J. S. KENNEDY.

TIMING DEVICE.

APPLICATION FILED OCT. 9, 1919.

1,367,148.

Patented Feb. 1, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

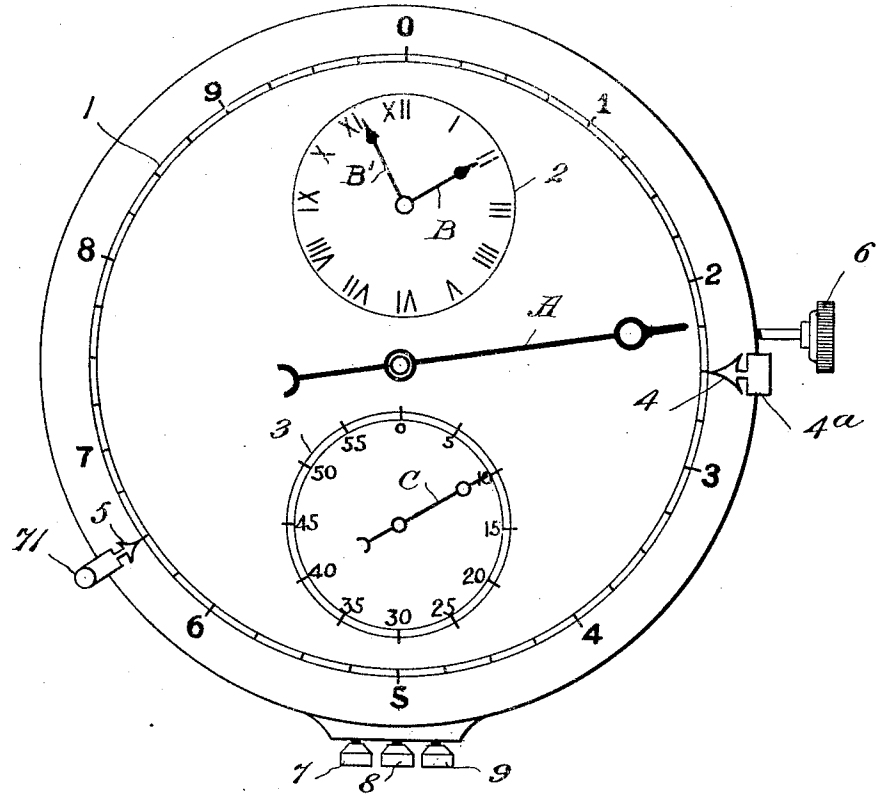
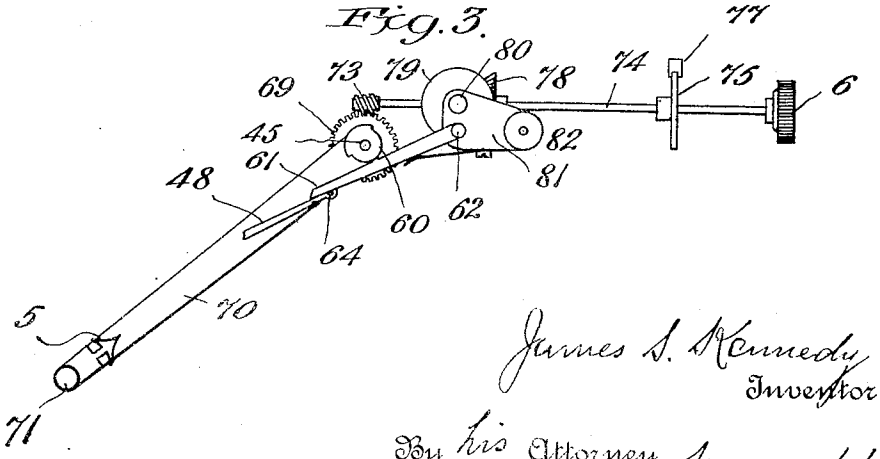


Fig. 3.



