

No. 710,146.

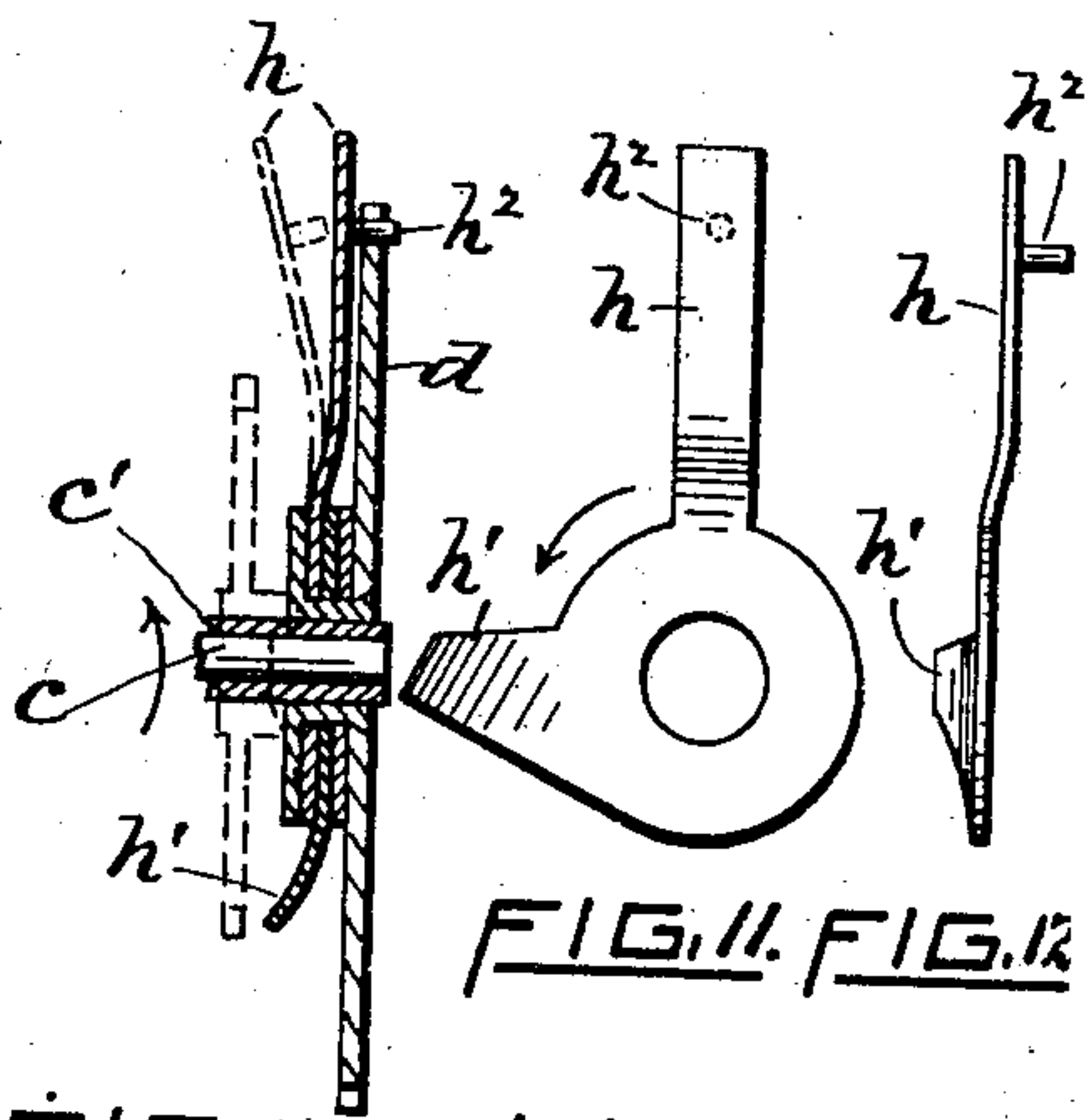
