Nov. 11, 1947. K. E. BEMIS 2,430,444

COMBINED TIMER AND ACTUATING MEANS

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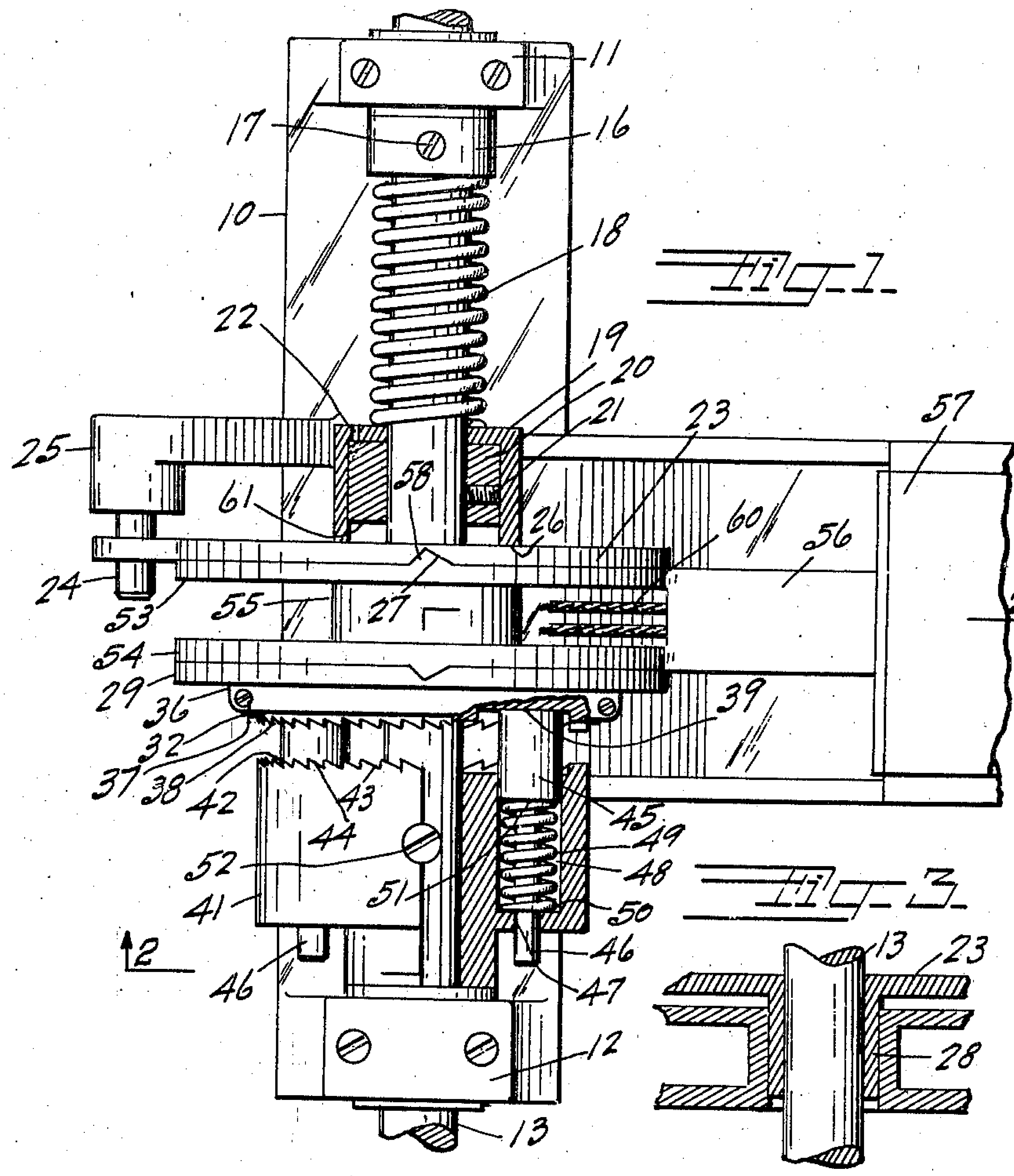

Fig-1.

Fig-3.

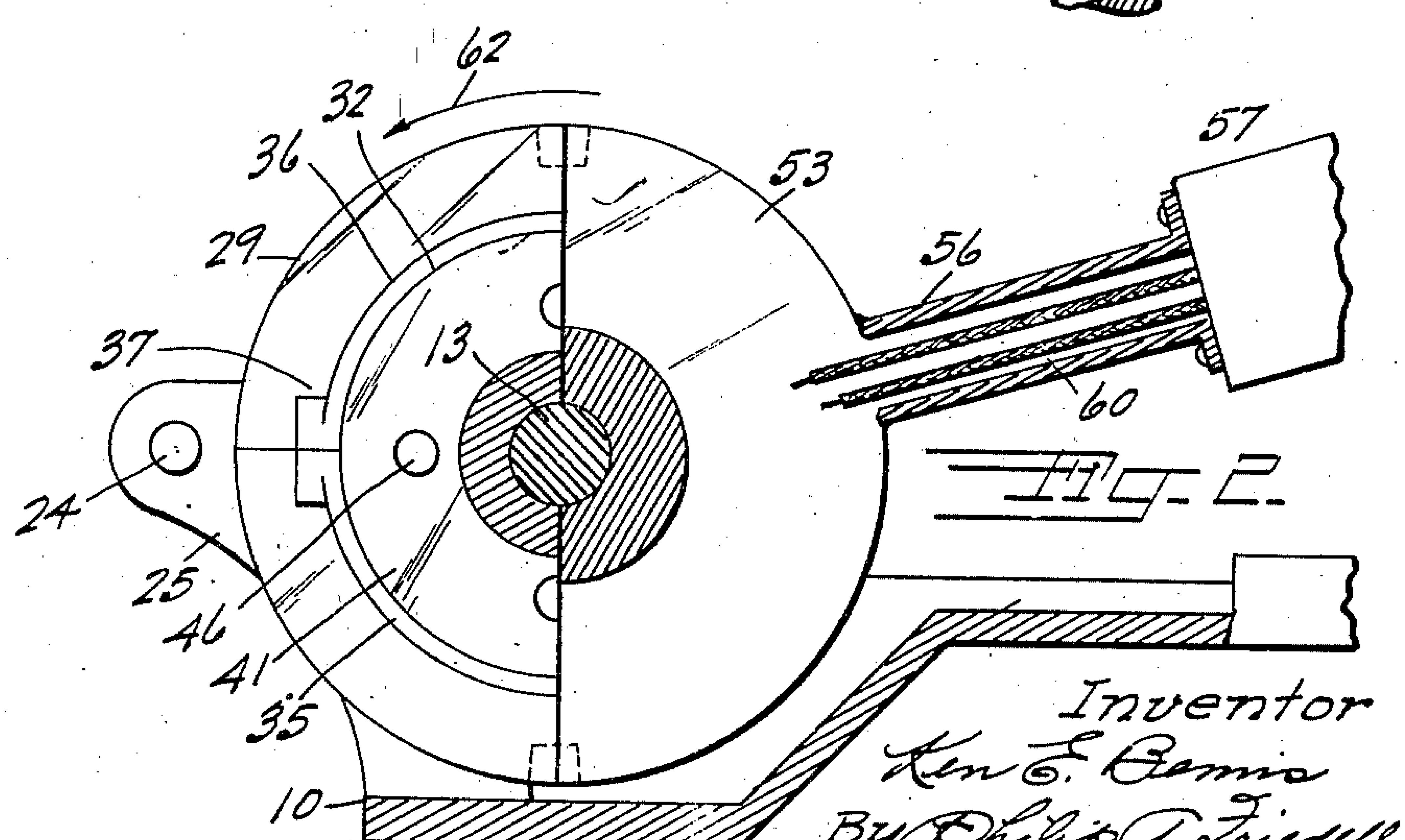

Fig-2.