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By his Attorney Thomas King

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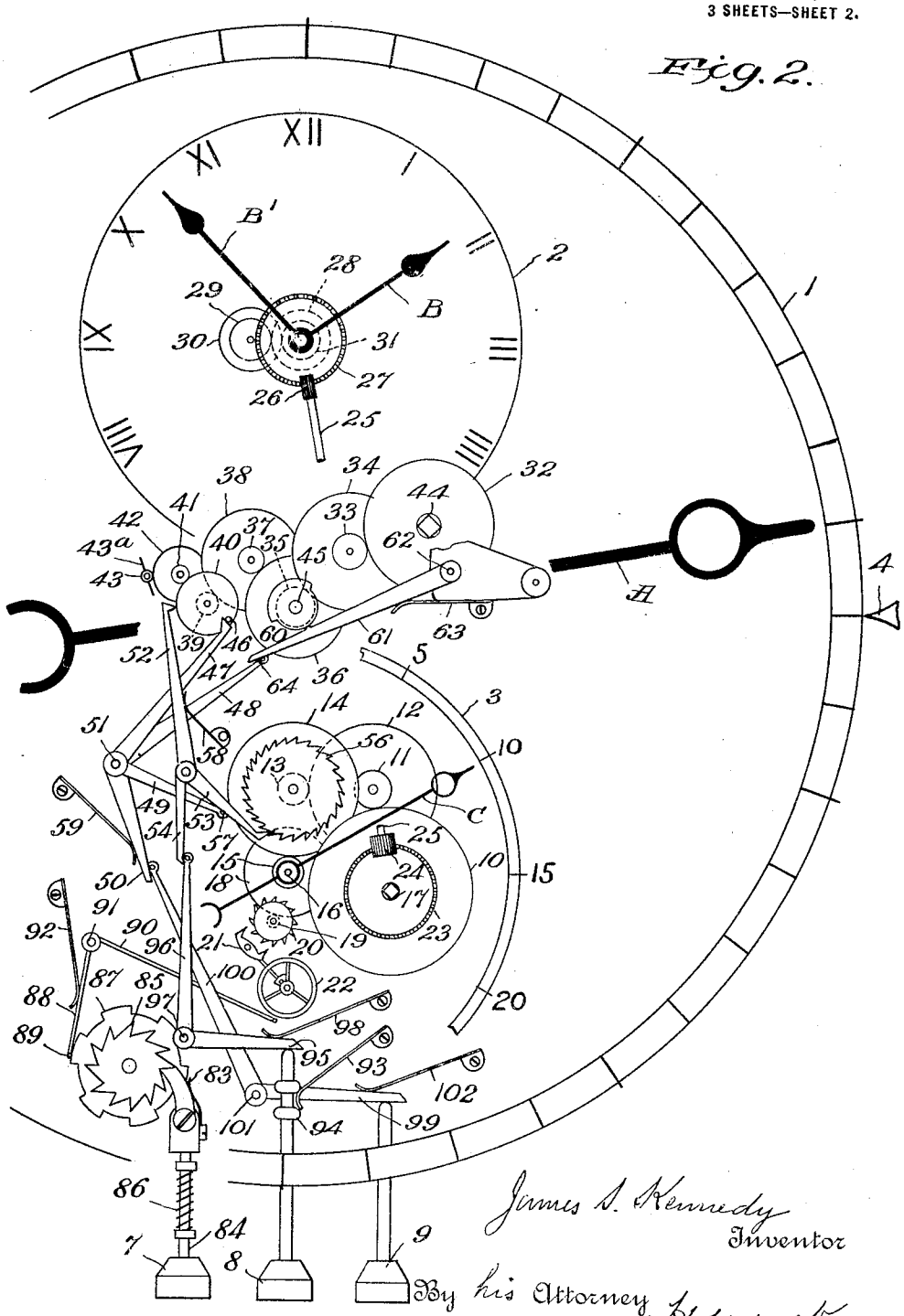
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 5.

