained. Preferably, the clutch plate 32 is secured to the reduced portion of the shaft 34 by a lag screw 35, the plate being effectively held against rotation with respect to its associated shaft by a rib-and-slot interlocking connection as shown at 36. The clutch plate 32 is provided on its face with a suitable frictional and shock-absorbent material 37, such as cork or leather.

In order that the shaft 34, together with its associated clutch head 28 and clutch plate 32, may be normally maintained in a driven relation to the clutch disk 26, there is provided a thrust spring 38, one end of which engages an anti-friction washer 40 disposed intermediate the clutch head and the adjacent shoulder with which the shaft 34 is provided. The other end of the thrust spring 38 surrounds the cylindrical portion 41 of a spacer element 42 and abuts the outwardly extending flange 43 thereof, the spacer element being supported by the frame member 14 and adapted to maintain the thrust spring 38 in a spaced relation to the shaft 34 at all times.

The clutch disk 26, the clutch head 28 and the clutch plate 30 constitute a clutch unit U, in which the frictional members 30 and 37 of the clutch head and clutch plate 28 and 32, respectively, are normally maintained by the spring 38 in driven engagement with the frictional member

27 of the clutch disk. Thus it will be understood that, although the clutch head 28 is free to rotate with respect to the shaft 34 when the clutch unit is released, such clutch head and shaft are rotated simultaneously with, and at the same speed as, the shaft 22 during such time as the frictional members 30 and 31 are maintained in driven engagement with the frictional member 27.

In order that the clutch unit U may be released when it is desired to reset or return second and minute hands 20 and 21 to their respective starting positions, the clutch head 28 is provided on its periphery with an annular groove 44 adapted for the reception of the yoke end 45 of a clutch-actuating lever 46, pivotally supported on the frame member 14 as shown most clearly in Fig. 3. The upper end of the clutch-actuating lever 46 is disposed in a substantially horizontal plane so as to provide a contact foot 47, with which the lower end of the stem 49 of a reset button 50 is adapted to cooperate. The reset button 50 is normally held in its elevated position by a thrust spring 51, associated with the stem 49 and adapted to yield as the button is depressed. Upon releasing the clutch unit U, the shaft 34 is free to rotate, with respect to the clutch head 28, and is therefore adapted to be returned from any advanced position to its normal or starting position so as to effect the return of the second hand 20 to its starting position. Such return movement of the shaft 34 is effected under the influence of gravity acting on a pendulum 54 connected to the shaft and adapted to move under its own weight from any position other than a truly depending one to its normal position of rest shown in Fig. 3. In order to obviate oscillation of the pendulum 54 as it swings into its normal or depending position, the shaft 34 is provided with a flat surface, as shown at 55, with which surface a flat spring 56 is adapted to intimately engage, the spring being secured at one end to a lug 57 carried by the frame member 12.

The possibility of the existence of such a state of equilibrium of the pendulum 54 as would obviate its return to a normal position is precluded by providing the pendulum with a knife-edge cam 58, and by providing the frame member 12 with a similar knife-edge cam 60 located above the axis of the shaft 34 in a vertical plane passing through such axis. These knife-edge cams are so disposed that, in the event the clutch unit U is declutched while the pendulum 54 is in its upper dead-center position, the cam 58 will engage the cam 60, as the shaft 34 is displaced longitudinally of itself, and thereby move the pendulum in one direction or the other to an off-center position, thus allowing it to be effectively acted on by gravity whereby its return to its normal position is insured. Although the cams 58 and 60 are so related that engagement of one with the other is effected under the condition just described, it is to be observed that under normal operating conditions the cam 58 is permitted to move unobstructedly past the cam 60 as the pendulum moves through its upper dead-center position.

In order to permit the second hand 20 to be readily adjusted to predetermined starting position, it is secured to an adjustable plug-like pin 61, the head portion 62 of which is provided with a slot 63 and the shank portion 64 of which is frictionally held within a socket 65 formed in one end of the shaft 34. When it is desired to rotate the plug-like pin 61, with respect to the shaft 34 to effect, for example, pre-zero positioning of the second hand 20, a suitable instrument such as a screw driver may be inserted in the slot 63 by way of an opening 66 provided in the transparent protective dial cover 67, the opening being normally closed by a pivotally supported shutter-like closure 68. In order that the shaft 34 may be restrained against rotation during such time as the plug-like pin 61 is being rotated to effect an adjustment of the second hand 20, there is provided a U-shaped latch 70 which is carried by a shaft 71 journaled on the frame member 14, the shaft being provided at its outer end with an operating lever 72 by which it may be so rotated as to move the latch into interlocking engagement with the pendulum 54. Inasmuch as the latch 70 is adapted to receive the pendulum 54 between its restraining arms, it follows that the shaft 34 may be effectively retained against rotation in either direction when making an adjustment of the second hand 20 in one direction or the other, pursuant to which the pendulum may be released by moving the latch, through the medium of the shaft 71 and its associated handle 72, to its upper or retracted position shown in Fig. 3.