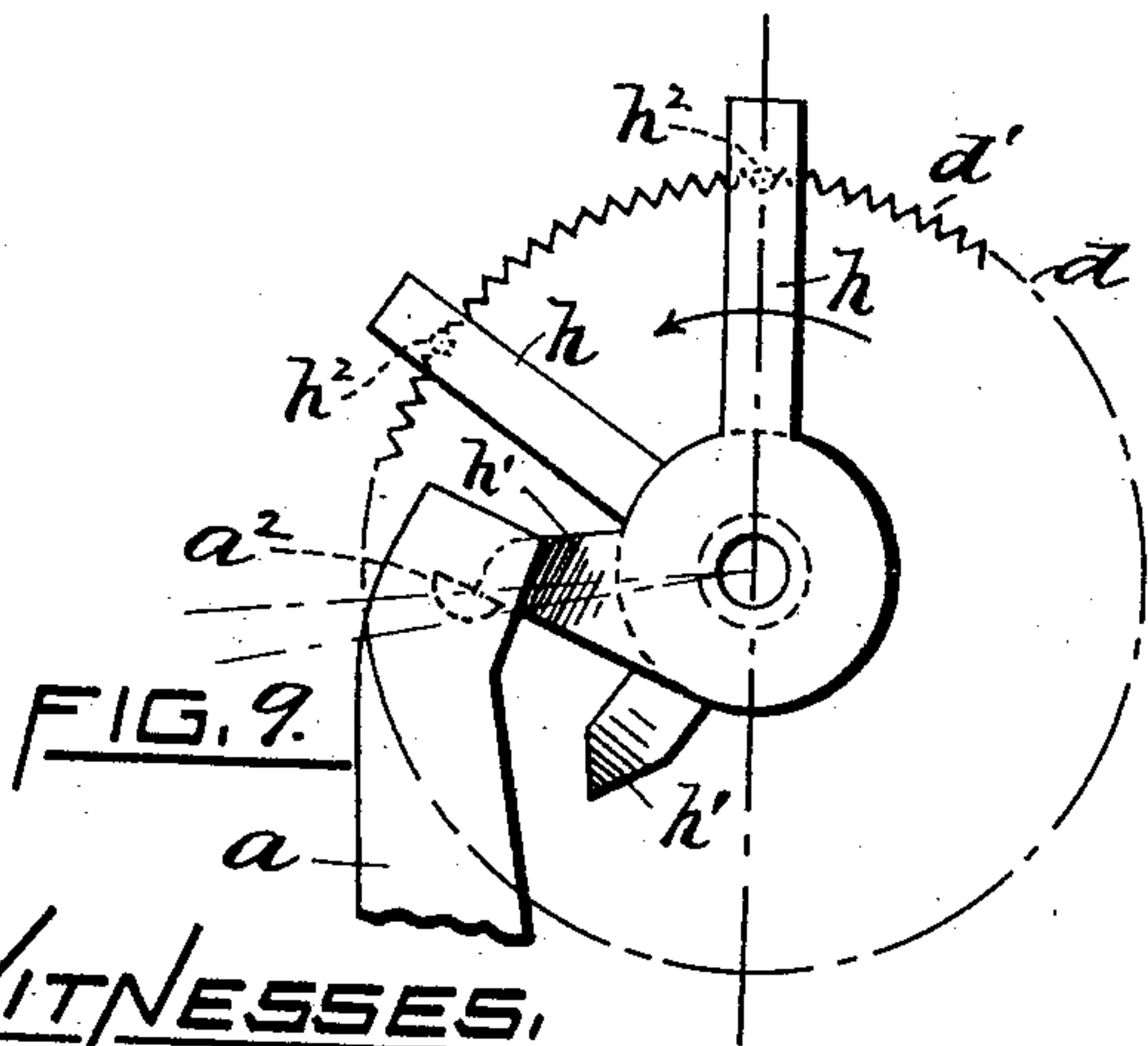