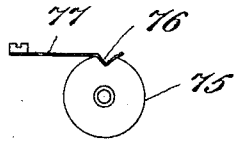
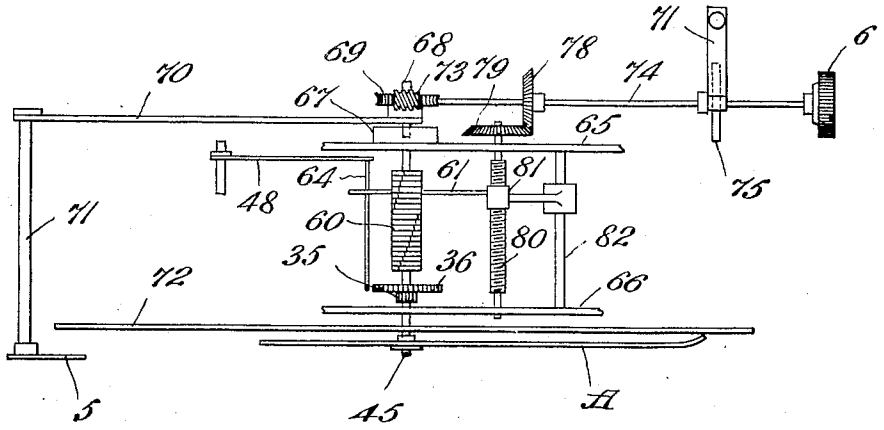


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES S. KENNEDY, OF YONKERS, NEW YORK.

TIMING DEVICE.

1,367,148. Specification of Letters Patent. Patented Feb. 1, 1921.

Application filed October 9, 1919. Serial No. 329,636.

To all whom it may concern:

Be it known that I, JAMES S. KENNEDY, a citizen of the United States, residing in Yonkers, county of Westchester, State of New York, have invented a certain Improvement in Timing Devices, of which the following is a specification.

In the manufacture of water gas a current of steam is passed through a layer of anthracite or coke in a state of incandescence, whereby the steam is decomposed, the resulting hydrogen and carbon monoxid being utilized in connection with further steps in the process which needs no description here. The passage of steam through the mass of glowing fuel soon lowers its temperature to a point at which decomposition becomes too slow, and it then becomes necessary to shut off the steam and to restore the requisite high temperature by blowing air through the fuel mass, after which gas production is resumed by substituting steam for air. The process thus involves a series of alternating periods of air draft called the "blow" period, and of gas production, called the "run" period.

The respective durations of the blows and runs vary greatly depending upon the character of the fuel and upon local and operative conditions, and it is important, not only that these periods be determined by competent gas engineers, but that means be provided whereby the operatives may be enabled easily and exactly to measure each period without danger of mistake or confusion. This is particularly true because it is customary to use two or more sets in many gas works; and, obviously, these should be so timed as to distribute the blow and run periods among the various sets in the most efficient manner.

It has been found, particularly for short cycles of operation, such as two minute blows and four minute runs, that an ordinary clock is not well adapted to the necessary timing operations. Temporary changes are often necessary, as, for instance, to a cycle of two and a quarter minutes blow and four minutes run, and under such circumstances the danger of confusion in the operator's mind, as well as the difficulty of preserving proper adjustment of time among the various sets, is obvious.

It is the principal object of the present invention to provide a simple and thoroughly reliable timing device for the guidance of operators under the circumstances above set forth. The invention is, of course, useful in any connection where it is found desirable to distribute successive time periods in various cycles variously divided.

In its main features my present invention comprises a timing device for measuring a convenient total cycle of time in convenient units, and adapted to return automatically to zero at the conclusion of the cycle in question without practical loss of time. I prefer to use an indicator having a cycle of movement, such as a dial and a pointer moving around the same, always in the same direction, but it would be within the scope of my invention to employ an indicator arranged to return to zero by a reverse movement.

It is to be understood that, although I have herein described and shown a timing device moving through a cycle of ten minutes and divided into quarter-minute units indicated by a pointer moving step by step, my invention may be embodied in apparatus fitted to a different cycle or time period, and differently divided.

My invention is illustrated in a preferred form in the accompanying drawing, wherein Figure 1 is a front elevation of the entire timing device with its preferred auxiliary time indicators, Fig. 2 is an enlarged elevation of the same with a large part of the main dial removed to show the interior mechanism, Fig. 3 is a view in elevation of certain details of mechanism, Fig. 4 is a plan view of the same, and Fig. 5 is an elevation of a further detail.

