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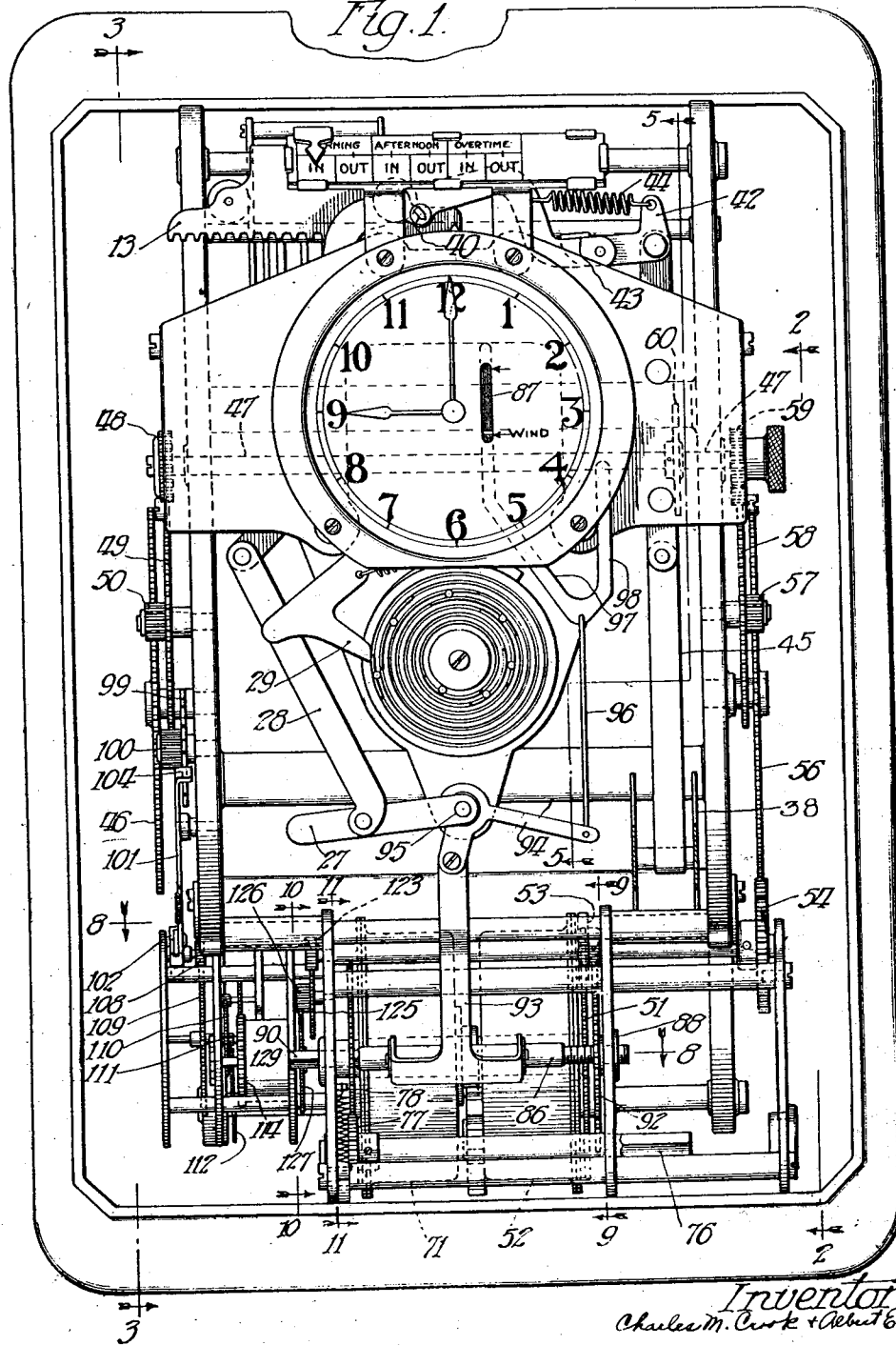
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C. M. CROOK ET AL

TIME CONTROLLED MECHANISM

Filed Feb. 3, 1925

8 Sheets-Sheet 1



Inventors:
Charles M. Crook & Robert E. Long
Jones, Addington, Ames & Leibold, Attys.

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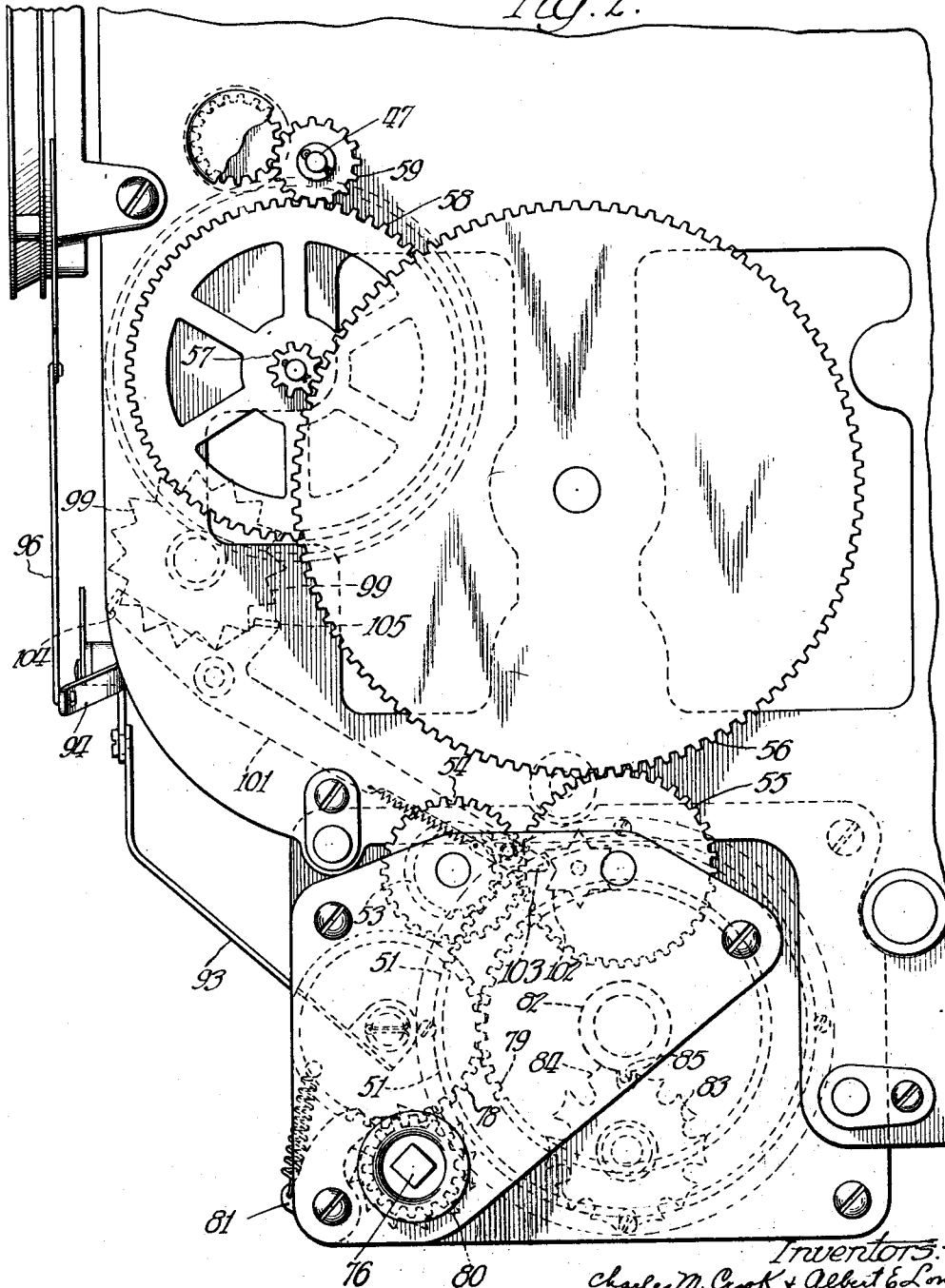
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Fig. 2.