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Fig-4.

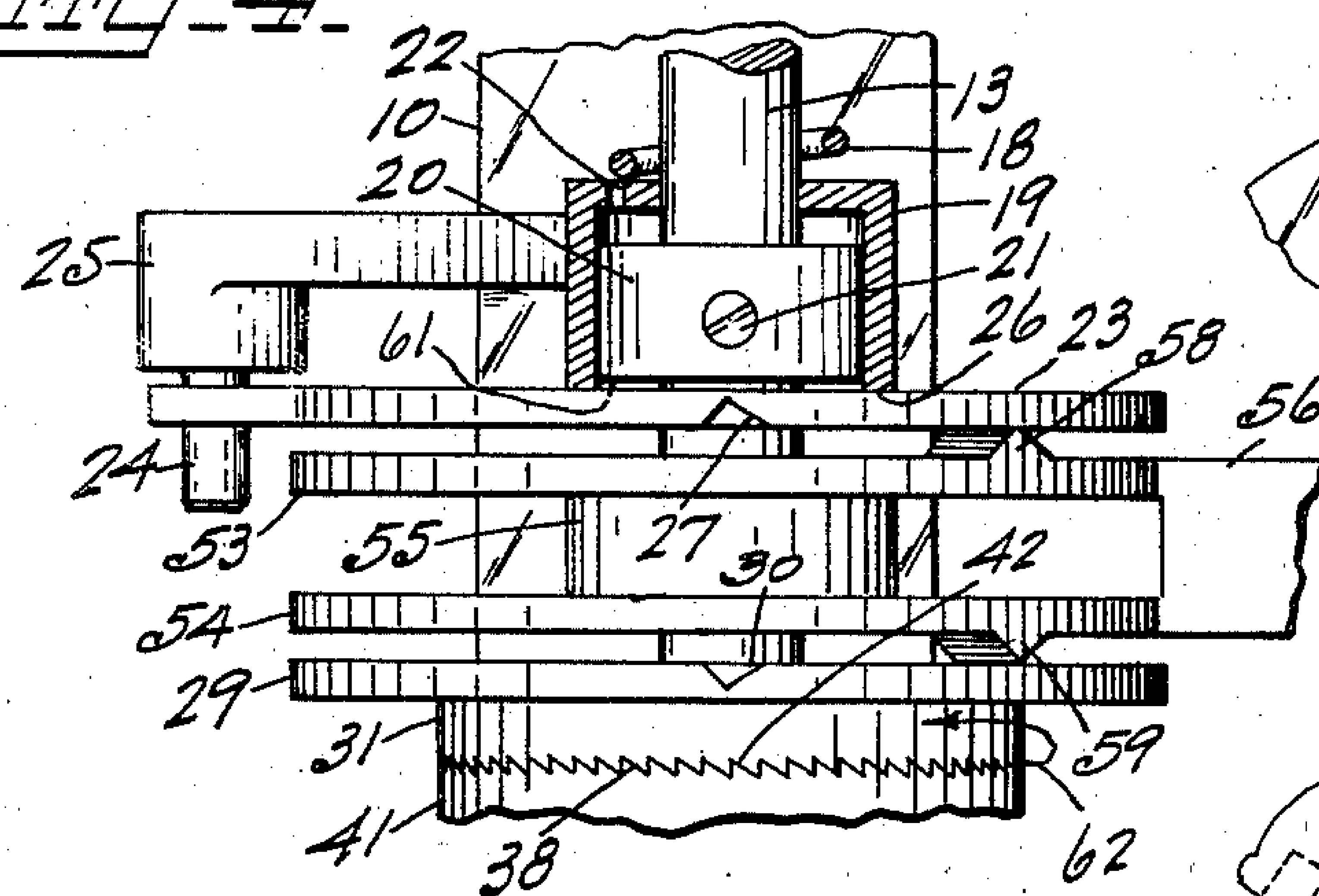


Fig-5.