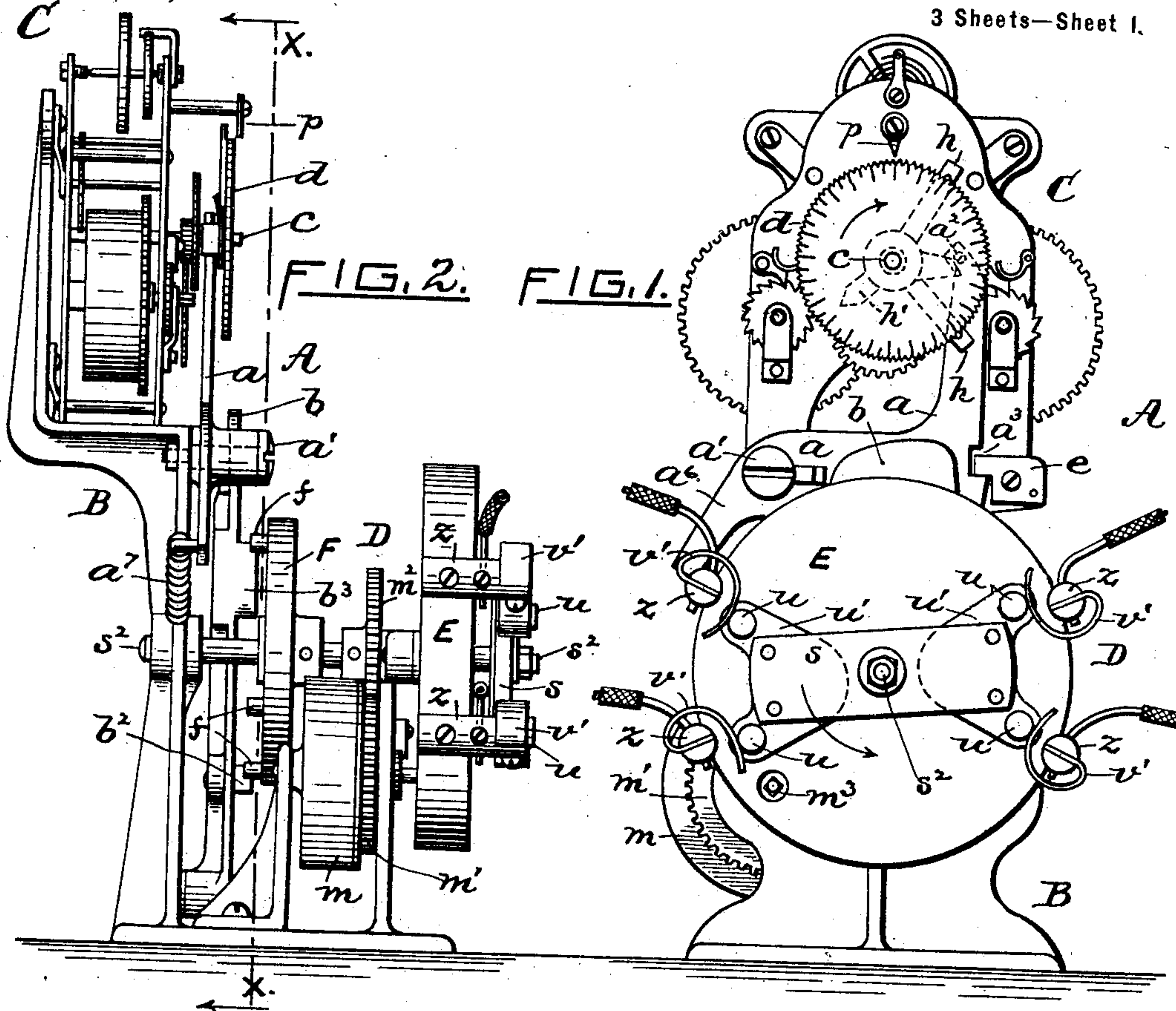
Patented Sept. 30, 1902.