Inventors:

Charles M. Crook & Albert E. Long

Jones, Addington, Ames & Peirce, Attys

July 10, 1928.

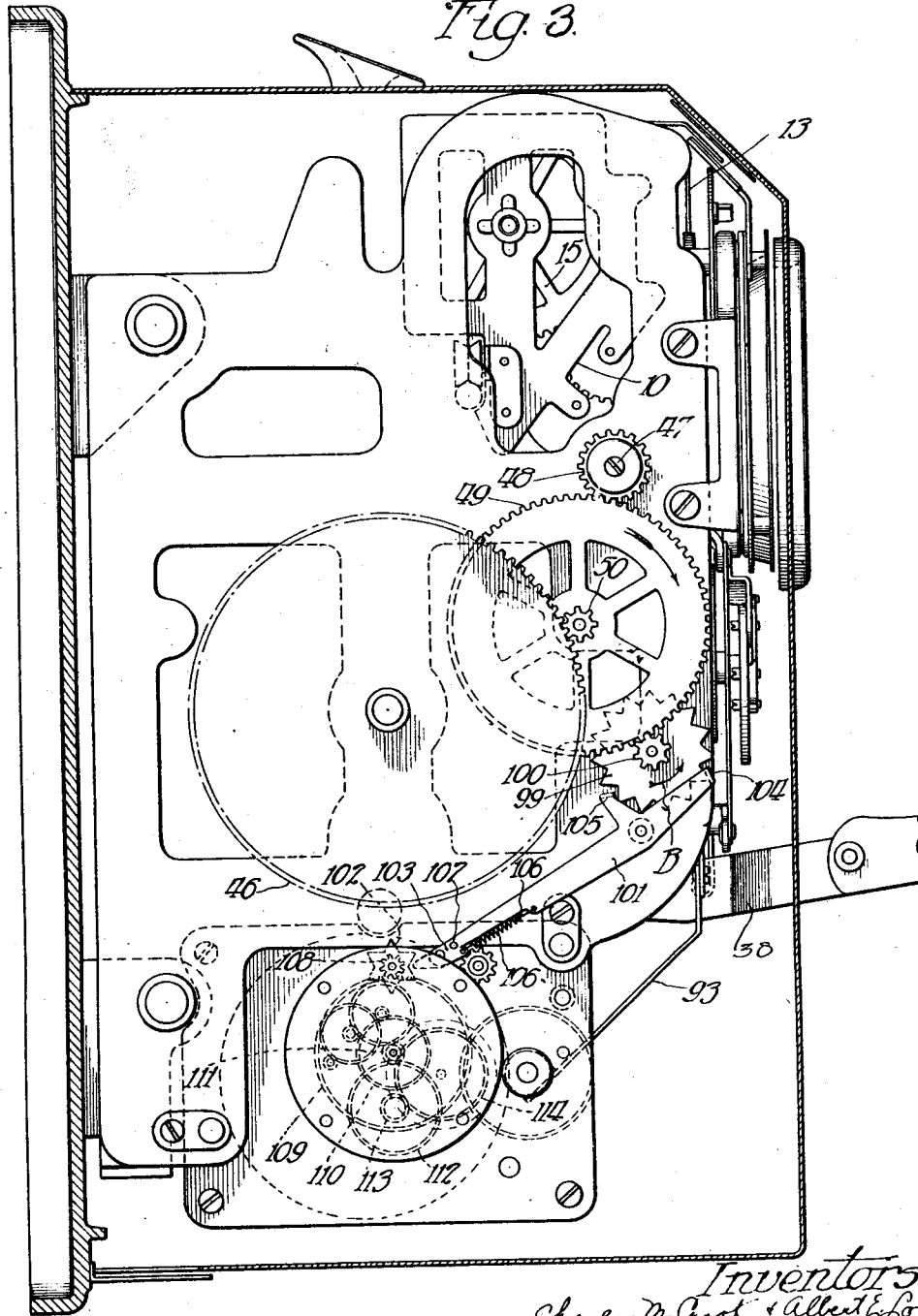
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C. M. CROOK ET AL
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Fig. 3.



Inventors:
Charles M. Crook & Albert E. Long

James Addington, Ames & Seibred, Attys

July 10, 1928.