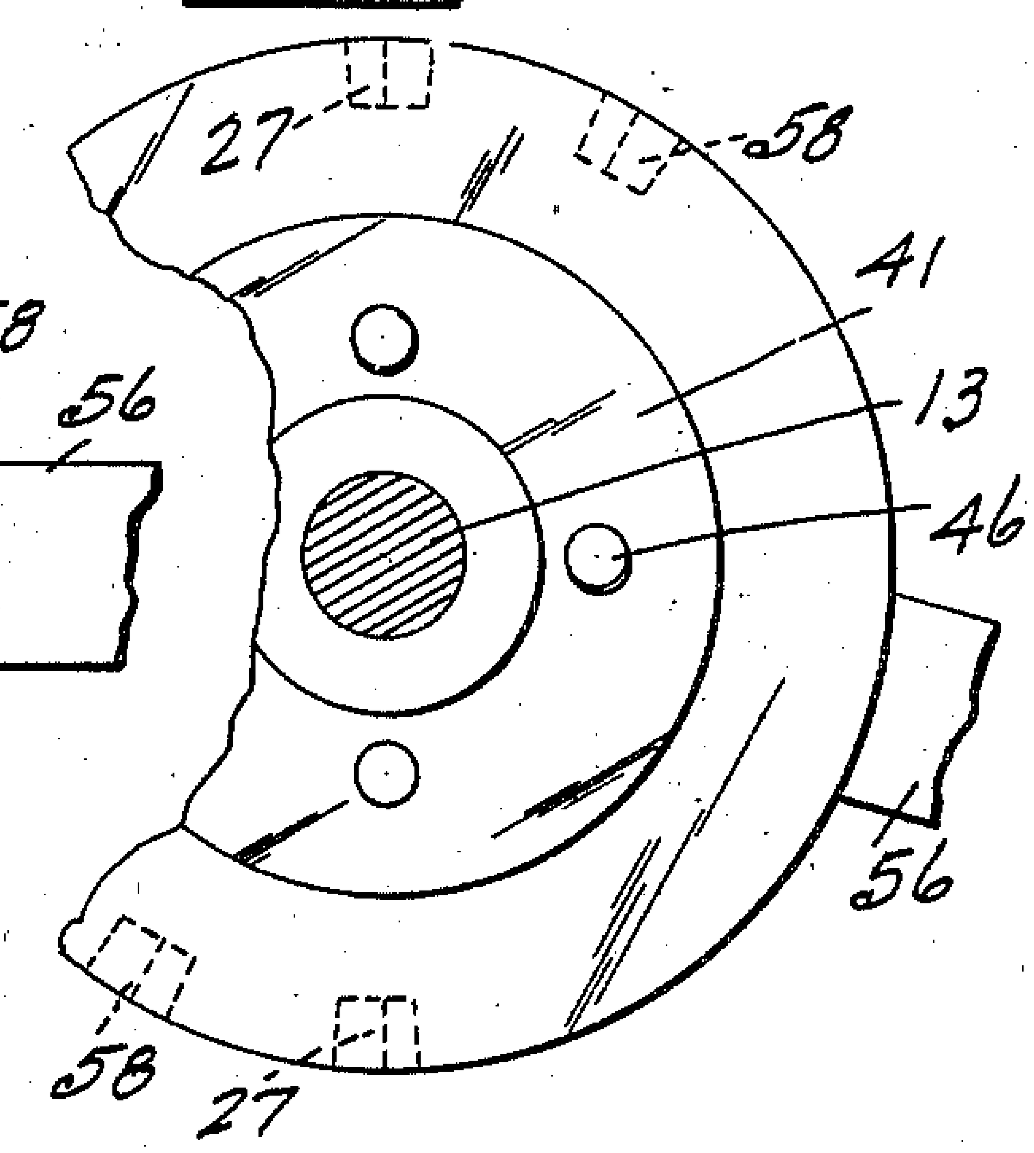


Fig-6.

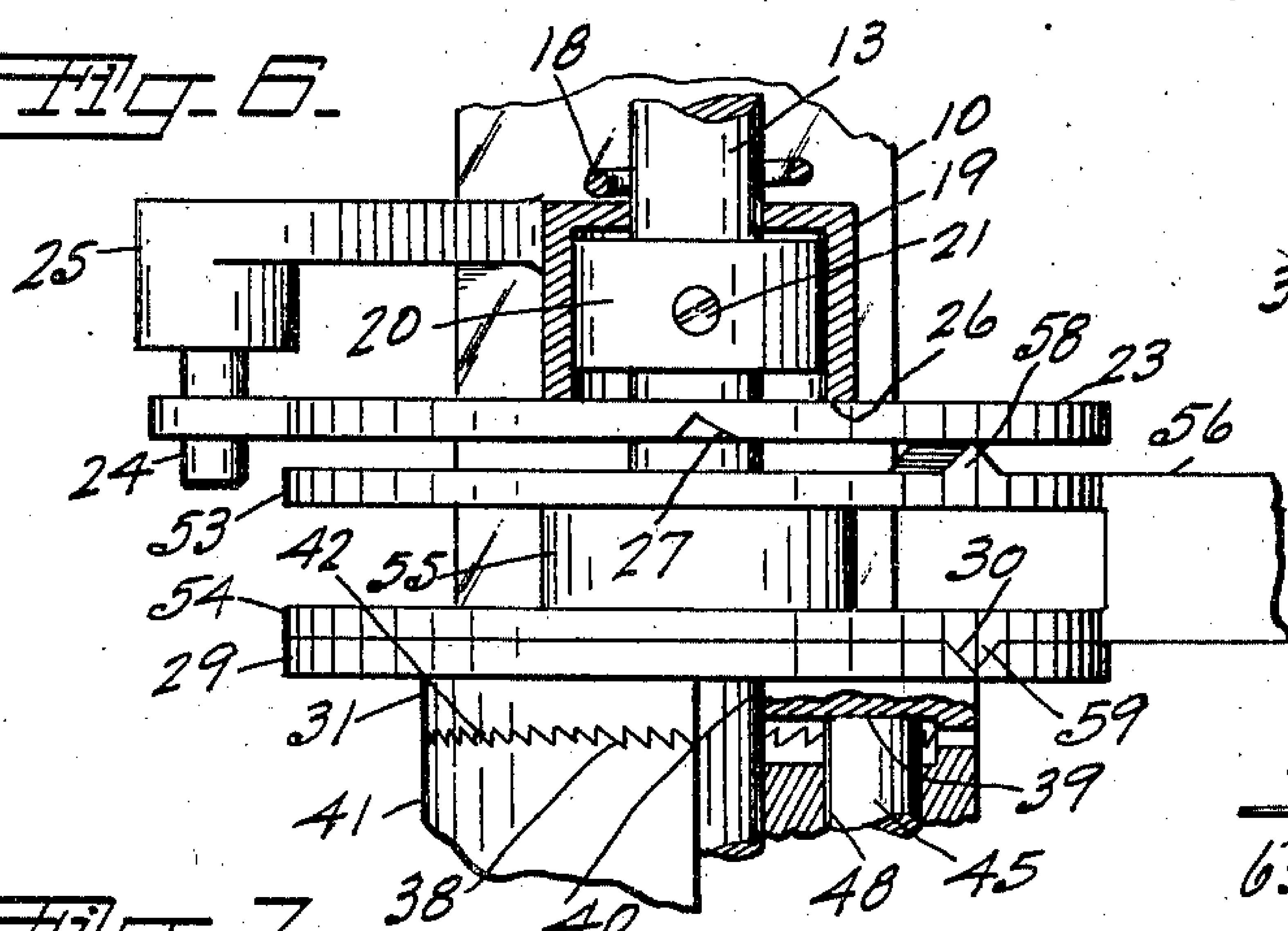


Fig-9.

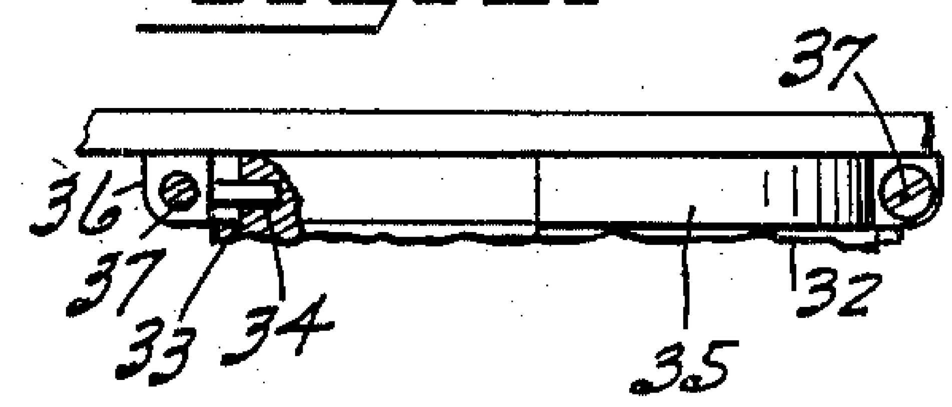


Fig-8.

