No. 817,175. PATENTED APR. 10, 1906.

C. E. KATSCH.

ELECTRIC TIME SWITCH.

APPLICATION FILED MAR. 15, 1905.

5 SHEETS—SHEET 1.

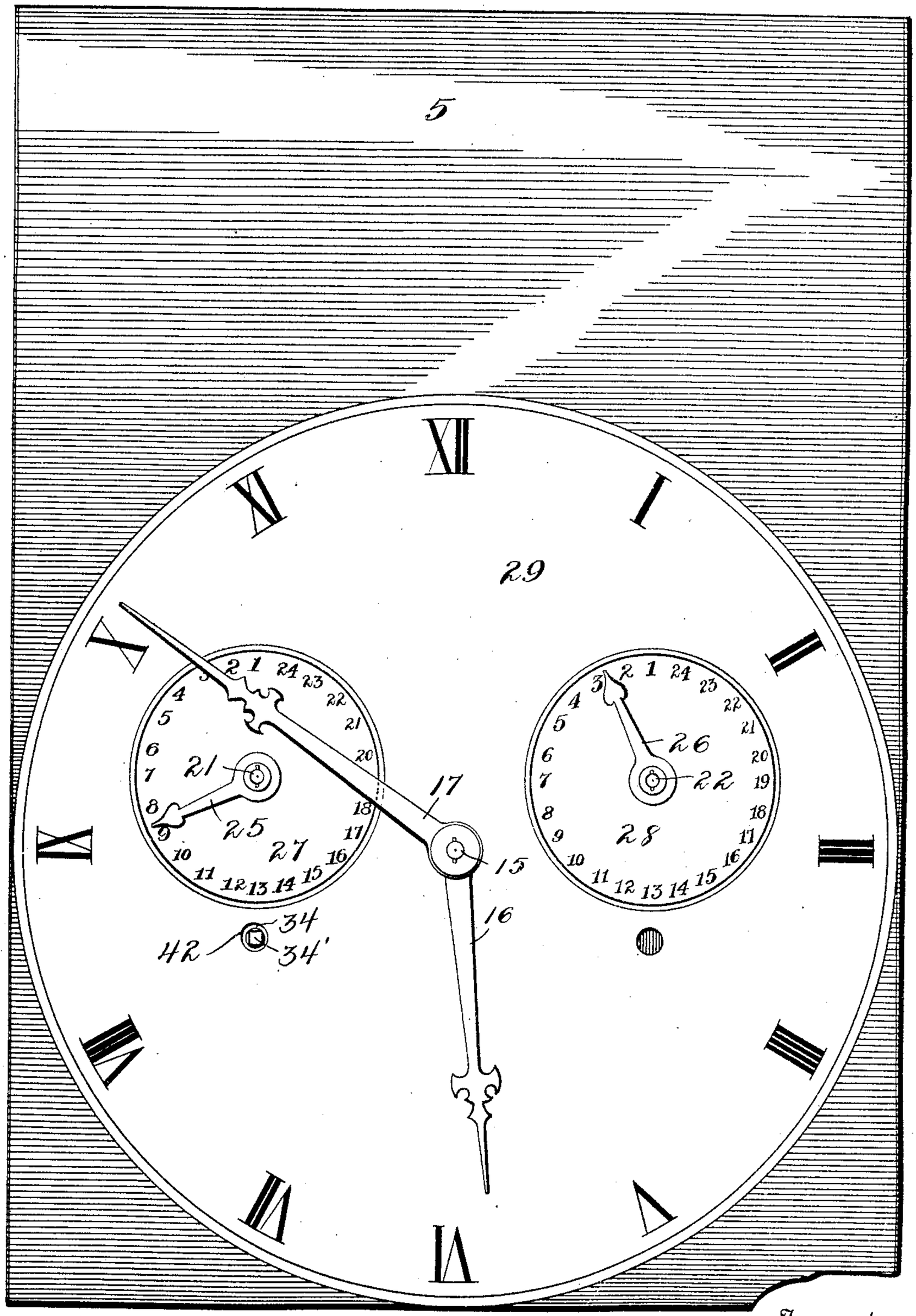

Fig. 1.