In the apparatus as herein shown and described by way of example, the principal timing device has an indicator or pointer A adapted to move clockwise around a principal dial 1, divided into ten one-minute periods, each of which is subdivided into quarter minutes. Progress of the pointer is by jumps from one quarter-minute mark to the next.

Within the area of the principal or main dial 1, are placed the auxiliary dials 2 and 3. The former of these is an ordinary clock with an hour hand B and a minute hand B'; while the dial 3 is marked off in sixty seconds indicated by the pointer C which makes one revolution a minute. The same train of clockwork runs both of these auxiliaries, and the device is so used in practice that the pointer C always indicates the termination of a quarter minute period on dial 3 (al-

though not necessarily the fourth quarter) at the same instant that the hand A leaps to a new quarter-minute mark on the dial 1.

The ten minutes cycle of dial 1 is intended for use where the total cycle to be measured is less than ten minutes; and, in the preferred form shown this total cycle is always more than five minutes.

The dividing point between the two parts of the total cycle, for instance between blow and run, is indicated by an index 4, which is capable of adjustment at will along the periphery of the dial. This may be variously accomplished as, for instance, by means of a spring clip 4^a carrying the index 4, and adapted to be slid into any position on the rim of the dial.

The end of the cycle is indicated by an index 5 movably mounted as hereinafter described, and capable of being set opposite any quarter-minute mark along the left hand semicircle (second five minutes) in Fig. 1. The thumb-nut 6 is used as hereinafter described for setting the index 5 and certain coöperating elements in my mechanism.

Assuming, now, that the hand A starts at zero with the beginning of a blow period in a water gas set. It will jump forward from one mark to the next every fifteen seconds until it reaches the index 4, which has been set by an engineer to indicate the end of the period of blow which is appropriate under the existing circumstances. The second hand C will measure the progress of time during each quarter minute, so that the operator who is watching it can prepare for the necessary manipulation of valves, and can be ready to change quickly from blow to run when the hand A jumps to the mark opposite the index 4.

In the same manner the operator watches the hand A near the end of the operating cycle, and, when the hand A reaches the index 5, he changes back from run to blow, and the operating cycle begins anew.

It is clearly very essential that, at this point, the hand A should return to zero, in order that it may again reach the index 4 at the end of the next blow period, and my invention provides means whereby this return is accomplished automatically, whatever the position of the index 5, this being done quickly enough so that the hand A is ready to move to the first quarter-minute mark in due time.

The auxiliary clock 2 is merely used to enable the operator to enter upon his time sheets the hour and minute of each blow and run.

At the bottom of the main dial 1 are three buttons 7, 8 and 9, whose modes of operation are hereinafter made clear. The purpose of the button 7 is to stop all the movements in order to set and start the hands B, B′ and C by a master timepiece. By this means all the timing devices for the various coöperating sets may be synchronized, so that they may be started at proper relative times, with a view to efficient distribution of the various blow and run periods. Upon pushing the button 7 a second time the hands B, B′ and C are started at the proper instant of time.

By pushing in the button 8, the hand A is arrested, and cannot again start until this button is pulled out. This is to prevent needless running of the hand A when a set is shut down for any reason.

When the button 9 is pushed in, and held, the hand A will run quickly around the dial 1. This is to reset the hand A when commencing to use the timer to time a blow or a run. Upon releasing this button when the hand is between the index 5 and zero, it will run on until it reaches zero and there stop.

I shall now describe the preferred details of mechanism whereby the above described operations are carried out.

The main hand or pointer A is actuated by a clockwork which I have called the "motive train" and the step-by-step progress of this train is controlled by a "controlling train" which also runs the two auxiliary timing devices. Each train has its own main spring (not shown).

Referring first to the "controlling train," the successive spur wheels 10, 11, 12, 13, 14 and 15 drive the arbor 16 which carries the second hand C, and these are driven in a well known manner by a spring on the shaft 17, having a squared end for fitting a winding key.