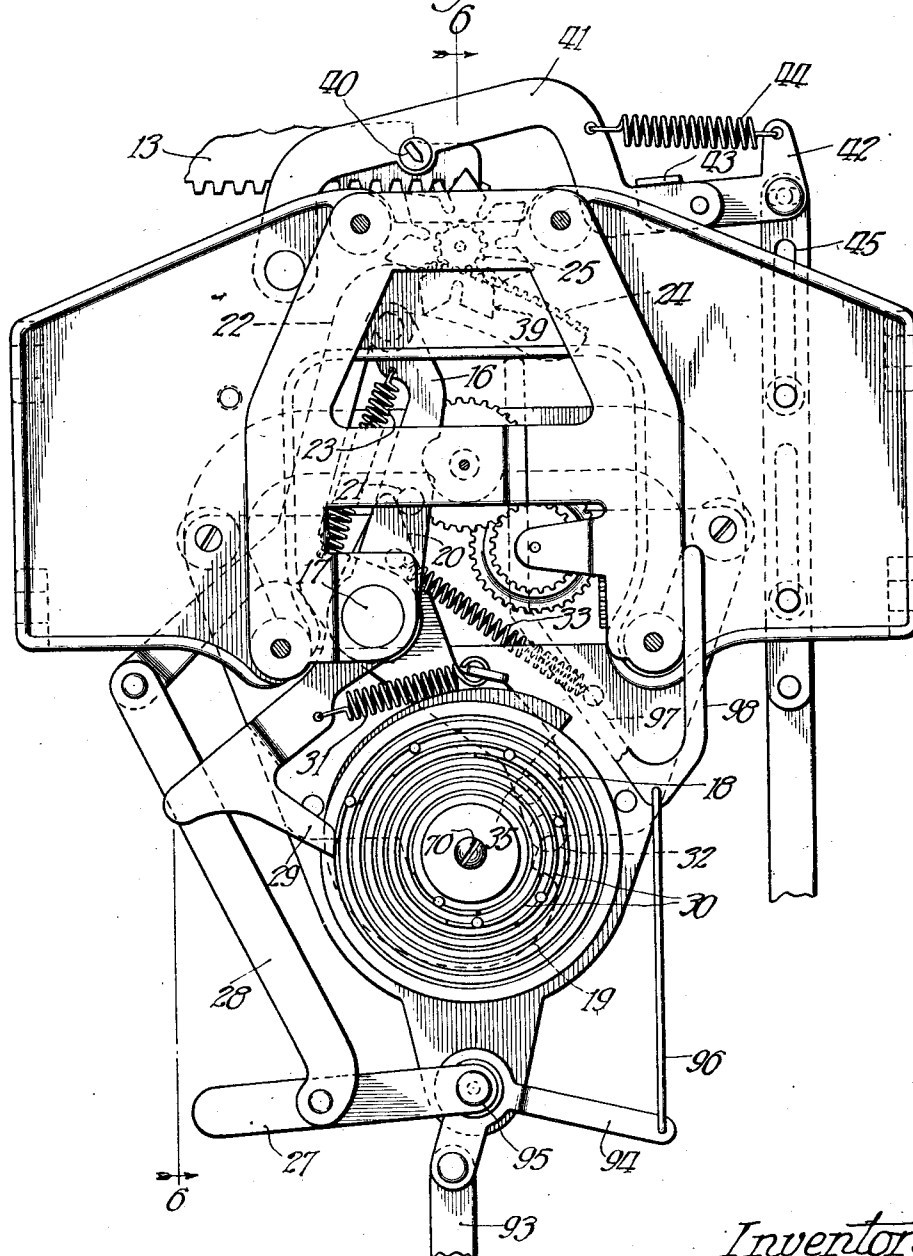
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C. M. CROOK ET AL
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Fig. 4.



Inventors:

Charles M. Crook & Albert E. Long

Jnes. Coddington, Ames & Seibred, Attys.

July 10, 1928.

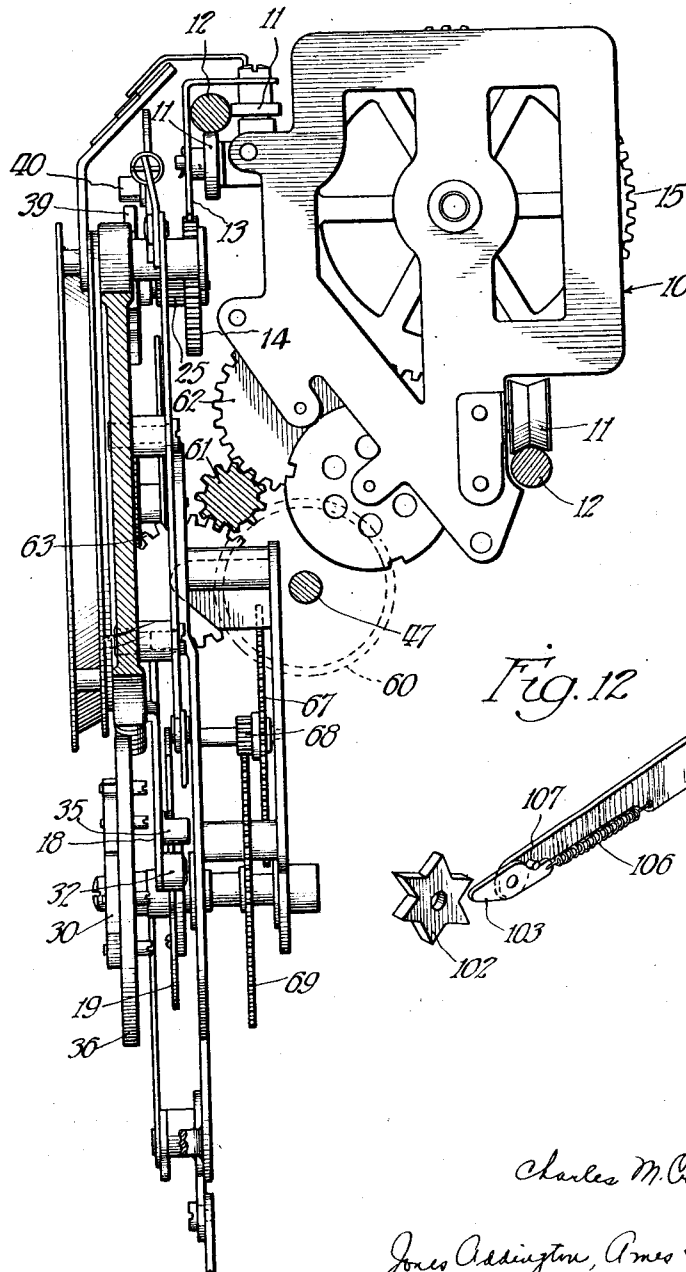
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Fig. 5.