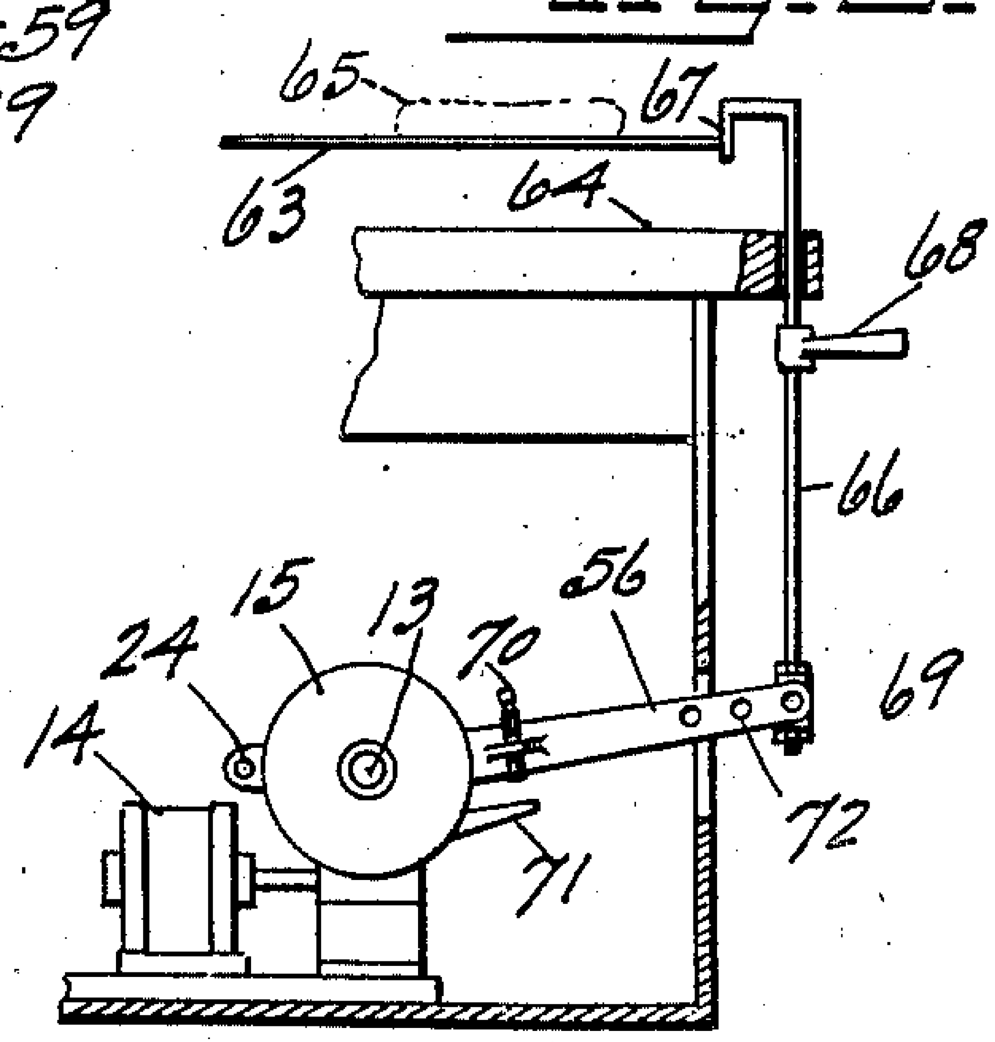
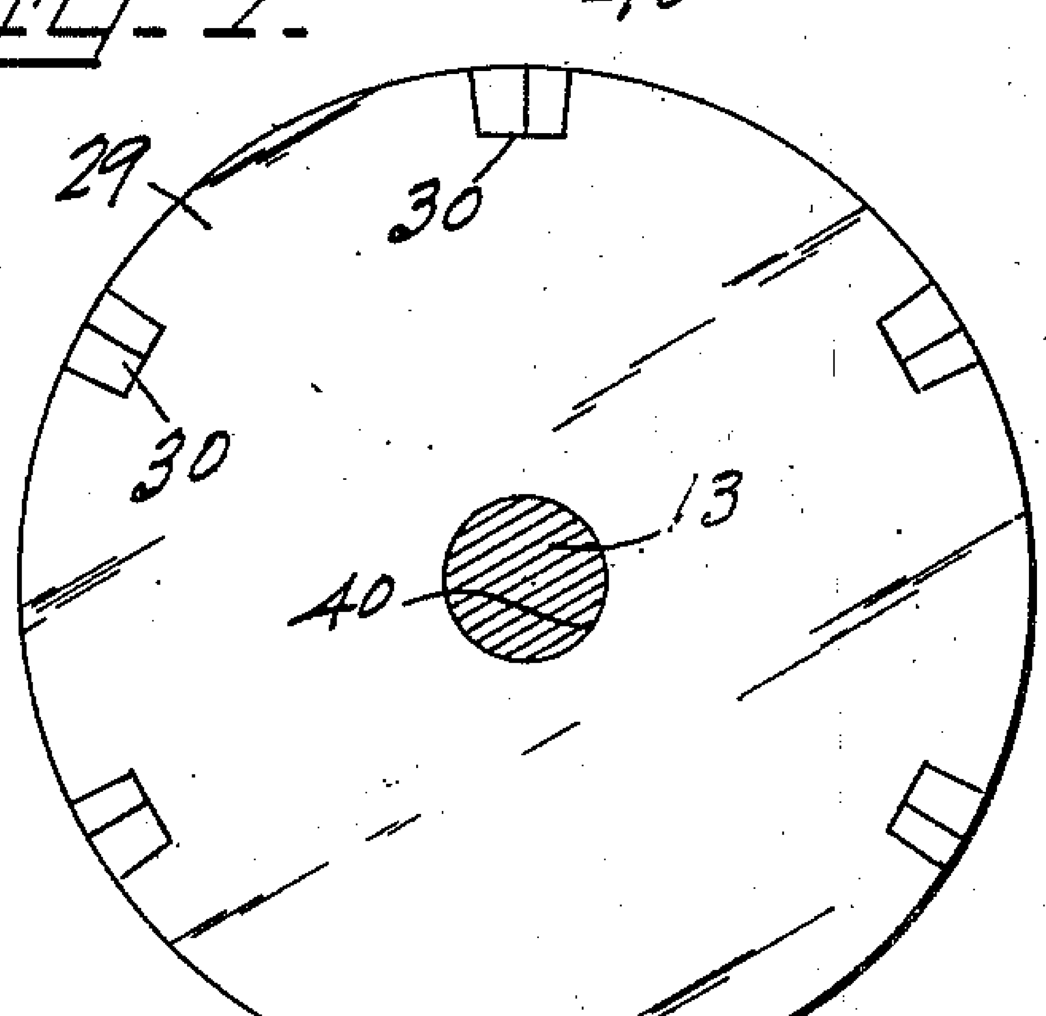


Fig-7.



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COMBINED TIMER AND ACTUATING MEANS

Ken E. Bemis, Oakland, Calif.