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his Attorney

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5 SHEETS—SHEET 2.

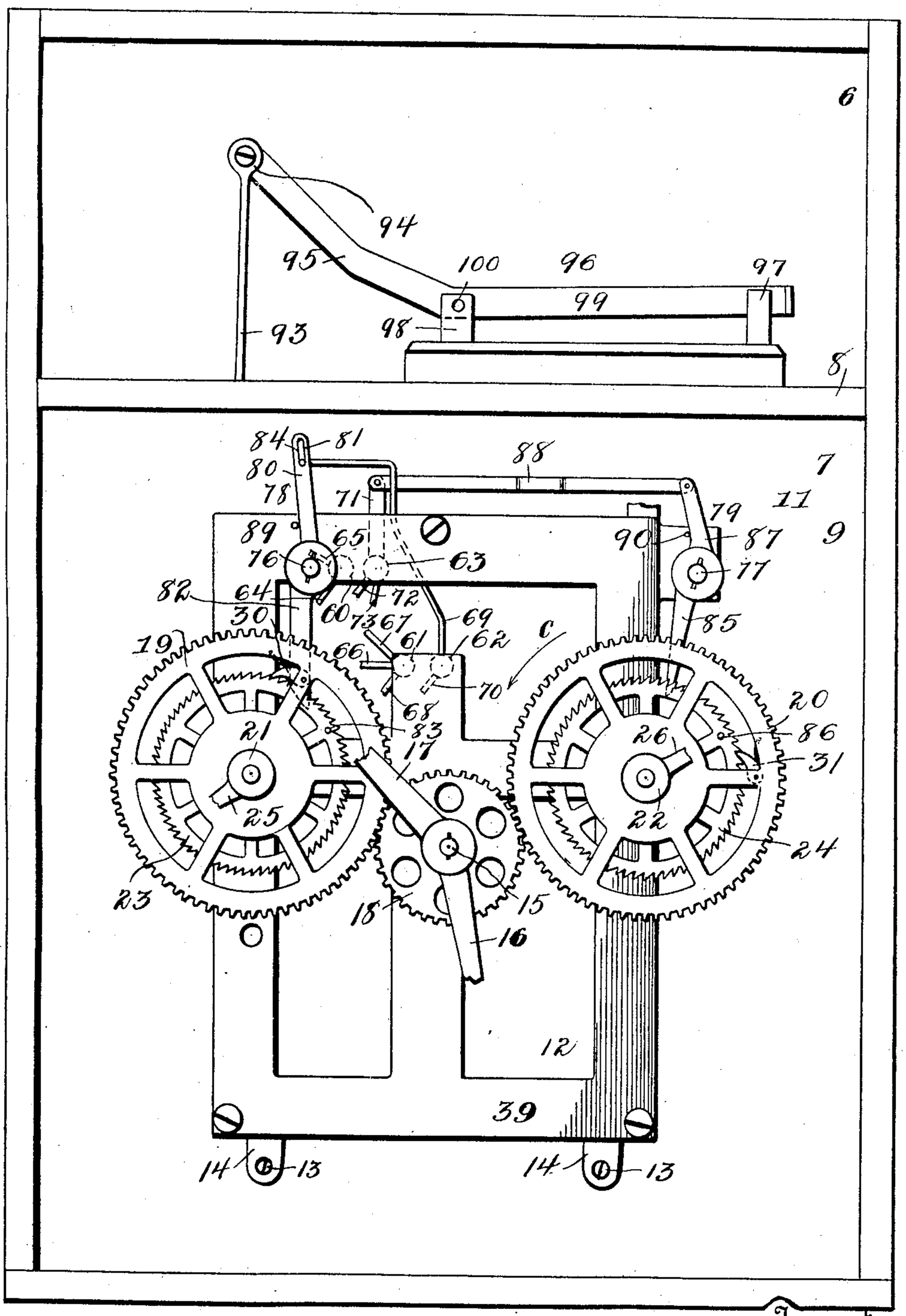

Fig. 2

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5 SHEETS—SHEET 3.