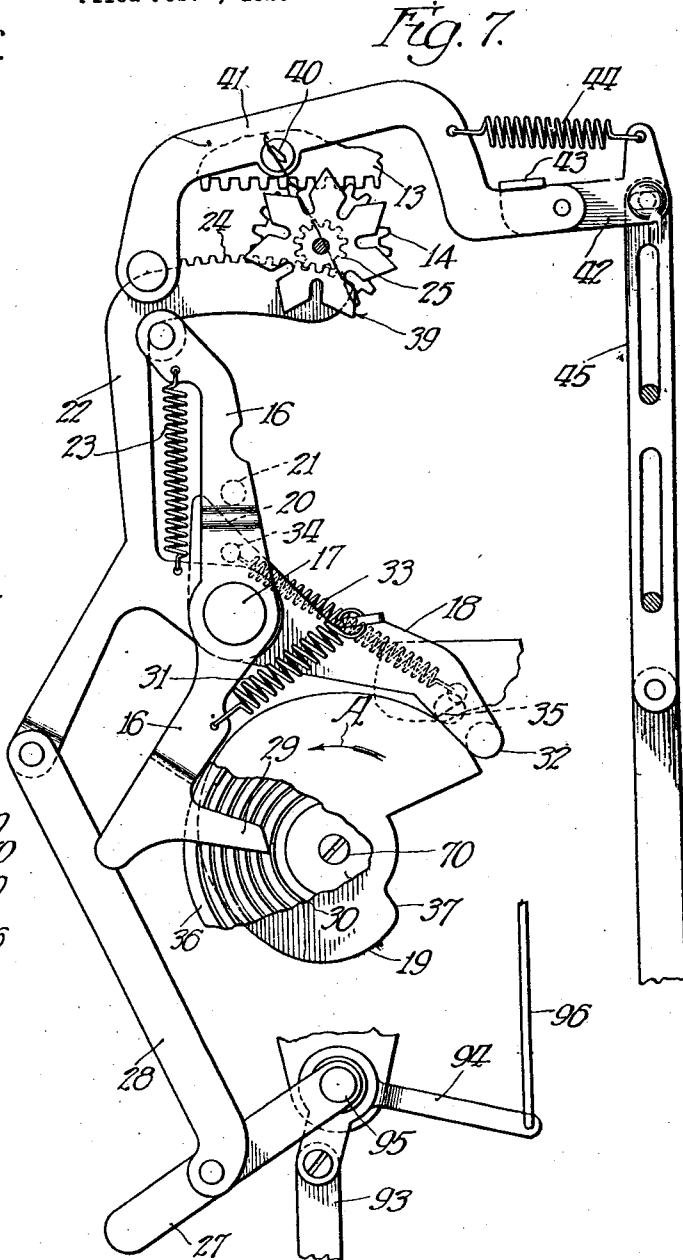
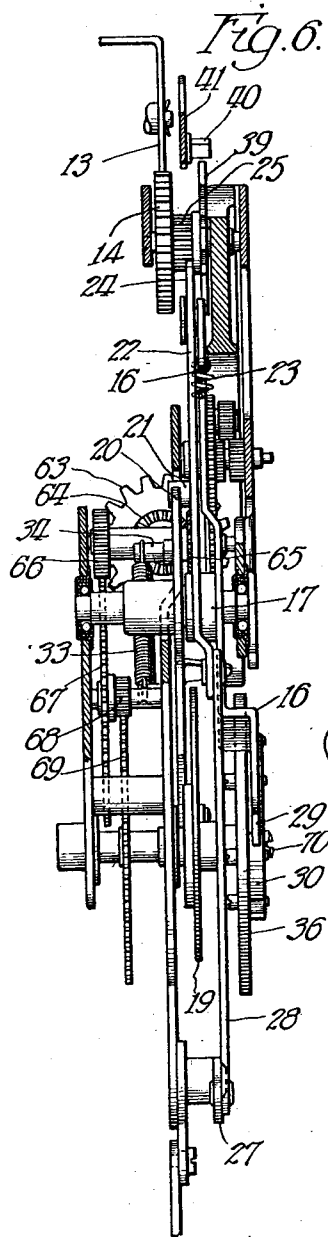
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C. M. CROOK ET AL
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Inventors:
Charles M. Crook & Albert F. Long
Jones, Addington, Ames & Osborn, Attys.

July 10, 1928.

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C. M. CROOK ET AL

TIME CONTROLLED MECHANISM

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Fig. 8.

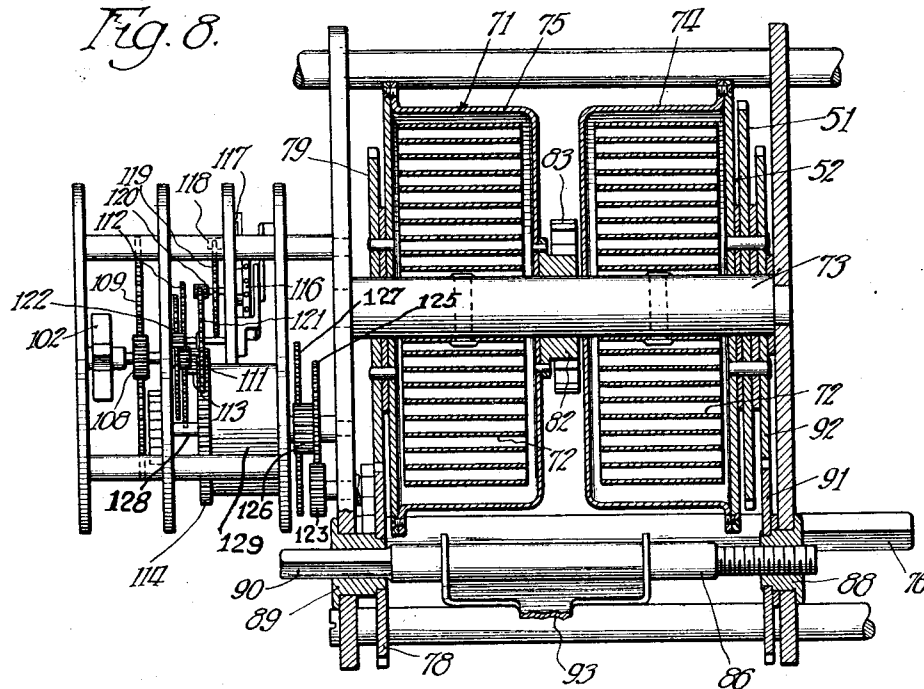
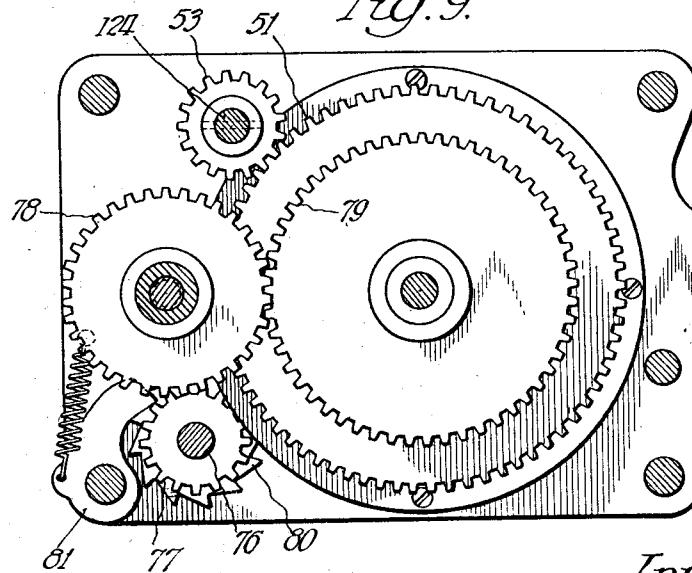


Fig. 9.



Inventors:

Charles M. Crook & Albert E. Long

Jones, Addington, Ames & Seibels, Attys.