Since the minute hand 21 is required to rotate with relation to the second hand 20 according to the rotation of 1 to 60, the clutch head 28, which is adapted to rotate at the same speed as the shaft 34, namely, 1 R. P. M., may be employed in transmitting power of rotation to the minute hand by way of suitable reduction gearing so as to establish the desired speed relationship between the second and minute hands. To this end the clutch head 28 is provided at its periphery with a gear 74, the face of which is sufficiently wide to maintain engagement of that gear with its associated gear 75 despite longitudinal displacement of the shaft 34 under the action of the reset button 50 or the thrust spring 38. The gear 75 is journaled on a stub shaft 76 carried by the frame member 14 and is provided with a drive pinion 77, meshing with a gear 78, secured to a shaft 80, journaled in the frame members 12 and 14. The shaft 80 is surrounded by a torsion spring 81, one end of which is anchored to the shaft and the other end of which is anchored to the frame member 14 as shown. To the front end of the shaft 80, there is secured a gear 82, meshing with an idle gear 84, journaled on a stub shaft 85, carried by the frame member 12. The gear 84 meshes with a gear 86, which is journaled on the shaft 34 and to the hub-like flange 87 of which the minute hand 21 is rigidly secured. The gear train just described as including the gears 74, 75, 77, 78, 82, 84 and 86 is such that a gear ratio of 60 to 1 is attained between the gears 74 and 86 with the result that a corresponding speed ratio is attained between the second hand 20 and the minute hand 21. Referring to the torsion spring 81, it is to be observed that the direction of rotation of the shaft 80 is such incident to movement of the minute hand 21 in a clockwise direction, reference being had to Fig. 1, that energy is stored in the spring, the energy thus stored being sufficient, when the reset button 50 is depressed, to effect the return of that hand to its starting position from any advanced position that it may assume. In order to limit movement of the minute hand 21 to less than one complete revolution in its clockwise travel, means are provided for automatically applying a braking action to the clutch disk 26 at the proper instant. The automatic braking mechanism comprises an operating lever 87, connected to a shaft 88 piv-

otally supported in the frame member 15 and provided at one end with a spring like brake finger 90 adapted to be moved into and out of engagement with the clutch disk 26, as the operating lever 87 is moved from one extreme position to another extreme position as determined by a pair of stop lugs 91 which are carried by the frame member. In order that the operating lever 87 may be so moved as to automatically effect engagement of the brake finger 90 with the clutch disk 26 at the instant the minute hand 21 completes a predetermined portion of one complete revolution, the gear 78 is provided with an actuating pin 92, which, as the gear 78 is rotated in a counterclockwise direction (reference being had to Fig. 4), engages the operating lever 87, and thereupon causes that lever to move in a clockwise direction. Incident to a predetermined movement of the operating lever 87 under the action of the actuating pin 92, such lever is further moved with a snap action under the influence of a tension spring 94, one end of which is anchored to the frame member 15 through the medium of an anchor pin 95 and the other end of which is connected to the shaft 88 through the medium of a cranking arm 96 secured to that shaft and provided at its outer end with an anchor pin 97 to which the tension spring 94 is connected. After movement of the minute hand 21 has been discontinued by application of the braking mechanism just described, the minute hand 21 may be restored to its initial or starting position by depressing the reset button 50 in which case the clutch unit U is released whereupon reverse movement of the shaft 80 is effected under the action of its associated torsional spring 81. Such reverse movement of the shaft 80 is so limited as to cause the minute hand 21 to assume its zero or starting position, the means employed in this connection being herein illustrated as a suitably located stop lug 98 against which the actuating pin 92 abuts as the gear 78 is rotated in clockwise direction, reference being had to Fig. 4. As the minute hand 21 is returned to its starting position, incident to declutching of the clutch unit U, the second hand 20 is returned to its starting position under the action of gravity acting on the pendulum 54 in the manner hereinbefore described. Thus it will be understood that the reset button 50 performs the dual function of simultaneously initiating the return of the second hand 20 and the minute hand 21 to their initial or starting positions. It is observed, however, that immediately following the resetting operation of the hands 20 and 21, a further depression of the reset button 50 will effect such displacement of the operating lever 87 as to move it in a clockwise direction, reference being had to Fig. 5, so as to effect a release of the brake finger 90 from the clutch disk 26. Such movement of the operating lever 87 is effected by an actuating finger 100, which is suitably connected to the stem 48 of the reset button 50 and is adapted to engage the operating lever 87 and move it a sufficient distance to enable the tension spring 94 to further move it with a snap action to its position shown in Fig. 5. After having declutched the clutch unit U, and thereafter released the brake finger 90 in the manner described, rotation of the second and minute hands 20 and 21 may again be effected in a clockwise direction, reference being had to Fig. 1, by permitting the reset button to return to its normal position whereupon the clutch unit U is rendered effective under the action of the thrust spring 38.