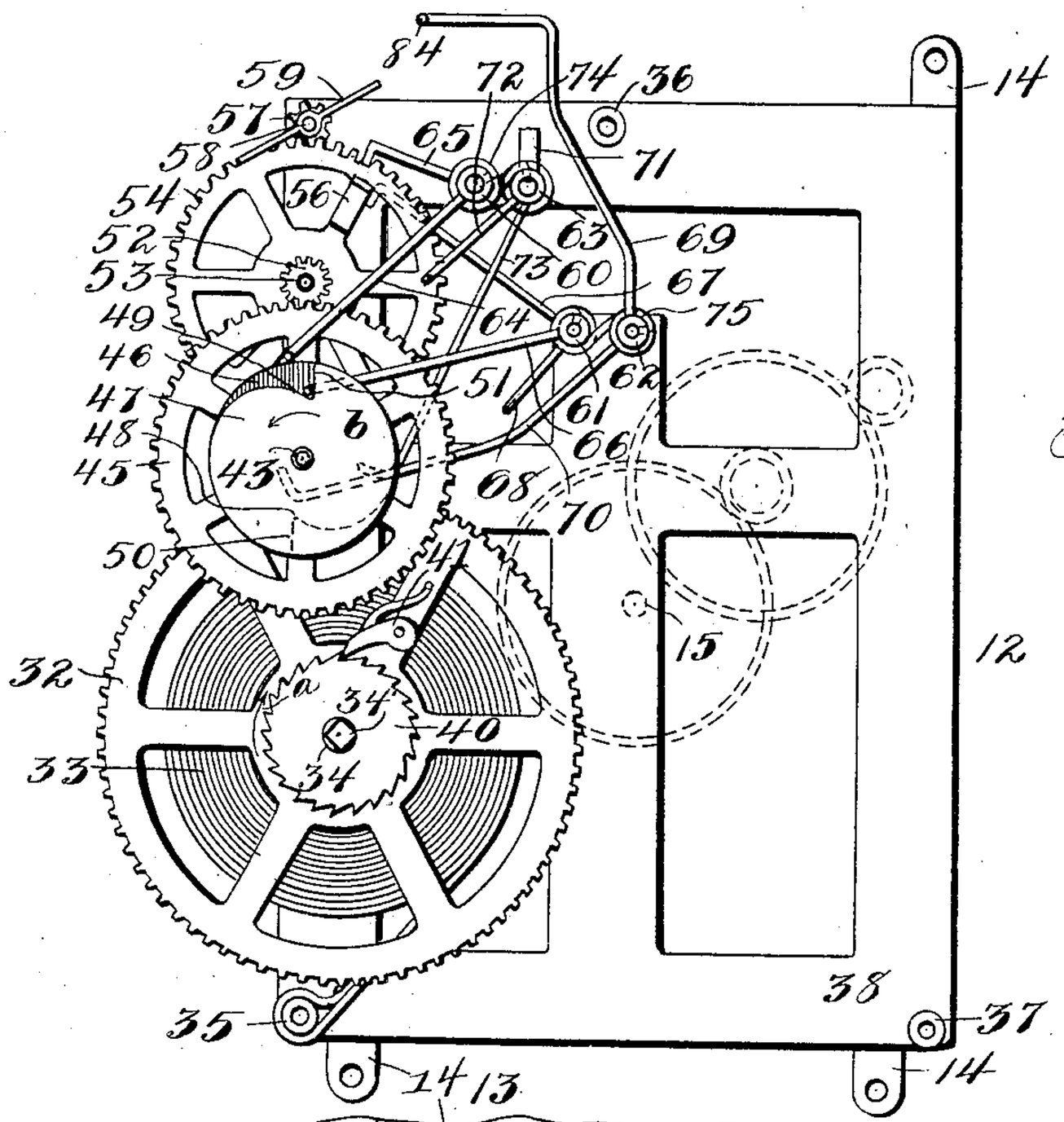

Fig. 3.