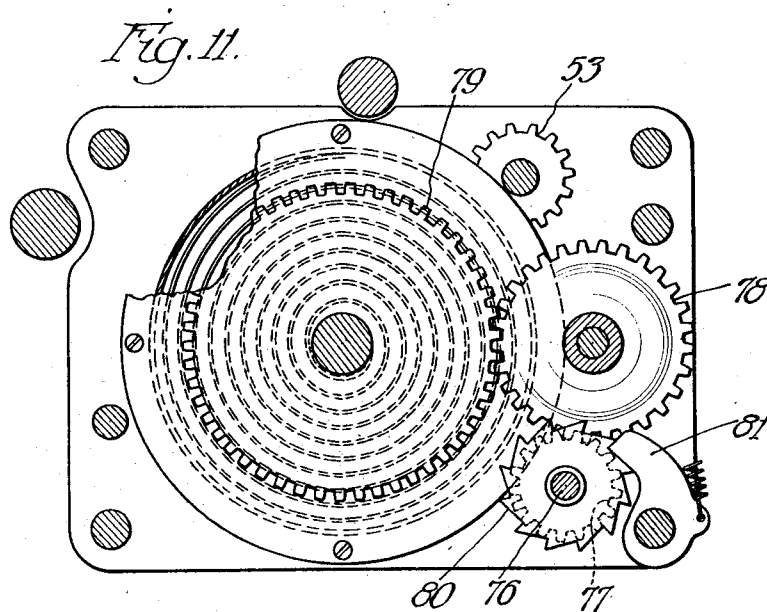
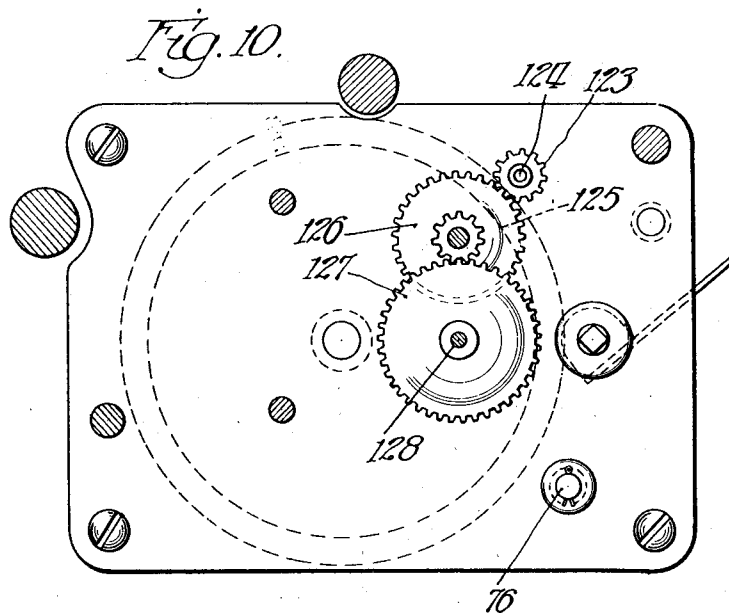
July 10, 1928.

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C. M. CROOK ET AL
TIME CONTROLLED MECHANISM

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Inventors:
Charles M. Crook & Albert E. Long
Jones, Addington, Ames & Seibold, Attys.

UNITED STATES PATENT OFFICE.

CHARLES M. CROOK AND ALBERT E. LONG, OF CHICAGO, ILLINOIS, ASSIGNORS TO STROMBERG ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF MAINE.

TIME-CONTROLLED MECHANISM.

Application filed February 3, 1925. Serial No. 6,538.

Our invention relates to timed-controlled mechanism.

One of the objects of our invention is to provide improved means for controlling the rate of movement of a power driven element.

A further object of our invention is to provide means for controlling the rate of movement of a power driven element comprising a time-controlled motor which does not furnish any of the power for driving the power driven element.

A further object of our invention is to provide a construction in which a power device is provided for driving a certain element or elements and in which the rate of movement of these elements is controlled by a time-controlled motor.

A further object of our invention is to provide a construction comprising a power device and an element or elements driven from said power device and means for restraining the movement of the driven element to a quick intermittent or periodic motion, said means comprising a time-controlled motor.

Further objects will appear from the description and claims.

Our invention is illustrated in connection with a workman's time recorder, although it is obvious that it is useful in connection with other mechanisms. The time recorder shown is similar in many respects to the construction described in the co-pending patent application of Crook, Serial No. 609,573, filed December 29, 1922. The time recorder shown is of the type which operates on a card having a number of columns thereon designated "In" and "Out" and also having spaced lines, one above the other, on the card for a number of days.

The workman on coming in in the morning inserts his card into the machine, and operates a lever or other suitable operating means, which will cause to be typed in the proper place on the card the time at which the workman comes in. Similarly on going out at noon, he inserts the card into the machine, and operates the lever, causing the time at which he goes out at noon to be printed or typed on the card; and so on for the other columns. Means are provided whereby at a certain time a shift will be made which will automatically cause the card to be positioned for printing in a different column. Means are also provided

whereby the shift can be made manually in case a workman comes in late or if for any other reason it is desired to print in a different column from the column where the printing would naturally take place.

In order that the time of arrival and departure will be printed on different lines on different succeeding days, time-controlled means are provided operable automatically once a day for causing the vertical position of the card to be varied from day to day, to cause the date to be printed in the proper place on the card.

All of the above provisions are disclosed in the prior Crook application referred to. In the present construction, however, improved time-controlled means are provided for effecting and controlling the movement of the various parts of the recorder, such as the movement of the type carriage, the movement of the card rack, the movement of the clock hands, etc.

Specifically, a powerful spring motor is provided for effecting the movement of the type carriage, the type wheels on the type carriage and the other power driven parts, and the movement of these power driven parts, particularly the movement of the type wheels, is limited to a quick intermittent or periodic movement (once a minute) by means of an escapement which is allowed to operate periodically by means of a time-controlled motor. This motor, in the form shown, comprises a clock mechanism, having its own escapement, so that the primary escapement which controls the powerful motor is, in turn, controlled by a second escapement which regulates the movement of the clock mechanism referred to.

In the drawings, in which the invention is illustrated.