Application March 1, 1946, Serial No. 651,393

24 Claims. (Cl. 161—1)

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This invention, a combined timer and actuating means, is an improvement over various timing devices particularly where operations are to be carried out or completed within specific time elapse periods, and where a final phase of the operation is to be carried out under controlled actuation free from shock or sudden impact. This timer is specifically designed for conditions where the same time interval is required for each cycle of operations, and particularly where a number of operations are carried out in stages, in series, or at will, at different points, and with the same or varying time requirements for the various stages, since a whole series of timers for the respective stages can be operated by a single driving means, with each timer operating independently of all others and ready for instant operation.

In considering its adaptability, a single shaft with a single driving means, may have a number of these timers operable thereon, and with each timer controlling some specific cooking, frying, or baking process, each requiring a different time-elapse period, such as one for frying eggs, another for steaks, another for deep-frying potatoes, with each operation exactly timed independently of the others, and each manually actuable at will independently of the others, irrespective of the fact that all are operable by the same shaft being driven at one predetermined speed.

This timer is so arranged that by selection of the correct timing element the time-elapse period is arranged to suit the specific operation. For each type of food preparation the time element is predetermined, and therefore changes of timing elements or adjustments of the timer are never required. However, this interchangeability is desirable in case that at some future time, a different operation is to be substituted at some given stage. Another advantage exists in the fact that all of the timers for a specific set up can be arranged on the driving shaft, with the exception of the timing discs, and after the time periods have been determined for the various operations, the correct timing discs can be applied.

The operation of this timer is different than conventional timers, in that though it is controlled by a continuously rotating shaft, there is no operation of the timer until a lever is depressed, and that it only operates through the specific time period, and that the lever remains in its depressed position until the time period has elapsed and is then raised to its initial position at an easy and shockless speed, so that any

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element carried by the lever will not be vibrated or shocked to cause displacement of material carried by the element. Furthermore, the timer is non-adjustable and therefore not subject to error in setting.

The objects and advantages of the invention are as follows:

First, to provide a timer which will consistently measure a predetermined time elapse period, and after completion of the time elapse period will actuate the device being timed and reset itself following actuation ready for the next operation.

Second, to provide a timer as outlined which is actuated by a continuously and uniformly driven shaft, is non-adjustable and therefore positive as to exact duplication of time-elapse periods.

Third, to provide a timer as outlined which cannot be manually operated or adjusted to vary the time-elapse period.

Fourth, to provide a timer as outlined which is particularly adapted to the timing of cooking, baking and similar operations where specific temperatures are used and maintained.

Fifth, to provide timing means of a type in which any number of timing devices can be mounted on a single shaft and driven by a single source of power, and with the respective timing devices separately arranged as to time-elapse period and degree of actuation of the device being timed, and in which the respective devices being timed are separately controllable and actuable.

Sixth, to provide a timing device which can be remotely located relative to the driving means and which includes no gearing or other speed reducing mechanism to collect dust, grease or other substances to interfere with accurate timing.

Seventh, to provide a timing device with means for actuating the device to be timed thereby, and which actuating means is controllable for actuation at the completion of a specific time elapse period and the time of actuation thereafter to the termination of the cycle can be arranged to suit the specific operation to be carried out.

Eighth, to provide a timing device as outlined in which manual operation of a single element sets the timing device in operation to carry out the specific time and operating cycle, with the single element being automatically reset for the next operation at the completion of a cycle.

Ninth, to provide a timing device as outlined which is of the simplest possible construction, with a minimum number of parts, convenient and easy to operate, and devoid of any speed-changing or time adjusting mechanism.

In describing the invention reference will be made to the accompanying drawings, in which:

Fig. 1 is a top plan view of the invention shown partly in section and showing the timing disc in reset position.

Fig. 2 is a sectional elevation through the invention taken on line 2—2 of Fig. 1.

Fig. 3 shows a modification of the stop-and-reset member mounting.

Fig. 4 is a fragmentary view showing the relation of the various parts of the timer at the start of an operating cycle.

Fig. 5 shows the relative positions of the timing wedges and grooves at the start of an operating cycle.

Fig. 6 shows the position of the timing wedges and grooves at the completion of the timing cycle and the start of the actuating cycle for the device operated thereby.

Fig. 7 is a face view of the timing disc and shows how change in the time elapse period is produced.

Fig. 8 is a greatly reduced view showing the arrangement of timing device and driving means, as applied to various cooking and frying devices such as the broiler covered by my Patent No. 2,300,768, issued November 3, 1942.

Fig. 9 shows a method of mounting the interchangeable timing disc.

The invention consists essentially of a timer which is mounted on a continuously rotating shaft, and which includes actuating means for actuating the device to be timed, and which actuating means upon manual or other external operation starts a timing cycle at the expiration of which the actuating means is relatively slowly returned to its original position and when this position is reached, the timer ceases operation and is ready for the next cycle. Thus, upon operation of the actuating means such as depression of a lever, the lever will remain depressed until the expiration of the time-elapse period for which the timer is arranged, and will then be slowly raised to its original position, the timer will cease operation until the lever is again depressed, while the shaft continues to rotate.

Referring to the drawings, the timer includes a frame 10 having bearings 11 and 12. A shaft 13 is rotatable in these bearings and is continuously driven as by a motor 14 through a suitable speed reducing mechanism 15 as indicated in Fig. 7.

A thrust member such as a collar 16 is fixed on the shaft as by a set screw 17 and functions as a thrust member for the compression spring 18 which reacts against the cup 19 which is limited in axial movement by and rotatable on the collar 20 which in turn is fixed against axial movement by suitable means such as the set screw 21, a suitable breather aperture 22 being formed as shown.

An anchor, or stop-and-reset member 23 is anchored against rotation by a pin 24 but which pin permits axial movement on the shaft 13 which is rotatable in the member 23, the pin 24 being fixed in an arm 25 which is integral with or fixed to the base 10, the sleeve 19 having a bearing face 26 thrusting against the outside surface of the stop-and-reset member. This member 23 has a V-shaped groove 27 formed in its inside face, one groove being sufficient if the member has a long bearing hub 28 as indicated in Fig. 3, but preferably having a pair of diametrically related grooves as indicated in Fig. 5 if no hub is provided on the member, to keep the member from cocking when the timer is being actuated.

The timing member or disc 29 is provided with one or more timing elements such as the equally spaced V-shaped grooves 30, the number of which is established by the time-elapse and actuating intervals of the timer, and may consist of any number with any equi-angular spacing around the disc when a hub is provided on the stop-and-reset member as indicated in Fig. 3, or equi-angularly spaced in pairs in diametric relation if the stop-and-reset member is to be retained parallel when there is no hub; the limits of timing being equal to one revolution and one-half revolution, respectively.

This timing disc may have an integral hub 31 as indicated in Figs. 4 and 6, or made interchangeable by being secured on a hub 32 as indicated in Figs. 1 and 2, the latter providing for interchange of timing discs without having to disassemble the timer in the event that a differently timed operation is to be substituted. Thus all mechanism with the exception of the timing discs, can be assembled, and suitable timing discs applied after the time periods of operation have been decided or established.

When these timing discs are made interchangeable, they are mounted somewhat as illustrated in Fig. 9, with a shoulder 33 formed on the hub for thrust, a pin 34 preventing rotation of the disc on the hub, and the two halves 35 and 36 of the disc being secured together by the screws 37 which tightly clamp the halves about the hub.