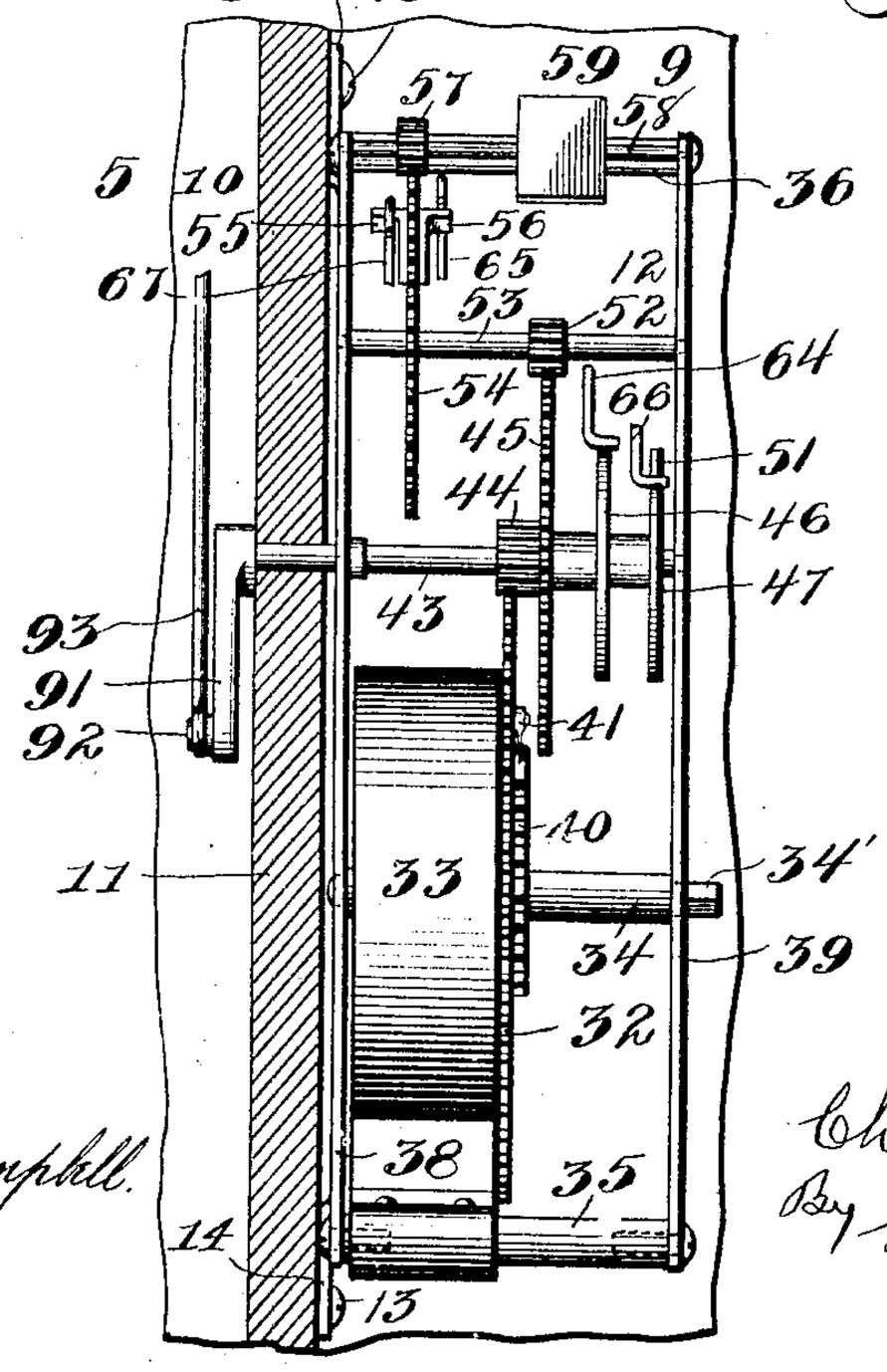

Fig. 4.

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5 SHEETS—SHEET 4.