The wheel 10 carries a crown wheel 23 meshing with a pinion 24 on one end of a shaft 25, at whose opposite end is a pinion 26 driving a second crown wheel 27, which operates through a train, 28, 29, 30, 31 to drive the hour and minute hands B and B′ in a well known manner.

In the "motive train," the wheels 32, 33, 34, 35, 36, 37, 38 and 39 drive the "pinwheel" 40; which, in turn drives the train 41, 42 and 43, running the fly 43^a which regulates the speed of movement of the entire "motive train." The usual main spring on the squared shaft 44 actuates the train, and the main hand A is carried by the arbor 45 concentric with the wheels 35 and 36.

This motive train is normally held motionless by a pin 46, on the pinwheel 40, which rests against the end of an arm 47 of a four-armed lever whose other arms are shown at 48, 49 and 50, and which is revolubly mounted at 51.

A three-armed lever 52, 53, 54 is similarly mounted at 55, and this lever is controlled by a wheel 56 having thirty-two slanting teeth, and fixed to the wheel 14. A pin on the arm 49 projects into the plane of move-

ment of the arm 53 just behind that arm, so that when 53 swings to the left in Fig. 2 it swings all four arms 47, 48, 49, 50 around their pivot 51.

The pointed end of the arm 53 is pressed against the wheel 56 by the spring 58, and, as the wheel 56 revolves anti-clockwise each tooth in turn gradually lifts this pointed end and then lets it drop suddenly into the next space behind the lifting tooth. The wheels 14 and 56 turn eight times for each complete revolution of the wheel 15 and second hand C. As there are thirty-two teeth on the wheel 56, it follows that this movement will occur once every quarter minute. The result is that, every fifteen seconds, the arm 47 will swing to the right liberating the pin 46, which is caught by the hook on the arm 52 and at once liberated when the end of 53 drops into a space on 56, bringing the arm 47 into position to catch the revolving pin 46 after it has completed one turn.

The "motive train" is so calculated that this one turn of the wheel 40 will carry the main hand A from one quarter-minute mark to the next on the dial 1.

The spring 59 preserves the normal position of the four-armed lever and holds the pin 57 against the arm 53.

This regular step-by-step movement of the hand A is continued until the end of the appointed cycle is reached, when automatic means are employed to carry the hand A at once to zero without pausing beyond the position of the index 5.

For this purpose I have shown a cam 60, mounted on the arbor 45, which cam is provided with a low portion and a high portion on its periphery. A lever 61 has a point bearing upon the periphery of the cam 60 and this lever is pivotally mounted at 62, being pressed against the cam by a spring 63. The cam is so proportioned and placed that while the hand A is moving from zero to the index 5, the point of the lever 61 rests upon the low portion of the cam, but when the hand A reaches the index 5, the high portion of the cam lifts the lever 61, which presses the pin 64 on the arm 48, and moves the end of the arm 47 out of the path of the pin 46, thus permitting the whole motive train to run free, without any restriction from the controlling train. This continues until the hand A reaches zero, when the low part of the cam 60 reaches the bearing point on the lever 61, which is then allowed to move to normal, allowing the arm 47 once more to stop the pin 46 and arrest the motive train. The speed of this return movement is such that the hand A reaches zero before the next releasing action of the controlling train. I do not limit myself to the use of a cam in this connection for determining the time of resetting. Other determining elements may be employed as equivalents without departing from my invention.

In order to adapt a single apparatus to different cycles of time it is necessary to provide automatic returning means which are capable of adjustment so as to liberate the motive train in this manner at the end of any predetermined total time interval. At the same time, the index 5, whereby the operator is warned of the termination of the cycle, must be moved to the proper position for this purpose. Obviously the adjustment of the automatic returning means must be so connected with the index-support that the return will take place when the hand A reaches the index.

For these purposes, as shown best in Fig. 4, I employ as determining elements a series of cams placed face against face, one for each quarter minute mark between five minutes and zero on the main dial. As indicated in Fig. 4, the proportion of high to low periphery varies progressively from one end of the series to the other. The cam at one end of the series corresponds to a cycle ending at five minutes and will have one half high and one half low. The cam at the opposite end corresponds to nine and three quarters minutes total cycle, and only one fortieth of the periphery will be high.