Figure 1 is a front view of a time recorder, the parts being removed to show the interior construction, showing the controlled and controlling spring motors, the sliding type carriage and the cam for controlling the step-by-step movement of the type carriage;

Fig. 2 is a section on the line 2—2 of Fig. 1 showing the primary spring motor and the gear train from this to the main counter-shaft;

Fig. 3 is a section on the line 3—3 of Fig. 1, showing the controlling spring motor

or clock mechanism and the escapement by which it controls the main countershaft referred to and allows it to move only once per minute;

Fig. 4 is a front view of the mechanism for controlling the movement of the type carriage;

Fig. 5 is a section on the line 5-5 of Fig. 1 showing the type carriage and the mechanism for controlling its movement;

Fig. 6 is a section on the line 6-6 of Fig. 4;

Fig. 7 is a front view showing some of the parts of Fig. 4 in a different position;

Fig. 8 is a horizontal section on the line 8-8 of Fig. 1 showing the primary spring motor and the controlling spring motor or clock mechanism;

Fig. 9 is an enlarged section on the line 9-9 of Fig. 1 showing the primary spring motor;

Fig. 10 is a section on the line 10-10 of Fig. 1 showing another view of the primary spring motor;

Fig. 11 is a section on the line 11-11 of Fig. 1 showing another view of the primary spring motor; and

Fig. 12 is a perspective view of the primary escapement controlling the main spring motor, and in turn, controlled by a second spring motor or clock mechanism.

We will first describe briefly the parts which are similar to the construction shown in the Crook application referred to. These similar parts comprise the laterally shiftable type carriage carrying the type wheels, the hammer mechanism, the card positioning mechanism, and the time indicating mechanism, that is, the clock face and hands, etc.

Type wheels and type carriage, (Figures 3 and 5).

The type carriage 10 is provided with suitable rollers 11 which travel along the transversely extending guide rods 12. A rack 13 is mounted on the front of the carriage which meshes with a pinion 14 controlled by the carriage shifting mechanism. The type carriage has a series of type wheels 15 driven from the type wheel gear 15 having indicia for typing the minute, the hour and the day of the week. These type wheels are shifted periodically to bring the proper printing indicia into printing condition, the minute wheel being shifted once per minute, the hour wheel once per hour and the day wheel once per day.

Type carriage control (Figs. 4, 5, 6 and 7).

The shifting of the type carriage to bring the printing in the proper column on the card is controlled by suitable transmission from the rotatable time controlled cam mechanism.

The mechanism for controlling the move-

ment of the type wheel carriage has provisions whereby the carriage is given a step-by-step movement in one direction and a quick return in the opposite direction automatically. The step-by-step movement can be so governed that the shift from column to column will take place automatically at practically any desired intervals. The construction whereby this is accomplished is substantially the same as that described in the copending application of Crook and Long, Serial Number 627,574, filed March 26th, 1923. However, in the aforesaid Crook and Long application the return of the time carriage required considerable time, probably an hour or more, whereas in the present construction the return of the carriage is effected almost instantly. The periodic step-by-step movement of the carriage from left to right is controlled by a controlling lever 16 pivotally mounted at 17 and the quick return is effected by means of a lever 18 also pivotally mounted at 17 and engaging the cam 19. This second cam lever effects the return by engaging the first cam lever and moving it, the second cam lever being provided with a projection 20 which engages a pin 21 on the first lever on its return movement. The controlling lever 16 acts on the type carriage through an intermediate lever 22 connected to the lever 16 by means of a spring 23, this intermediate lever 22 having a segmental gear 24 meshing with a pinion 25, with which pinion rotates a gear 14 meshing with the rack 13 on the type carriage. In the ordinary operation of the recorder, the segmental gear lever 22 moves as a unit with the cam controlled lever 16, the spring connection being provided simply to enable manual adjustment of the type carriage independently of the cam control adjustment. This feature of independent adjustment of the type carriage is substantially the same as that disclosed in the above prior application, and is effected by means including the pivoted arm 27 and the link 28 connecting this pivoted arm with the lever 22. The follower end 29 of the cam controlled lever 16 is held in engagement with the adjustable arcuate cam pieces 30 by means of a coil tension spring 31 connecting the two cam controlled levers 16 and 18. The follower 32 of the cam controlled lever 18 is held in engagement with the controlling cam by means of a spring 33 having one end secured to a fixed part of the construction and its other end secured to a pin 34 on this lever.

During the greater part of the revolution of the cam 19 the follower 32 rests on the periphery of the cam, but in order to provide for an abrupt definite drop-off to insure instant return of the carriage, an additional follower member 35 is provided in the form of the pin semi-circular in cross section se-

cured to the lever 18 and engageable with the cam 19 to control the return movement of the arm. Referring to Figure 7 the cam is rotating in the direction indicated by the arrow A and will soon disengage the follower 32. However, the arm will not be returned at this time as it will still be held out by the engagement of the semi-circular pin follower 35. However, as the movement of the cam continues it will soon disengage this semi-circular pin also and because of the flattened face of this pin, this disengagement will not be gradual, but will take place instantly and permit an instant return of the arm as soon as the pin drops off the abrupt shoulder. 70

As this pin 35 drops off the abrupt shoulder and the arm 18 moves down until the follower 32 engages the depressed portion of the cam, the follower lever 16 will be forced away from the center of the cam-carrying disk 36 because of the engagement of the extension 20 with the pin 21 on the side of the lever 16. The movement of the lever 18 will be sufficient to lift the follower point 29 high enough to clear the outermost one of the arcuate cam pieces 30 so that on the continued movement of the controller cam, this outermost cam piece 30 will ride under the point of the follower. As the controller cam continues to rotate, the abrupt rise 37 of the cam engages the follower pin 32 and forces the lever 18 outwardly, disengaging the extension 20 from the pin 21 on the other follower lever and permitting the point 29 of this other follower lever to engage the arcuate cam piece 30 underneath because of the action of the tension spring 31 connecting the two follower levers. 75

During the continued movement of the controlling cam, the point 29 of the follower lever successfully drops off from the successive arcuate cam pieces, 30, causing a shifting of the type carriage at the desired time intervals. These arcuate cam pieces may be adjustable circumferentially in the concentric grooves in the cam carrying disk 36, just as in the prior application referred to. 80

In order to rectify or justify any slight mis-alignment which may be present in the type carriage at the time the type hammer lever 38 is operated, justifying means are provided comprising a notched star wheel 39 rotatable with the pinion 25 and a tooth 40 mounted on a pivoted arm 41 connected with the hammer lever, this tooth being engageable in one of the notches of the star wheel to accurately position the star wheel to cause the printing to be done in accurate alignment in the column. In order to provide for a full and complete movement of the lever which carries the adjusting tooth and also for a full and complete movement of the actuating hammer, a spring lost motion connection is provided between the two comprising a lever extension 42 pivotally mounted on the main lever portion and having a stop shoulder 43 for engagement with the main lever portion, which is held thereagainst by means of the spring 44. This pivoted lever extension is connected to the hammer lever by means of a link 45. 85

Card positioning mechanism.