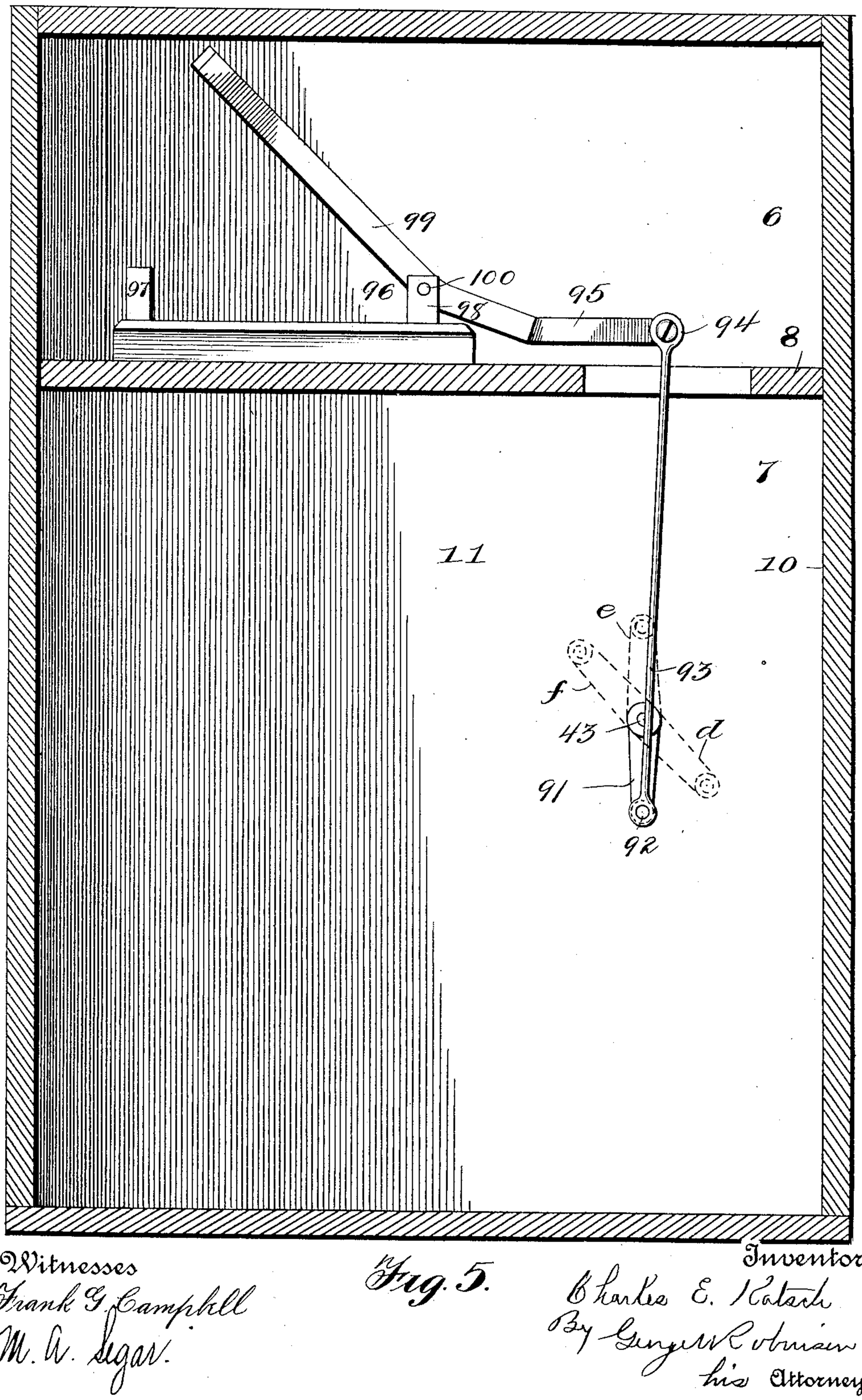

Fig. 5.

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5 SHEETS—SHEET 5.

Fig. 6.