In order to cause one of these cams at a time to become operative at the proper time, and in correspondence with the position of the index 5, I prefer to employ the construction shown best in Figs. 3, 4 and 5.

Upon the arbor 45 and between the frame-plates 65 and 66, are mounted the series of cams 60 and certain auxiliary adjustable elements of the automatic returning means. Outside of the plate 65 is a block 67 carrying a stub shaft 68 upon which is mounted a worm wheel 69 and an arm 70. The outer end of this arm carries a rod 71 extending just forward of the dial plate 72, close to its periphery and carrying the index 5.

A worm 73 on the shaft 74 drives the wheel 69, and this shaft carries a stop wheel 75 having a notch 76 into which fits a V-shaped portion on the spring 77. These last elements hold the parts steady in their appointed positions, and enable the person who rotates the rod 74 by means of the button 6 to identify the proper position of the parts. One revolution of the worm 73 and stop wheel 75 corresponds to movement of the index 5 from one quarter-minute mark to the next on the main dial.

By means of the beveled gears 78 and 79, revolution of the shaft 74 is caused to turn the screw 80. This screw fits a thread in the carriage 81 which is mounted to slide along the rod 82, and upon which the lever 61 is pivotally mounted at 62. From this it is clear that revolution of the rod 74 not only adjusts the position of the index 5, but causes

the lever 61 to bear successively upon one after the other of the cams 60. By proper proportion of parts the lever 61 is always made to bear upon that particular cam in the series that corresponds with the simultaneous position of the index.

Having now described the normal operation of my apparatus and its mode of adjustment to different time cycles, it only remains to describe the means whereby the same may be manually controlled by the buttons 7, 8 and 9, for the purposes already set forth.

The button 7 operates a spring-pressed pawl 83 pivoted on the rod 84, and engaging a toothed wheel 85. The button pawl and rod are normally pressed outward by the spring 86. Turning with the wheel 85 is a cam 87 having high and low peripheral portions, of equal angular dimensions. There is one high portion and one low portion for each pair of teeth in the wheel 85.

A slender arm 88 has a pin 89 which bears peripherally upon the cam 87. A second arm 90 is fixed to the arm 88 and the two are pivotally mounted at 91. The spring 92 presses the pin 89 against the cam 87, and when the pin comes opposite a low portion of the cam, this spring is permitted to press the end of the arm 90 against the balance wheel 22, thereby stopping the clockwork for synchronizing purposes, as above described.

Pushing the button inward and releasing it thus acts to stop the clockwork or controlling train, while the next movement in and out of the button starts it again, by bringing the pin 89 upon a high portion of the cam 87 and removing the arm 90 from contact with the wheel 22.

The button 8 is held in the normal position shown by a spring 93 which engages rings 94 on the shaft of the button. This spring holds the button steady when pushed in or pulled out into the position shown.

On pushing the button in, its shaft swings the two-armed lever 95, 96 around its pivot 97 against the pressure of the spring 98. This brings the hook 52 into position to catch the pin 46 and hold the pointer A stationary until the button 8 is again pulled out. At the same time the arm 53, acting on the pin 57, removes the arm 47 from in front of the pin 46, allowing said pin to move forward to be caught by the hook 52.

When the button 9 is pushed inward, its shaft pushes the two-armed lever 99, 100, which is pivotally mounted at 101. A pin on the end of the arm 100 swings the arm 50 to the left, thus removing the arm 47 from contact with the pin 46 and allowing the hand A to turn freely. Upon releasing the button 9, the springs 59 and 102 will return all the parts to normal, and the hand A can thus be stopped at any desired quarter-minute mark between zero forward to the index 5. If the button 9 be released beyond the index 5, the cam 60 will, of course, prevent the hand A from stopping until it reaches zero again.

It is clear that the essential elements of my invention may be embodied in a great variety of forms and applied to many uses, and it is to be understood that I have described the same in the form shown and for the purposes mentioned merely by way of example.