H. K. GARDNER.
AUTOMATIC ELECTRIC TIME SWITCH.

(Application filed Feb. 5, 1902.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES,

Charles T. Hannigan.
J. B. Butler

FIG. 10. INVENTOR,

Henry K. Gardner.

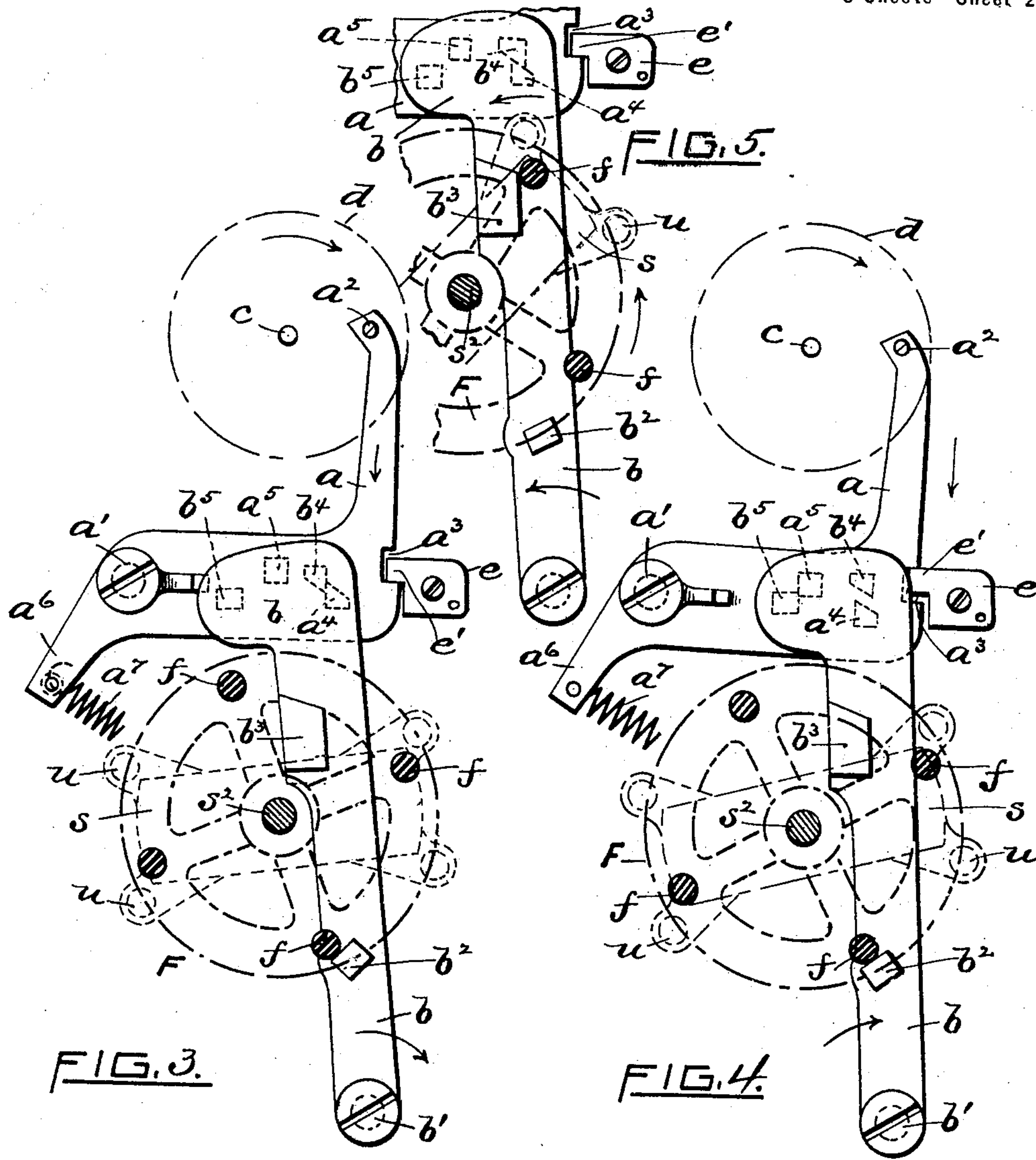
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(Application filed Feb. 5, 1902.)

(No Model.)