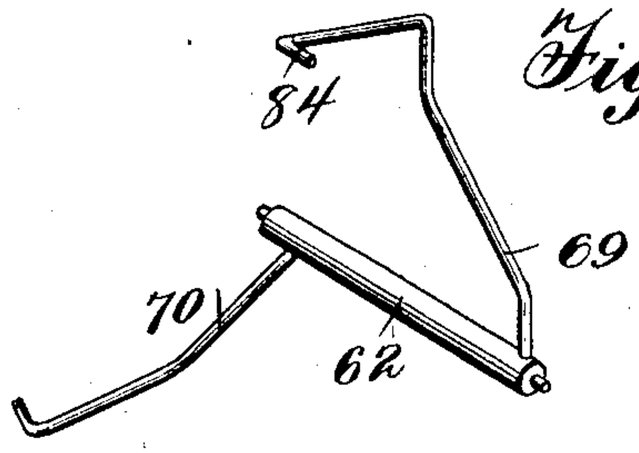
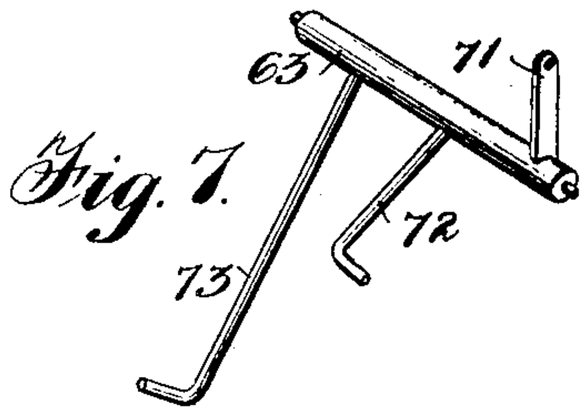


Fig. 7.



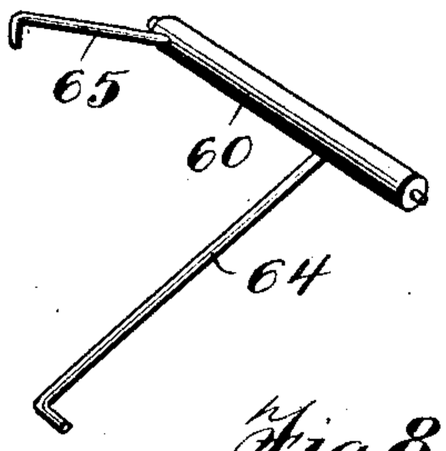


Fig. 8.

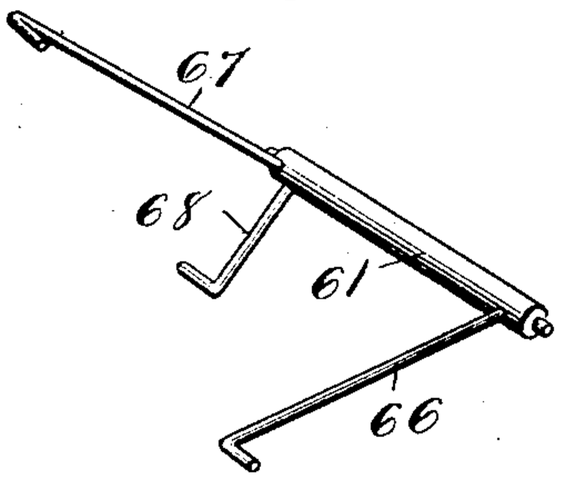


Fig. 9.

Fig. 10.