What I claim is:—

1. A timing device comprising an indicating pointer, clock work adapted to move the same forward from the starting point, and automatic means adapted to coöperate with said clock work to return said pointer to its starting point when it has reached a predetermined limit of movement.

2. Apparatus of the character set forth in claim 1 hereof, wherein the pointer is arranged to complete a succession of cycles of movement and wherein the automatic returning means is adapted to move the pointer forward to the starting point of a new cycle of movement.

3. A timing device comprising an indicating pointer, clock work adapted to move the same from its starting point, automatic returning means comprising a plurality of determining elements, each adapted to start the returning means at a different point in the range of movement of the pointer and regulating means for bringing any one determining element into operative relation with the remaining elements of the returning means.

4. Apparatus of the character set forth in claim 3 hereof, wherein a pointer is mechanically connected with the regulating means so as to move therewith to indicate the point of return for the timing pointer.

5. In apparatus of the general character described, a pointer and dial, a motive train for said pointer, a controlling train adapted to restrict the action of said first named train to a step by step movement, and returning means for the pointer operated by said motive train and adapted to free the same temporarily from the restricting action of said controlling train.

6. Apparatus of the character set forth in claim 5 hereof, wherein a secondary timing device is provided, driven by said controlling train, and comprising means adapted to measure the time periods between successive step by step movements of the motive train.

7. Apparatus of the character set forth in claim 5 hereof, wherein a clock is provided for indicating the time of day in hours and minutes, the driving mechanism of said clock being operatively connected with the controlling train.

8. Apparatus of the character set forth in

claim 5 hereof, combined with manual means for stopping and starting the movement of the controlling train.

9. Apparatus of the character set forth in claim 5 hereof, combined with manual means for freeing the motive train from the restricting action of the controlling train.

10. Apparatus of the character set forth in claim 5 hereof, combined with manual means for simultaneously arresting movement of the motive train and disconnecting the same from the controlling train.

11. Apparatus of the character set forth in claim 1 hereof, wherein an index is provided which is movably attached between the starting point and the point of return.

12. A timing device comprising an indicating pointer, clock-work adapted to move the same from its starting point, automatic returning means for said pointer comprising a plurality of cams mounted in a series along a shaft adapted to revolve with the pointer, a carriage adapted to move along said series of cams, and a lever pivotally mounted on said carriage and extending across said series of cams.

13. A timing device comprising an indicating pointer, clock-work adapted to move the same from its starting point, automatic returning means for said pointer comprising a plurality of cams mounted in a series along a shaft adapted to revolve with the pointer, a carriage adapted to move along said series of cams, and a lever pivotally mounted on said carriage and extending across said series of cams; in combination with a setting shaft operatively connected with the carriage for moving the same, a movable index and means actuated by said index.

14. In apparatus of the general character described, a pointer and dial, a motive train for said pointer including a wheel having a stop pin, a controlling train adapted to restrict the action of said first-named train to a step-by-step movement and including a toothed actuating wheel, and a pivoted stop-lever adapted to be moved by said actuating wheel into and out of contact with said pins; and returning means for the pointer operated by said motive train and adapted to free the same temporarily from the restricting action of said controlling train.

15. Apparatus of the character set forth in claim 14 hereof wherein the stop lever is provided with a supplemental arm and wherein a lever adapted to move said arm is provided in combination with a cam driven by the motive train.

16. Apparatus of the character set forth in claim 14 hereof wherein the stop lever is provided with a supplemental arm and wherein manual means are provided for acting upon said arm to tilt the lever and free the motive train.

17. Apparatus of the character set forth in claim 14 hereof wherein the stop lever is provided with a supplemental arm and wherein is provided a second pivoted lever operated directly by the toothed wheel in the controlling train, one arm of said second lever being adapted to tilt the first named lever through said supplemental arm and the other arm of said second lever being provided with a portion adapted to be brought into the path of movement of the stop pin.

In testimony whereof I have hereto set my hand on this 6th day of October 1919.

JAS. S. KENNEDY.