The hub 31 or 32 has a clutch face 38 with a multiplicity of fine teeth and a bearing face 39 within the circular series of teeth, and has a bore 40 in which the shaft 13 is rotatable, and the hub is axially slidable on the shaft.

A clutch collar 41 has a complementary clutch face 42 with a multiplicity of complementary clutch teeth 43 for engagement with the teeth 44 on the timing disc hub. Mounted in the clutch hub and slidable parallel to the axis of the hub is a plurality of equi-angularly spaced plungers 45 each of which terminates rearwardly in a spindle 46 which operates through a bore 47 formed through the rear of the hub, while the plunger operates in a counterbore 48 coaxial with the bore. A compression spring 49 cooperates between the bottom 50 of the counterbore and the back 51 of the plunger and urges the plunger against the face 39 of the timing disc hub.

The clutch is fixed on the shaft 13 as indicated at 52 against both, relative rotational and axial movement.

Located between the stop-and-reset member and the timing disc is the actuating member shown as consisting of two discs 53 and 54 spaced by an integral hub 55 and with a hollow arm 56 projecting from and integral with one side of the discs, and at the end of which is shown mounted the upper member 57 of a bacon fryer. Projecting from the outside face of each disc is a V-shaped engaging element respectively 58 and 59 to engage in the grooves 27 and 30. As will be noted, the hollow arm 56 provides a conduit for the power leads 60 to the electrically heated or operated devices, such as 57.

Obviously, the actuating member is not limited to operation through a lever arm 56; though not shown, operation can easily be arranged through a gear or sprocket mounted on the hub 55 or periphery of the discs 53 and 54, depending on the arrangement of the device which is to be timed and actuated. In Fig. 8, the timer is shown connected to the broiler grid disclosed in my patent previously mentioned.

The operation of the invention is as follows: If diametric lugs 58 and 59, and diametric grooves 27 and 30 are provided, the timing will be limited to one-half revolution of the disc 29, so that for each time interval, a pair of diametric engaging elements will be required. If these engaging elements engage singly, that is, only one groove 27 for the stop-and-reset member, and only one wedge member on each side of the actuating member, then the maximum time cycle will be equal to a complete revolution of the shaft 13. Though the timer will probably be used with diametric engaging elements because of lower cost of manufacture and a requirement for less power, the operation for the single engaging elements will be explained for purposes of clarity.

Considering the shaft 13 driven by the motor 14 through a speed reducer 15 at a speed of one-tenth revolution per minute. The collars 16 and 20, and the clutch collar 41 will turn with the shaft. As shown in Fig. 1 the timer is stopped and reset ready for an operation. The engaging members 58 and 59 are seated in the grooves 27 in the stop-and-reset member and 30 in the timing disc. The cup 19 is thrusting against the outer face of the collar 20 and forcing the stop-and-reset member toward the clutch block while the plungers 45 force the timing disc away from the clutch block with the plungers riding on the face 39, and the timing disc held against rotation by the lug 59.

With manual depression of the arm 56 to the position indicated in Fig. 5, the wedges 58 and 59 ride out of the grooves 27 and 30, force the stop-and-reset member back against the action of the spring 18 with movement limited by the front face 61 of the collar 20, and simultaneously force the timing disc 29 toward the clutch block to cause engagement of the clutch teeth 43 and 44, as is clearly illustrated in Fig. 4. Since the clutch block is continuously driven by the shaft 13, the timing disc is immediately driven in the direction of the arrows 62, with the actuating member remaining motionless in its depressed position.

If there is only one groove in the timer disc, then no action will take place until the groove 30 passes clear around and reaches the wedge 59 at which time the wedge will engage in the groove, with the spring 18 through the cup 19 forcing the stop-and-reset member and the actuating member sufficient to force the wedge into the groove while simultaneously maintaining the clutch in engagement. This concludes the time-elapse or time-delay period and would be equal to 360° minus the angle through which the arm 56 was depressed and divided by 360, multiplied by the time for one revolution of the shaft 13. If the arm 56 was depressed through an angle of 36° and the time for one revolution of the shaft was ten minutes, then the time-delay period would be equal to

$$\frac{360-36}{360}\times 10=9 \text{ minutes}$$

and with diametric engaging members it would be the lower of the two grooves which would next engage as indicated in Fig. 6, and the time-elapse period would be

$$\frac{180-36}{180}\times 5=4 \text{ minutes}$$

As the wedge 59 engages in the groove 30, the timing disc starts returning the arm 56 to its original position with the wedge 58 riding on the face of the stop-and-reset member as indicated in Fig. 6 until it reaches the groove 27, but because the cup 19 is limited as to axial movement by the collar 20, it cannot force the stop-and-reset member over toward the clutch, consequently the plungers 45 through springs 49 force the timing disc away to de-clutch the teeth 43, 44 and force the wedge 58 into the groove 27, with all parts again in the position shown in Fig. 1, ready for the next operation. The actuating time of the lever 58 would be equal to the difference between the total time and the time-elapse period, as previously calculated, one minute in either case.

For other time periods additional grooves are formed in the timing disc. As shown in Fig. 7, each total cycle would be equal to 60° of movement, or one-and-two-thirds minutes. This time can be divided between the time-delay period and the actuation period in any desired proportion by limiting the angular movement of the arm 56, somewhat as indicated in Fig. 8, in which the arm is made to lift the grid 63 to a level above the range top 64 after the meat 65 has been cooked for a predetermined period of time, the temperature of the range top being accurately controlled so that for a given thickness of steak an exact time of cooking will be required.

The grid is mounted on a vertical shaft 66 as indicated at 67 and this shaft has a handle 68 for actuating the timer, the lower end of the shaft 66 being adjustably connected to the arm 56 as indicated at 69. Adjusting means is provided on the arm 56 as indicated at 70 for cooperation with a stop member 71.

Consider the timing disc Fig. 7. The total time per cycle would be one-and-two-thirds minutes as previously pointed out, and assume that one minute was the correct cooking time for the steak, then the lifting time would be two-thirds minute, so that the manual depression of the arm 56 would be limited to 24°, therefore the set screw 70 would be adjusted for this limitation, the adjustment 69 freed with the lever 56 in depressed position so that the grid 63 would lie flat on the range top, and then the adjustment 69 made and secured. Thus depression of the lever would be limited to 24° from the position shown in Figs. 1 and 2, the grid would remain stationary on the range for exactly one minute after it was depressed through the medium of the handle 68, and then would raise to its highest position in another two-thirds of a minute and stop, ready for the next operation. The length of the arm can be made to suit the lift required and the angle through which it must take place, or the connection can be made at a different point 72 on the arm.

This arrangement is particularly desirable where all heating and cooking devices are accurately controlled as to temperature, and with different range areas provided for cooking eggs, steaks, bacon, and similar products, and all of which require different times of cooking ranging from 45 seconds to a maximum of four minutes. Only one drive shaft with driving motor is required for a complete lineup, including toasters, waffle irons, steak grills, bacon grills, and the like, with a timer for each cooking or other processing unit and provided with a disc arranged for the established time-elapse period, for which reason consistent and exact timing can always be depended upon.