In order that movement of the second and minute hands 20 and 21, respectively, may be discontinued at any point intermediate their initial or starting positions and the positions in which they are brought to rest automatically, through the cooperation of the actuating pin 92 with the operating lever 87 in the manner already described, there is provided a stop button 101. This stop button is substantially identical with the reset button 50 already described and for that reason it is deemed unnecessary to elaborate on it other than to point out that it is so disposed with respect to the operating lever 87 that this lever may be so moved, incident to depression of the stop button, as to cause it to move in a clockwise direction, reference being had to Fig. 4, a sufficient distance to permit the tension spring 94 to then further so move the lever with a snap action as to cause the brake finger 90 to engage the clutch disk 26. In order that rotation of the second and minute hands 20 and 21, respectively, may be established in a clockwise direction, reference being had to Fig. 1, after they have been brought to rest under the operation of the stop button 101, there is provided a start button 102 which is structurally identical with the stop button 101 but is adapted, when depressed, to engage the operating lever 87 and so move it in a counterclockwise direction, reference being had to Fig. 4, from its braking position as to enable the tension spring 94 to act on it and further move it to its position shown in Fig. 4, thereby causing the brake finger 90 to disengage the clutch disk 26.

From the foregoing, it will be understood that the timing device embodying the present invention is not only simple and inexpensive but is also such, due to its flexibility of control, that it may be used to advantage in many lines of work where accuracy in the timing of operations which are to be carried out, either interruptedly or uninterruptedly, is of utmost importance.

Although only one form of the invention is herein shown and described, it will be understood that various changes may be made without departing from the spirit of the invention, as for example, the substitution of a suitable switch for the brake finger 90 and the utilization of such switch to start and stop an electric motor so connected to the shaft 22 as to rotate that shaft at the rate and in the manner already described.

What is claimed is:

1. A timing device comprising a longitudinally displaceable shaft, an indicator hand secured to said shaft, a clutch unit associated with said shaft and including a clutch disk and a clutch plate, said clutch plate being carried by said shaft and normally engaging said clutch disk, means for longitudinally displacing said shaft whereby said unit is declutched, and means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its starting position.

2. A timing device comprising a longitudinally displaceable shaft, an indicator hand secured to said shaft, a clutch unit associated with said shaft and including a clutch disk and a clutch plate, said clutch plate being carried by said shaft and normally engaging said clutch disk, means for longitudinally displacing said shaft whereby said unit is declutched, and a pendulum carried by said shaft and rendered effective incident to declutching said unit for rotatively returning said

shaft to its starting position whereby said hand is returned to its starting position.

3. A timing device comprising a longitudinally displaceable shaft, an indicator hand secured to said shaft, a clutch unit associated with said shaft and including a clutch disk and a clutch plate, said clutch plate being carried by said shaft and normally engaging said clutch disk, means for longitudinally displacing said shaft whereby said unit is declutched, a pendulum carried by said shaft and rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its starting position, and cam means rendered effective incident to longitudinal displacement of said shaft to move said pendulum from its dead-center position above the axis of said shaft in the event such dead-center position prevails at the instant said shaft is longitudinally displaced in the declutching operation.

4. A timing device comprising a shaft, a second indicator hand secured to said shaft, a minute indicator hand supported on said shaft for rotation with respect thereto, a clutch unit associated with said shaft and including a clutch disk, a clutch head and a clutch plate, said clutch head being carried by said shaft for rotation with respect thereto and said clutch plate being secured to said shaft for rotation therewith, means for maintaining said clutch head and clutch plate in driven relation to said clutch disk whereby said clutch head and said shaft are driven simultaneously at the same speed, gear means operatively connecting said clutch head with said minute hand whereby said minute hand is rotated simultaneously with said shaft but at a reduced speed with respect thereto, means for declutching said clutch unit, means rendered effective upon declutching said unit for rotatively returning said shaft to its starting position whereby said second indicator hand is returned to its starting position, and means rendered effective upon declutching said unit for rotatively returning said minute indicator hand to its starting position.