3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

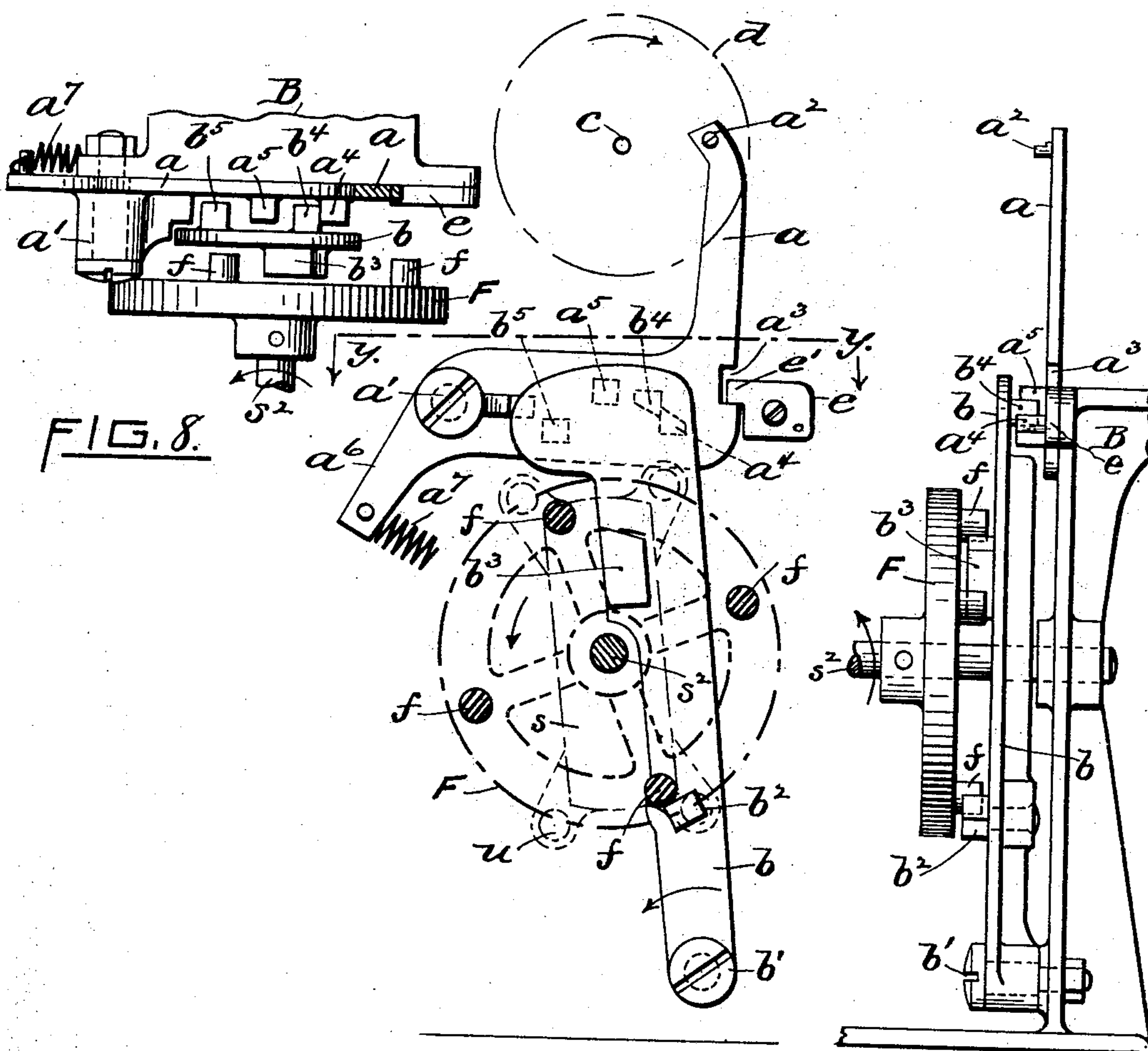


FIG. 6.

FIG: 7.

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UNITED STATES PATENT OFFICE.

HENRY K. GARDNER, OF PROVIDENCE, RHODE ISLAND.

AUTOMATIC ELECTRIC TIME-SWITCH.

SPECIFICATION forming part of Letters Patent No. 710,146, dated September 30, 1902.

Application filed February 5, 1902. Serial No. 92,619. (No model.)

To all whom it may concern:

Be it known that I, HENRY K. GARDNER, a citizen of the United States of America, and a resident of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Electric Time-Switches, of which the following is a specification.

My invention relates to improvements in automatic electric time-switches for controlling electric circuits, the device being more particularly adapted for use in connection with electric-lighting circuits, where it is desired to make or close the circuit at certain predetermined times or intervals, thereby automatically lighting the electric lamps in the circuit, the device being also employed for breaking the electric circuit at certain other predetermined times, thereby automatically extinguishing the lights in said circuit.

While, as just stated, my improved electric time-switch is adapted for use in electric-lighting circuits, it is also well adapted for use in electric circuits used for other purposes, where the electric current is to be switched on or off at certain prearranged times or for any particular length of time.

My invention consists, essentially, in the combination, with motor-actuated or mechanically-movable switch member and clock or time mechanism detached from said switch, of a suitably-graduated time-dial adjustably mounted on and adapted to revolve in unison with the center or time spindle of said clock, time-tripper members adjustably secured to and revolving with the said time-dial, and normally stationary releasing mechanism connected with said switch having a member thereof arranged in the path of and adapted to be engaged by said moving time-trippers at predetermined intervals of time, all as will be more fully hereinafter set forth and claimed.