Since the timer is non-adjustable, the time-elapse period being fixed, no errors in timing can result as do result with conventional timers through improper manual adjustments, and perfect timing is assured.

I claim:

1. A timing device, in combination; a shaft and means for continuously driving said shaft at slow speed; supports for said shaft; a member having stop-and-reset means and axially movable relative to said shaft; a timing disc having engageable means for driving by said shaft and having said shaft normally freely rotatable therein; actuating means pivoted on said shaft and movable to two angular positions; engaging means on said timing disc, and engaging elements on said actuating means and cooperatively related to said engaging means and said stop-and-reset means with all engaging means and engageable elements in engagement when said actuating means is in one position, movement of said actuating means to the other position disengaging said engageable elements and engaging said timing disc with said shaft for rotation therewith; said timing disc following a predetermined time period of operation engaging said engageable elements and returning said actuating means to its initial position, and being disengaged from said shaft when said initial position is reached through engagement of said engageable elements in said engaging means and stop-and-reset means.

2. A structure as defined in claim 1; a clutch block fixed on said shaft and a clutch face formed on said timing disc and functioning as said engageable means, and resilient urging means for normally retaining said clutch face out of engagement with said clutch block, and moved into engagement by said engageable elements when said actuating means is moved to its other position.

3. A structure as defined in claim 1; said actuating means comprising an arm having pivotal support on said shaft and having oppositely projecting wedges forming said engageable elements, and said stop-and-reset means and said engaging means comprising V-shaped grooves for cooperation with said wedges respectively for limiting the return movement of said actuating means and for returning said actuating means to its one position.

4. A combined timer and power device comprising; a shaft and means for driving said shaft at a uniform slow speed; supports for said shaft; stop means axially movable relative to said shaft and urging means therefor; a timing disc including engageable elements and having a clutch face and supported on said shaft; a clutch block fixed on said shaft and resilient urging means urging said clutch face out of engagement with said clutch block; an actuating arm mounted in cooperative relation to said stop means and to said timing disc and having engaging means normally engaging said stop means and said timing disc, and manually movable out of engagement therewith from its initial position to a terminal position, with manual movement thereof engaging said timing disc with said clutch block, said timing disc, following a predetermined degree of rotation, engaging said engaging means and returning said actuating arm to its initial position with the engaging means engaging said stop means to stop movement of the arm and release said timing disc for disengagement from said clutch block.

5. A structure as defined in claim 4; said timing disc comprising a hub having said clutch face formed on one end, and a disc detachably secured on said hub whereby the timing of the device may be changed at will by substitution of a disc with a suitable number of equi-angularly spaced engageable elements.

6. A structure as defined in claim 4; said actuating arm being supported by said shaft and having projecting edges; said stop means and said timing disc each having V-shaped grooves for cooperation with said wedges and functioning as the engageable elements and stop means.

7. A structure as defined in claim 4; said stop means comprising a member having a V-shaped groove, and said timing means having a plurality of V-shaped grooves equi-angularly spaced, and said actuating arm having projecting wedges for cooperation with said grooves with said grooves and wedges respectively functioning as said stop means, engageable elements, and as said engaging means.

8. A structure as defined in claim 4; said stop means comprising a member having a V-shaped groove, and said timing means having a plurality of equi-angularly spaced V-shaped grooves, and said actuating arm being supported at one end by said shaft and having wedges for cooperation with said grooves and having means for connecting the other end to a device to be operated following the time elapse period established by the speed of the shaft and the number of grooves in said timing disc.

9. A structure as defined in claim 4; said stop means comprising a disc having said shaft rotatable therethrough and having a V-shaped groove formed adjacent the periphery, means retaining said disc against rotation while allowing axial movement, and resilient urging means for urging said stop means to cooperate with said actuating arm, and means for limiting the axial movement thereof, and a wedge formed on said actuating arm for cooperation in its initial position with said groove.

10. A combined timing and actuating device comprising; a shaft and means for driving said shaft; a stop-and-reset member axially movable and non-rotatable and supported on said shaft and having an indent formed in one face, and first resilient urging means cooperating with the other face and means limiting movement of said resilient urging means; a timing disc having a hub with said shaft rotatable therein and clutching means on said hub; a clutch block fixed on said shaft and having second resilient urging means urging said clutching means out of engagement therewith; equi-angularly spaced indents formed in one face of said timing disc; an actuating arm having one end supported by said shaft and having attaching means at the other end for attachment to a device to be actuated, and having engaging means for engagement with said indent, and sequentially with said equi-angularly spaced indents, with said first and second resilient urging means urging said stop-and-reset member and said timing disc against opposite faces of said actuating arm, and with said arm manually movable from its initial position to a second position, said engaging means on said arm engaging in said indent and in one of said equi-angularly spaced indents when in its initial position and being moved out of both indents and moving said timing disc into engagement with said

clutch when manually moved to its second position, and with the next indent on said timing disc engaging said engaging means following the time-elapse period established thereby and returning said actuating arm to its initial position for cooperation of the engaging means with said indent in said stop-and-reset member and simultaneously releasing said timing disc for retraction for disengagement from said clutch.

11. A structure as defined in claim 10, said stop-and-reset member comprising a stop disc having an axial bore in which said shaft is rotatable, and an arm extending from the periphery and having a second bore; a base for said timer having an anchor arm and a pin mounted therein for said second bore to retain said stop disc against rotation while allowing axial movement; said resilient urging means comprising two spaced apart collars fixed on said shaft and a cup slidable and rotatable on one collar and having a length greater than the collar and with the open end of the cup bearing against said disc, and a compression spring operating between said cup and the other collar.

12. A structure as defined in claim 10; said indents in said stop-and-reset member and in said timing disc being V-shaped radially from the axis of the shaft, and said engageable means including a V-shaped member projecting from each side of said arm for selective cooperation with said indents, whereby movement of the arm from its initial position will retract the V-shaped members from the V-shaped indents to ride on the plane surfaces of the respective discs and force the timing disc clutch face into engagement with the clutch block.

13. A structure as defined in claim 10; said timing disc being detachably secured on said hub for interchange of discs for changing the time-elapse period and actuating time at will.

14. A structure as defined in claim 10; said clutching means comprising a multiplicity of fine teeth formed in the outer face of said hub and having a thrust bearing face within the confines of said teeth, and said clutch block having a multiplicity of complementary teeth and a plurality of equi-angularly spaced spring-urged plungers cooperating with said bearing face for urging said teeth out of engagement.