5. A timing device comprising a longitudinally displaceable shaft, a second indicator hand secured to said shaft, a minute indicator hand supported on said shaft for rotation with respect thereto, a clutch unit associated with said shaft and including a clutch disk, a clutch head and a clutch plate, said clutch head being carried by said shaft for rotation with respect thereto and said clutch plate being secured to said shaft for rotation therewith, means for maintaining said clutch head and clutch plate in driven relation to said clutch disk whereby said clutch head and said shaft are driven simultaneously at the same speed, gear means operatively connecting said clutch head with said minute hand whereby said minute hand is rotated simultaneously with said shaft but at a reduced speed with respect thereto, means for longitudinally displacing said shaft whereby said unit is declutched, means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said second indicator hand is returned to its starting position, and means rendered effective incident to declutching said unit for rotatively returning said minute indicator hand to its starting position.

6. A timing device comprising a longitudinally displaceable shaft, a second indicator hand secured to said shaft, a minute indicator hand supported on said shaft for rotation with respect thereto, a clutch unit associated with said shaft and including a clutch disk, a clutch head and a clutch plate, said clutch head being carried by said shaft for rotation with respect thereto and said clutch plate being secured to said shaft for rotation therewith, means for maintaining said clutch head and clutch plate in driven relation to said clutch disk whereby said clutch head and said shaft are driven simultaneously at the same speed, gear means operatively connecting said clutch head with said minute hand whereby said minute hand is rotated simultaneously with said shaft but at a reduced speed with respect thereto, means for longitudinally displacing said shaft whereby said unit is declutched, a pendulum secured to said shaft and rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said second indicator hand is returned to its starting position, and spring means associated with said gear means and rendered effective on said gear means incident to declutching said unit for rotatively returning said minute indicator hand to its starting position.

7. A timing device comprising a longitudinally displaceable shaft, an indicator hand adjustably secured to said shaft whereby such hand may be predeterminedly positioned at any one of a number of starting positions, a clutch unit associated with said shaft and including a clutch disk and a clutch plate, said clutch plate being carried by said shaft and normally engaging said clutch disk, means for longitudinally displacing said shaft whereby said clutch unit is declutched, and means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its predetermined starting position.

8. A timing device comprising a longitudinally displaceable shaft, an indicator hand adjustably secured to said shaft whereby such hand may be predeterminedly positioned at any one of a number of starting positions, a clutch unit associated with said shaft and including a clutch disk and a clutch plate, said clutch plate being carried by said shaft and normally engaging said clutch disk, means for longitudinally displacing said shaft whereby said clutch unit is declutched, means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its predetermined starting position, and manually controlled means for retaining said shaft against rotation while in its starting position and while adjustment of said hand to a predetermined starting position is being effected.

9. A timing device comprising a longitudinally displaceable shaft, an indicator hand secured to said shaft and adapted to be rotated through the medium thereof, a clutch unit associated with said shaft and through the medium of which said shaft is rotated, automatically actuated control means rendered effective incident to predetermined rotation of said shaft to render said shaft inactive, and reset means operable to first effect longitudinal displacement of said shaft whereby said clutch unit is declutched and further operable to next render said control means ineffective, means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its starting position, and means for thereafter rendering such unit effective with respect to said shaft.

10. A timing device comprising a longitudinally displaceable shaft, an indicator hand secured to said shaft and adapted to be rotated through the medium thereof, a clutch unit associated with said shaft and through the medium of which said shaft is rotated, automatically actuated control means rendered effective incident to predetermined rotation of said shaft to render said shaft inactive, and reset means operable to first effect longitudinal displacement of said shaft whereby said clutch unit is declutched and further operable to next render said control means ineffective, means rendered effective incident to declutching said unit for rotatively returning said shaft to its starting position whereby said hand is returned to its starting position, means for thereafter rendering such unit effective with respect to said shaft, and manually actuated means operable on the one hand to render said shaft inactive at any instant during such time as said shaft is being rotated through the medium of such unit and operable thereafter on the other hand to render said shaft active under the influence of said unit.

OTTO UHL, JR.