In carrying out my invention I employ any first-class clock-movement, preferably one having an "eight-day wind." Combined with said clock-movement and wholly detached and disconnected from it I also provide a suitably-mounted intermittently-revoluble switch, adapted to be directly actuated by an independent spring and gear train or weight, this latter being released by interposed novel

escapement mechanism controlled by suitable fingers or "trippers" mounted upon and moving in unison with the revolving "center" or "time" spindle of the clock mechanism.

In the accompanying three sheets of drawings, illustrating one form of my improved automatic electric time-switch, Figure 1 is a front view of the complete device. Fig. 2 is a corresponding side view. Fig. 3 is an enlarged transverse section and elevation taken substantially on line *x x* of Fig. 2, showing the escapement mechanism in its normal position. Fig. 4 is a similar view showing the relative position of the escapement-levers at the instant the initial lever is depressed by the revolving finger, the latter, however, being omitted, but shown in Fig. 1. Fig. 5 is a similar view showing the initial lever returned to its normal position, the fellow lever being returned to its normal position, shown in Fig. 3, and the switch being correspondingly rotated. Fig. 6 is a similar view showing the levers again in the normal position and relation, the switch being at the end of its movement or one-fourth of a revolution. Fig. 7 is a corresponding side view of the escapement device. Fig. 8 is a horizontal section taken on line *y y* of Fig. 6. Fig. 9 is a rear elevation of the "time-fingers" and dial. Fig. 10 is a transverse sectional view taken through the center of the dial and fingers. Fig. 11 is a back view of one of the finger members; and Fig. 12 is a side or edge view of the same.

In the drawings, A indicates my improved automatic electric time-switch as a whole and as installed for service.

B designates a frame or standard, to which is secured a suitable clock-movement C, and also having the several members constituting the switch and escapement mechanism mounted thereon.

At a central point below and in substantial alignment with the revoluble clock spindle or shaft *c* is located the revoluble switch-carrying shaft *s*². This shaft is supported in suitable bearings and has the usual insulated switch member *s* secured thereon. At each end of the switch is secured a conducting-plate *u'*, having two laterally-separated contact-pins *u u*. These latter when in use are in contact with the usual yielding brushes *v'*

v' , through which latter the electric current freely passes from one pole z , via the pins u , &c., to the other pole in a well-known manner.

5 E indicates an insulated stationary disk or plate carrying the several poles z . A suitable spring m , through which the switch is actuated, is adapted to be wound by a key fitted to a shaft m^3 , passing through a hole
10 formed in said plate E. A spur-gear m^2 , secured to the switch-shaft, is rotated by means of a fellow gear m' , controlled and actuated by the spring m . Upon the shaft s^2 is also
15 drawn, a series of four pins f arranged around the rear side of its rim at equal distances apart. These pins engage certain lugs or dogs of the intermediate releasing-lever b , soon to be described. The lever b is pivoted
20 at b' and carries at its upper end or head two short rearwardly-projecting pins b^4 and b^5 , the lower face of the former being beveled, as clearly shown. Said lever is also provided with two other stop pins or lugs b^2 and b^3 .
25 These lugs are formed on the front face of the lever, the former, b^2 , being located near the fulcrum and the other being intermediate of the upper and lower lugs. The initial or bell-crank lever a of the escapement mechanism is located in a vertical plane parallel
30 with but just in the rear of said lever b . It is pivoted at a' to the standard B and has a downwardly-extending arm a^6 , to which is attached a retracting-spring a^7 . The face of the lever adjacent to the head portion of lever b is also provided with two short pins a^4
35 a^5 , adapted to coact with said pins b^4 b^5 . The right edge of lever a has a notch a^3 therein to receive the tongue e' of the stationary stop member e . The upper end of lever a carries
40 a laterally-extending flattened pin a^2 , adapted to be engaged by the tripping members of the dial's fingers, soon to be described. The escapement-wheel F is located in front of the lever b , its pins f being fixed so as to contact
45 with the lugs b^2 b^3 of said lever. The relation of these several centers or fulcrums a' b' s^2 to one another is such that the force of the switch-actuating spring m cannot rotate the switch
50 and escapement-wheel F more than ninety degrees without being arrested. This action is due to the contact of the pins f with the lugs b^2 b^3 of lever b . The center or dial spindle c , which in this case is preferably arranged to
55 make one revolution in twenty-four hours, is extended in front and adapted to receive a suitably-graduated dial d , having a serrated or notched rim. The dial may be divided into
60 twenty-four equal divisions, corresponding to the number of hours in a day, each division being, as drawn, subdivided into four equal parts, indicating one-quarter of an hour and being the serrations just referred to. To the back face of the dial a pair of
65 axially-movable sheet-metal fingers h are frictionally mounted, each having a short arm h' arranged at a suitable angle there-