15. A combined timer and actuating device comprising; a shaft; means for driving said shaft; an actuating arm having one end mounted on said shaft and means at the other end for attachment to a device to be actuated and having first and second wedge-shaped members projecting from opposite sides; a stop-and-reset member supported by said shaft and non-rotatable and axially slidable thereon; resilient urging means urging said stop-and-reset member to cooperate with the first wedge-shaped member on one side of said actuating arm, and a V-shaped radial groove formed in said stop-and-reset member for cooperation with said first wedge-shaped member; a timing disc having a plurality of equi-angularly spaced V-shaped grooves for sequential cooperation with the second wedge-shaped member on the other side of said arm, and having a hub provided with a multiplicity of fine teeth and having an axial bore in which said shaft is rotatable; a clutch block having complementary teeth and having resilient urging means to urge said teeth out of engagement and force said timing disc to cooperate with said second wedge shaped member, and with said wedge shaped members normally engaged in said V-shaped grooves with said arm in initial position; manual operation of said arm to a second position moving said wedge-shaped members out of said V-shaped grooves and thereby forcing said timing disc axially to engage said teeth to drive said disc, and following a predetermined degree of rotation, the next V-shaped groove in said timing disc engages said second wedge-shaped member to drive said arm back to its initial position with the first wedge then cooperating with the groove in said stop-and-reset member to stop the arm and release the timing disc for disengagement of the teeth.

16. A timing and actuating device, in combination; a shaft and means for continuously rotating said shaft at slow speed; a timing element having an axial bore with said shaft rotatable therein, and having engageable means for engaging said shaft for driving therewith and normally retained out of engagement; stop means; an actuating device supported at one end by said shaft and having means at the other end for connection to a device to be timed and actuated, and normally retained in its initial position by said stop means and movable through external sources to a second position; urging means actuated when said actuating device is in other than its initial position for creating and maintaining engagement of said engageable means with said shaft; said timing element having driving means cooperatively related to said actuating device and cooperating therewith, following a predetermined degree of rotative movement creating a time-elapse period, to drive said actuating device to its initial position and thereby release said engageable means, and reset said timing and actuating device for subsequent operation; said timing element comprising a disc having a plurality of radially disposed V-grooves equi-angularly spaced for establishing time-elapse periods; said engageable means comprising a hub for said timing disc and having a clutch face provided with a multiplicity of fine teeth, and a clutch hub having complementary teeth and fixed on said shaft and having resiliently actuated means cooperating with said hub to urge said hub away from said clutch block for disengagement of said teeth; said stop means having a V-shaped groove, and said actuating device having V-shaped projections for cooperation with the groove in said stop means and with one of the grooves in said timing disc when in initial position, and creating engagement of said teeth when the V-shaped projection is not engaged in the V-shaped groove in said stop means.

17. A timer, in combination; a continuously rotating slow-speed shaft; an actuating arm having one end supported by said shaft; a timing disc normally rotatable relative to said shaft and supported thereby; engaging means for engaging said timing disc for driving with said shaft; stop means for said actuating arm in its initial position; and means associated with and cooperative between said actuating arm, said stop means, and said timing disc for actuating said engaging means for driving said disc when said actuating arm is manually angularly moved from its initial position, and for returning said actuating arm to its initial position following a predetermined degree of one revolution of said timing disc, and releasing said engaging means when said actuating arm reaches its initial position; said timing disc having a plurality of equi-angularly spaced timing elements each consisting of a driving member for returning said actuating arm to its

initial position, and with the angular spacing between the timing elements greater than the angular movement of the actuating arm, whereby a time cycle of operation is divided into a time-elapse period until the next driving member cooperates to return the actuating arm, and an actuating period while the driving member returns the actuating arm to its initial position.

18. A timer, in combination; a continuously rotating slow-speed shaft; an actuating arm having one end supported by said shaft; a timing disc normally rotatable relative to said shaft and supported thereby; engaging means for engaging said timing disc for driving with said shaft; stop means for said actuating arm in its initial position; and means associated with and cooperative between said actuating arm, said stop means, and said timing disc for actuating said engaging means for driving said disc when said actuating arm is manually angularly moved from its initial position, and for returning said actuating arm to its initial position following a predetermined degree of one revolution of said timing disc, and releasing said engaging means when said actuating arm reaches its initial position; said engaging means including a clutch face on said timing disc, and a clutch block having a clutch face fixed to rotate with said shaft; and spring urged plungers urging separation of said clutch faces, and with said means associated overcoming the urgence of said plungers and causing engagement between said clutch faces when said actuating arm is manually moved from its initial position.

19. A timer, in combination; a continuously rotating slow-speed shaft; an actuating arm having one end supported by said shaft; a timing disc normally rotatable relative to said shaft and supported thereby; engaging means for engaging said timing disc for driving with said shaft; stop means for said actuating arm in its initial position; and means associated with and cooperative between said actuating arm, said stop means, and said timing disc for actuating said engaging means for driving said disc when said actuating arm is manually angularly moved from its initial position, and for returning said actuating arm to its initial position following a predetermined degree of one revolution of said timing disc, and releasing said engaging means when said actuating arm reaches its initial position; said means associated with said stop means and with said actuating arm comprising cooperative wedge elements for relative axial movement of the stop means and actuating arm, and with an operative connection with said engaging means for engagement thereof for driving said timing disc.

20. A timer, in combination; a timing disc; a continuously rotating slow-speed shaft normally freely rotatable in said timing disc; engaging means for engaging said timing disc with said shaft for rotation therewith; an actuating arm having one end supported by said shaft and movable through a predetermined angle from and to an initial position; and retaining means for releasably retaining said actuating arm in its initial position; and operative connections associated with and cooperatively related between said actuating arm and said timing disc and including said retaining means for actuating said engaging means when said actuating arm is moved from its initial position to initiate driving of said timing disc by said shaft, and for returning said actuating arm to its initial position by said timing disc following rotation of said timing disc through a predetermined portion of one revolution, to divide an operating cycle into two timing periods, one of which is a time-elapse period before actuation of the arm, and the other an actuating period for returning the arm to its initial position, with the arm in its initial position releasing said engaging means for rotation of the shaft relative to the timing disc.

21. A structure as defined in claim 20; and means adjustable at will and cooperatively related to said actuating arm for limiting the angular movement thereof for adjusting the ratio between the two timing periods and establishing the exact time-elapse period, or the actuating period, at will.

22. A structure as defined in claim 20; said timing disc having a plurality of operative connections for sequential actuation and driving of said actuating arm to its initial position for dividing each revolution of said timing disc into a plurality of operating cycles individually initiated by movements of the actuating arm from its initial position.

23. A structure as defined in claim 20; said timing disc comprising a disc member and a hub member, and with the disc member replaceable at will for changing the duration of the operating cycles, said disc having a plurality of operative connections for sequential actuation and driving of said actuating arm to its initial position, and with the number of operative connections equal to the time required for one revolution of the timing disc divided by the time required for one operating cycle.

24. A structure as defined in claim 20; said timing disc having a plurality of operative connections for sequential actuation and driving of said actuating arm to its initial position, and with the number of operative connections equal to the time required for one revolution of the timing disc divided by the time required for one operating cycle; and means adjustably related to said actuating arm for limiting movement thereof for adjusting the ratio between said two timing periods for establishing the exact time-elapse period for either, at will.

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The following references are of record in the file of this patent:

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