The card positioning mechanism (Figs. 1 and 3) is controlled from a spur gear 46 which is driven from the main countershaft 47 by transmission including a pinion 48 mounted on the main countershaft, a gear 49 meshing with the pinion 48, and a pinion 50 rotatable with the gear 49 and meshing with the card positioning gear 46. The card positioning mechanism may be similar to the construction shown in the Crook application referred to. 90

Main countershaft and transmissions.

The main countershaft 47 is driven from the primary spring motor by transmission including a gear 51 rotatable with the driven spring barrel 52, a pinion 53 meshing with this gear, a gear 54 rotatable with this pinion, a gear 55 meshing with this gear 54, a large gear meshing with the gear 55, a pinion 57 meshing with the large gear, a gear 58 rotatable with the pinion, and a pinion 59 meshing with the gear 58 and mounted on the main countershaft 47. 95

The type wheel gear 15 on the type carriage is driven from the main countershaft by means of a gear 60 mounted on this main countershaft, an elongated pinion 61 meshing with this gear and a gear 62 mounted on the type carriage and meshing with the elongated pinion 61 and with the type wheel gear 15, this elongated pinion being of sufficient length so that the gear 62 can slide on it and be in mesh with it in any position to which the laterally shiftable carriage may be moved. This transmission is similar to that shown in Crook application referred to. 100

The carriage shift controlling cams are driven from the main countershaft 47 by a transmission (Figs. 4, 5, 6 and 7) including a gear 63 meshing with the elongated pinion 61, a bevel pinion 64 rotatable with the gear, a bevel gear 65 meshing with the bevel pinion 64, the pinion 66 rotatable with the bevel gear 65, a gear 67 meshing with the pinion 66, a pinion 68 rotatable with the gear 67, and a gear 69 meshing with the pinion 68 and mounted on the same shaft 70 on which the carriage controlling cams are mounted. 105

Primary motor (Figs. 8, 9, 10 and 11).

The primary spring motor comprises two spring drums similar in some respects to the two spring drums used in phonograph motors, one spring drum 52 being driven from 110

the other drum 71 in a yielding flexible manner. The inner ends of the springs 72 of both drums are riveted to the rotatable shaft 73, the outer ends of the spring being secured to the respective drum casings 74, 75. The transmission above described from the motor to the main countershaft is from the driven spring drum 52.

The winding mechanism acts on the driving spring drum. This winding mechanism comprises the winding stem 76, a pinion 77 mounted on this stem 76, a gear 78 meshing with the pinion 77, and a gear 79 meshing with the gear 78 and mounted on the driving spring drum 71. In order to prevent the driving spring drum from unwinding a ratchet wheel 80 is mounted on the winding stem 76 and engaged by a spring pressed pawl 81.

In order that the driving spring drum may at all times exert a substantially uniform pull on the driven spring drum, we provide means for limiting the relative rotation between the two spring drums. In the particular means provided for this purpose, the design is such that this relative rotation between the two drums is limited to nine revolutions. This limiting means comprises a geneva gearing (Figs. 2 and 8), the single toothed gear 82 being mounted on the driving drum, coaxially therewith, and the multiple toothed gear 83 being mounted on the driven spring drum eccentrically with respect thereto. The multiple toothed gear 83 is provided with one tooth 84 of peculiar formation so that when its edge engages the circular portion of the single toothed gear, further relative rotation of the two gear members in that direction is prevented. It will be seen that this limiting tooth 84 will not only limit the winding up movement of the driving spring drum with respect to the driven spring drum, but will also limit the unwinding movement of the driven spring drum with respect to the winding spring drum. The limiting movement in one direction is effected by the engagement of the odd tooth of the multiple toothed gear on one side of the tooth 85 of the single toothed gear and the limiting movement in the other direction is effected by engagement of the odd tooth 84 on the other side of the single tooth.

In order to indicate the relative positions of the two winding drums with respect to each other, we provide an indicator comprising a longitudinally shiftable bar 86 which controls through suitable transmission a suitable indicator 87 adjacent the dial of the clock and which shiftable bar is controlled by the relative position of the two drums. This control by the two drums is effected by means of an internally threaded bushing 88 into which the end of the shiftable bar is threaded, a second bushing 89 in which the squared end 90 of the shiftable bar is slidable,

and means whereby the internally threaded bushing 88 is controlled from the driven drum 52 and the apertured bushing 89 is controlled from the driving drum 71. The internally threaded bushing 88 is geared to the driven drum by means of a gear 91 rotatable with this bushing and meshing with the gear 92 rotatable with the driven drum. The bushing 89 having the squared opening is geared to the driving drum through the intermediate winding gear 78 previously referred to, which is mounted directly on this bushing and meshes with the gear 79, and consequently the bushing is rotated whenever the driving drum is rotated. From the above it will be seen that a relative rotation in one direction between the two spring drums will cause a shifting of a shiftable bar 86 in one direction because of the threaded engagement between the bar and the threaded bushing and relative rotation in the opposite direction will cause sliding movement of the shiftable bar in the opposite direction. Thus, the position of this shiftable bar indicates the relative position of the two drums.

The transmission from this shiftable bar 86 to the indicating member 87 comprises a bracket 93 secured to the shiftable bar 86, a bell crank lever 94 pivotally mounted at 95 and having one arm connected by a pin and slot connection with the bracket 93 and a link 96 pivotally connected at one end to the other arm of the bell crank lever 94 and connected at its upper end to the shiftable indicating member 87. The indicating member is provided with two arms 97 and 98 suitably guided to cause the indicating member to move up and down vertically. These arms are provided simply to guide the indicating member and cause it to move smoothly and freely.

Timing motor.

Thus far we have described the powerful primary spring motor which furnishes the power for the moving parts and have also described the transmission from this primary motor to the main countershaft and from this countershaft to various driven mechanisms. We will now describe the means whereby a small time controlled motor controls and regulates the movement of the main countershaft which is driven from the primary motor. This small controlling motor is mounted on the side of the main motor. Its function is to control the movement of the main motor and the parts driven by the main motor. It does this by controlling an escapement which permits a quick periodic movement of the parts driven by the main motor, one movement per minute being permitted. The small controlling motor is itself controlled by an escapement in the usual manner of spring clock mechanisms.

The spring drum which drives the small controlling motor is kept wound up by the movement of the powerful primary spring motor. There are thus three mechanisms directly associated with the spring drum of the small controlling motor (1) the escapement which controls the periodic movement of the primary motor and the parts driven thereby; (2) the escapement mechanism which controls the movement of the spring drum of the small controlling motor in the usual manner of a clock escapement; and (3) the means for keeping the spring drum of the small controlling motor wound up at a uniform tension comprising a transmission between the powerful primary motor and the spring drum of the small controlling motor.