with and constituting what may be termed a "time-tripper." Each of said fingers h has a pin h^2 projecting in front therefrom adapted to engage the notched portion of the dial's rim, as clearly shown. The free end of each tripping-arm h' is so arranged that in moving
70 around in its circular path it will engage the said pin a^2 , projecting from the upper end of the initial lever a and depress the latter until arrested by the fixed stop e' . Fig. 4 shows the corresponding relation of the lever, &c.
75 As soon as the arm h' has passed the pin a^2 the lever is instantly returned to the normal position shown in Fig. 3 by means of the spring a^7 .
80

The manner of setting the time-tripping device is substantially as follows: The graduations or index formed on the dial's face may, if desired, be numbered to correspond with
85 or indicate the twenty-four hours of a day. Now in order to set the finger h it is first sprung rearwardly, as indicated by broken lines in Fig. 10, thereby disengaging the pin
90 h^2 from the dial, followed by turning it axially until the pin coincides with the notch or time at which it is desired that the switch is to be actuated. Upon releasing the finger the pin enters the adjacent notch. When the time
95 mechanism advances the dial so that the pin h^2 of the finger arrives at the vertical position or substantially opposite the pointer p , (shown in Fig. 1,) the corresponding tripper-arm h' will then engage the lever a and de-
100 press it, as before stated. The continued movement of the dial—say, for a period of fifteen minutes—will carry the arm h' past the tripping-pin a^2 , thereby releasing the escapement mechanism and permitting the spring
105 m , &c., to actuate the switch one-fourth of a revolution. I would state that I prefer to arrange the pointer p and pin a^2 with respect to the pin h^2 and the outer end of the arm
110 h' , so that when the two former coincide with the two latter the lever a will at the same time be acted upon by the tripping-arm. Fig. 9 also shows the relation of the parts.

In order to provide a free passage for the fingers h past the face of lever a , the outer or
115 front end of pin a^2 does not extend to the rear face of the dial, thereby forming a clear space between them for the finger. The other portion h' , however, is bent rearwardly, (see Fig. 10,) so as to lie in the plane of pin a^2 .
120

In my improved time-switch the angular movement of the dial and its fingers need not exceed one ninety-sixth of a revolution or fifteen minutes in order to depress the lever a from the normal position and release the es-
125 capement mechanism which actuates the switch, as clearly indicated in Fig. 9. The action of the slowly-revolving dial causes the tripper-arm h' to first depress the initial lever a , as before described, thereby at the same
130 time carrying the beveled interlocking stop-pin a^4 thereof (shown in the normal position in Fig. 3) downwardly past the adjacent face of the fellow pin b^4 of lever b , (or to the po-

sition shown in Fig. 4,) thereby releasing lever *b*, so that at the very instant of release when the arm *h'* actually leaves the pin *a*² the force of spring *m*, acting through the gears *m'* *m*², slightly turns the escapement-wheel *F*, thereby at the same time, through the medium of the, for the time being, lower pin *f*, in contact with the bottom pin *b*² of lever *b*, vibrating the latter from the position shown in Fig. 3 to that indicated in Fig. 4, or until the face of pin *b*⁵ engages a corresponding pin *a*⁵ of lever *a*. It is to be understood that the wheel *F* is rapidly moving meanwhile by the force of said spring *m*, so that when the corresponding upper pin *f* of the wheel engages the side of the lug *b*³ it will vibrate lever *b* rearwardly or toward the shaft *s*², thereby separating the frictionally-engaged pins *b*⁵ *a*⁵, at which instant the spring *a*⁷ will return lever *a* to its normal position. (See Fig. 5.) The final movement of the wheel carries the upper pin *f* past lug *b*³, thus swinging lever *b* toward the left to its limit, as shown in Figs. 6 and 3, and leaving the switch *s* in its new or changed position. (See Fig. 6.) At this instant, too, the lower lug *b*² engages a bottom pin *f*, while the then elevated lever *a* carries the pin *a*⁴ upwardly in front of pin *b*⁴, the result being to instantly stop the wheel's movement and to lock the lever *b* against further action until it is again released by depressing the initial lever *a*. I would state that while the adjacent faces of pins *a*⁴ *b*⁴ are represented in Figs. 3 and 6 as being in close contact the lever *b* has, in fact, a slight play when in this position, so that the tripping-arm *h'* has really little or no work to do in depressing the lever *a*. The force of the retracting-spring *a*⁷ serves simply to overcome the weight of the lever and maintain it in the normal position. I would further add that the time required for automatically actuating the switch after the tripper has passed the pin *a*² of the initial lever *a* of the escapement device is very short or barely one second.