We will now describe in detail these three mechanisms, and first, the manner in which the escapement which controls the primary motor is itself controlled by the controlling motor. A gear train connects the star wheel 99 of this escapement with the main countershaft 47 so that there is a spring tension, tending to rotate this star wheel in the direction of the arrow B in Figs. 3 and 12. This gear train comprises the pinion 48 and gear 49 previously described, and a pinion 100 meshing with the gear 49, and rotatable with the star wheel 99. This star wheel 99 is permitted to move periodically once a minute by the escapement lever 101. This escapement lever 101 is controlled by a six-toothed star wheel 102 which is driven from the small controlling motor or clock mechanism, the movement of this controlling clock mechanism being so controlled that the six-toothed star wheel makes a complete revolution every six minutes or so that it rotates the distance from one tooth to the other every minute. The escapement lever 101 carries at its lower end a spring pressed dog 103, the purpose of which will be described hereinafter. The escapement lever has at its upper end two branches having follower portions 104 and 105 for co-operation with the teeth of the star wheel 99. When the follower portion 104 is in engagement with the tooth of the star wheel 99, the spring pressure tending to move the star wheel in the direction of the arrow B causes the tooth of the star wheel to press on the follower and urge it radially outwardly causing the tip of the dog 103 to bear against and follow the tooth of the star wheel 102 with which it is in engagement. This movement continues until the star wheel 99 has travelled far enough to move the follower 104 to release the teeth of the star wheel with which it is in engagement, whereupon the released star wheel gives a quick movement under the action of the spring tension. This movement of the star wheel causes one of its teeth to engage the follower 105, and the con-

tinued movement of the star wheel forces the lower end of the escapement lever downwardly causing the pivoted dog 103 to slip past the point of the tooth with which it is in engagement, the spring 106 permitting the necessary yielding of the pivoted dog. The movement of the star wheel 99 continues until the point of the tooth which engages the follower 105 has forced this follower radially outwardly far enough to permit the point of the tooth to slip past and the movement of the star wheel 99 is thereafter arrested by the engagement of a tooth with the follower 104 which has been radially inward by movement of the escapement lever. The tooth of the star wheel thus presses on the follower 104 urging it radially outward, and again causing the dog 103 to engage and follow up a tooth on the star wheel 102. In this movement the dog 103 is held rigid with respect to the escapement lever 101 by means of a stop pin 107 on the lever which is engaged by the dog. In this manner the star wheel is given a quick periodic movement once per minute.

The transmission between the spring drum of the small motor and the controlling star wheel 102 comprises a pinion 108 mounted to rotate with this star wheel, a gear 109 meshing with this pinion 108, a gear 110 rotatable with the gear 109, a pinion 111 rotatable with the gear 110, a gear 112 meshing with the pinion 111, and a pinion 113 rotatable with the gear 112 and meshing with the gear 114 on the casing 115 of the spring drum.

It will be noted that the only work which this small controlling motor has to do is to drive the star wheel which controls the movement of the escapement lever 101.

The escapement which controls the movement of the controlling motor or clock mechanism may be similar to an ordinary escapement for controlling a clock mechanism and is not shown in great detail but comprises the usual oscillatable balance wheel 116 and a transmission between this balance wheel and the spring motor, whereby a time controlling force is exerted on this spring motor.

This transmission between the escapement and the spring drum comprises a detent wheel 117 controlled by the escapement lever, and balance wheel, a pinion 118 rotatable with this detent wheel, a gear 119 meshing with this pinion, a pinion 120 rotatable with this gear, a gear 121 meshing with this pinion, and a pinion 122 rotatable with this gear, and meshing with the gear 110, hereinbefore referred to which is connected with the spring drum through transmission previously described.

The transmission between the spring drum of the small controlling motor and the spring drum of the primary motor, whereby the primary motor keeps the spring of the con-

trolling motor wound to a uniform tension, comprises a pinion 123 mounted on the shaft 124 on which the pinion 53 is mounted, a gear 125 meshing with the pinion 123, a pinion 126 rotatable with this gear, and a gear 127 meshing with the pinion 126 and mounted on the shaft 128 of the spring drum. One end of the spring is connected to this shaft, the other end being connected to the drum housing 129, on which the drive gear 114 is mounted.

It will be seen that this controlling clock mechanism or small motor comprises essentially a spring driven balance wheel controlled, clock mechanism which permits periodic movement of the main countershaft 47, once per minute, this controlling clock mechanism furnishing one of the power for driving the main countershaft and in fact being itself supplied with power from the main primary motor.

While we have shown but one form of our invention, it is to be understood that we do not desire to limit ourselves to this particular construction since many changes and modifications may be made therein without departure from the scope of the following claims.

We claim:

1. A power device, an escapement for controlling the movement of said power device, a second power device and means whereby said second power device controls said escapement, said escapement comprising an oscillatable member and said controlling means comprising a rotatable member having a plurality of detents which successively detain and release said oscillatable member, said escapement and controlling means having provisions whereby the oscillatable member will make substantially a complete oscillation back and forth between the time it is released by one detent and detained by the following detent.

2. A power device, an escapement for controlling the movement of said power device, a second power device and means whereby said second power device controls said escapement, said escapement comprising an oscillatable member and said controlling means comprising a rotatable member having a plurality of detents which successively detain and release said oscillatable member, said escapement and controlling means having provisions whereby the oscillatable member will make substantially a complete oscillation back and forth between the time it is released by one detent and detained by the following detent, said provisions comprising a spring controlled dog acting between the oscillatable member and rotatable member which yields to permit the completion of the oscillation.
3. A power device, an escapement for controlling the movement of said power device, a second power device, and means whereby said second power device controls said escapement, said escapement comprising an oscillatable member and said controlling means comprising a rotatable member having a plurality of detents which successively detain and release said oscillatable member, said escapement and controlling means having provisions whereby the oscillatable member will make substantially a complete oscillation back and forth between the time it is released by one detent and detained by the following detent, said provisions comprising a spring controlled dog acting between the oscillatable member and rotatable member and mounted on the oscillatable member, which yields to permit the completion of the oscillation.
4. A spring motor comprising two coaxial coil springs, a shaft to which the inner ends of both springs are secured, two drums to which the outer ends of said springs are secured respectively, and means for limiting the relative movement of said drums with respect to each other comprising a Geneva gear.
5. A spring motor comprising two coaxial coil springs, a shaft to which the inner ends of both springs are secured, two drums to which the outer ends of said springs are secured respectively, and means for limiting the relative movement of said drums with respect to each other comprising a Geneva gear, one member of the Geneva gear being secured to one drum and the other member being secured to the other drum.
6. A spring motor comprising two coaxial coil springs, a shaft to which the inner ends of both springs are secured, and means for limiting the movement of the springs with respect to each other, comprising a Geneva gear.

In witness whereof, we have hereunto subscribed our names.

CHARLES M. CROOK.
ALBERT E. LONG.