By means of my invention it is obvious that practically no additional force or work beyond its normal requirements is imposed on the clock-movement in changing the switch from one position to the other, since the operative force or power for actuating the switch is wholly detached from and independent of the time-controller *C*. In fact, the size of the chronometer or clock mechanism is not necessarily increased when employed for controlling the action of switches used for electric circuits of high voltage. I consider this a valuable feature of my invention.

I claim as my invention and desire to secure by United States Letters Patent—

1. In an automatic electric time-switch, the combination with a motor-actuated or mechanically-movable switch member and clock or time mechanism, detached or disconnected from said switch, of a suitably-graduated

time-dial adjustably mounted on and adapted to revolve in unison with the center or time spindle of said clock, time-tripper members adjustably secured to and revolving with the said time-dial, and normally stationary releasing mechanism connected with said switch having a member thereof arranged in the path of and adapted to be engaged by said moving time-trippers at predetermined intervals of time, substantially as hereinbefore described and for the purpose set forth.

2. In an electric time-switch, provided with clock mechanism and a motor-actuated switch having a movable member, an escapement device comprising a spring-pressed initial lever *a* having stop pins or lugs, a locking-lever *b* having its upper portion provided with lugs adapted to engage those of said lever *a*, and an escapement-wheel *F*, arranged to revolve in unison with the movable member of said switch, having pins arranged to coact with lugs formed on lever *b* and located in the path of said pins, substantially as described and for the purpose set forth.

3. In an electric time-switch, time mechanism provided with suitable tripping members, and a revoluble motor-actuated member *s* of an electric switch, in combination with interlocking escapement-levers *a* *b*, arranged with respect to said tripping members, and an escapement-wheel *F* revolving in unison with said switch member provided with means for controlling the angular movements of said lever *b*, whereby upon actuating the escapement-lever *a* the combined action of said members, *b* and *F*, allows the said switch member *s* to revolve to open or close the electric circuit, substantially as described.

4. In an automatic electric time-switch, the combination with a revoluble time-dial having tripping-fingers connected therewith, and a motor-actuated intermittently-revoluble switch or contact members, of an escapement-wheel working in unison with said contact member, a lever *b* having its angular movements controlled by said wheel, and a lever *a* in normal engagement with said lever *b* arranged in the path of and adapted to be actuated by said tripping-fingers, substantially as described.

5. In an automatic electric time-switch, the combination of a suitably notched or graduated dial, adjustable tripping-fingers arranged with respect to said dial, clock mechanism for continuously rotating the dial and fingers, stationary contact points or poles, an intermittently-revoluble motor-actuated member *s* arranged to engage said points thereby closing the electric circuit, a spring-pressed lever *a* arranged to be engaged and actuated by said tripping-fingers, a lever *b* normally locked to said lever *a*, and an escapement-wheel revolving in unison with said member *s* provided with means for controlling the angular movements of said lever *b*, substantially as hereinbefore described and for the purpose set forth.

6. In an automatic electric time-switch having independent clock and switch-actuating mechanisms, an escapement device consisting of a revoluble pin-carrying escapement-wheel
5 F adapted to be actuated by said switch mechanism, a movable lever *b* provided with stops or pins arranged with respect to and adapted to engage the pins of said wheel, a movable spring-pressed initial lever *a* having pins arranged to engage and interlock with fellow
10 pins of the lever *b*, a stop for limiting the angular movement of lever *a*, and revolving tripping means actuated by said clock mech-

anism arranged to engage with and actuate said lever *a*, thereby for the instant releasing 15 the lever *b* and permitting the wheel to revolve a certain angular distance, substantially as described and for the purpose hereinbefore set forth.

Signed at Providence, Rhode Island, this 20 3d day of February, 1902.

HENRY K. GARDNER.

Witnesses:

GEO. H. REMINGTON,
G. E. SMITH.