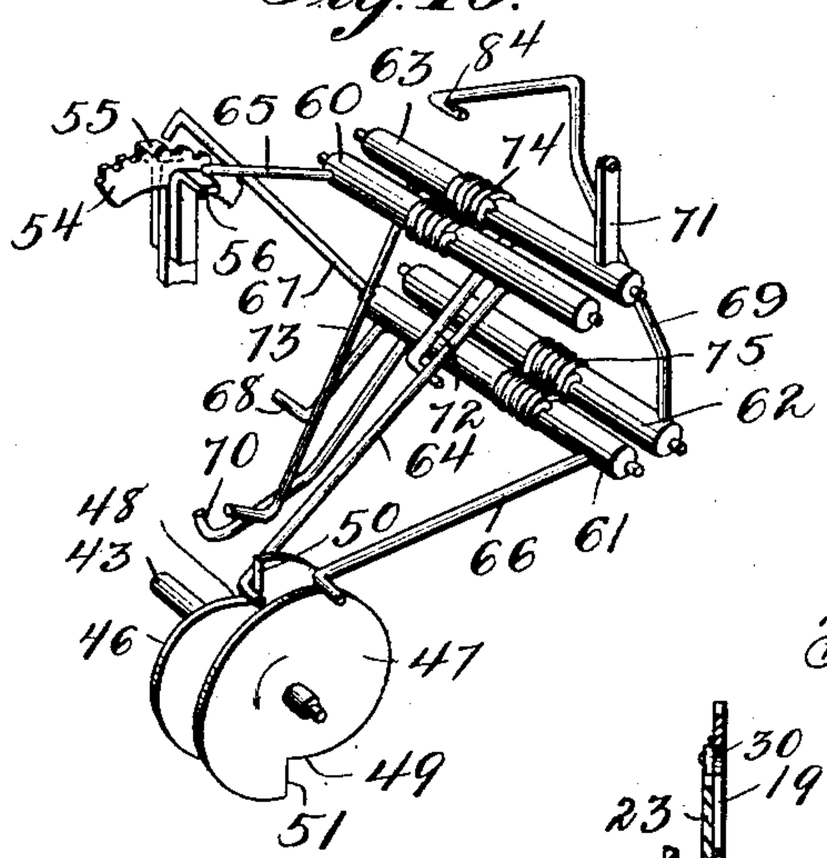
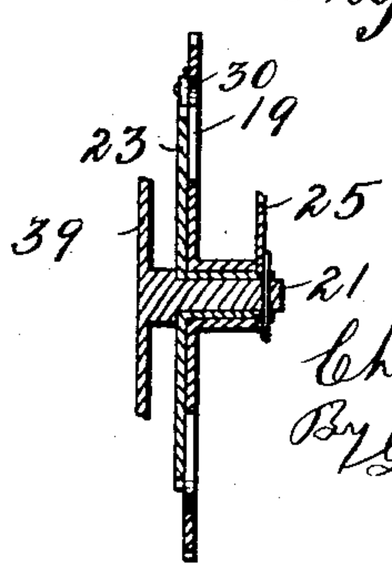


Fig. 11



Witnesses

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M. A. Legar.

Inventor

Charles E. Katsch

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his Attorney

UNITED STATES PATENT OFFICE.

CHARLES E. KATSCH, OF NEW HAVEN, CONNECTICUT.

ELECTRIC TIME-SWITCH.

No. 817,175. Specification of Letters Patent. Patented April 10, 1906.

Application filed March 15, 1905. Serial No. 250,189.

To all whom it may concern:

Be it known that I, CHARLES E. KATSCH, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented Improvements in Automatic Electric Time-Switches, of which the following is a specification.

My invention relates to automatic electric time-switches, and has for its object the provision of a time-switch adapted to break or complete an electric circuit at any time during a twenty-four-hour day.

A further object of the invention is the provision of an electric time-switch operated by clock mechanism, said clock mechanism cooperating with independent tripping mechanisms having independent setting-dials and pointers for each of said tripping mechanisms, whereby the time at which said switch is to be opened and closed may be varied at will.

Further objects and advantages of the invention will be set forth in the detailed description which now follows.

In the accompanying drawings, Figure 1 is a front elevation of a time-switch constructed in accordance with the invention. Fig. 2 is an elevation with the front of the casing of the time-switch removed, illustrating the setting mechanisms which control the tripping mechanisms hereinafter described and also illustrating an electric switch in its closed position. Fig. 3 is an elevation of portions of the tripping mechanisms and of a motor mechanism hereinafter described. In said figure certain elements of a clock mechanism proper are indicated in dotted lines. Fig. 4 is an end elevation of a clock-frame, showing the above-mentioned motor mechanism mounted therein. Fig. 5 is a vertical section of the time-switch casing looking from the rear of said casing. Fig. 6 is a detail perspective view of a spindle and tripping-levers hereinafter described. Fig. 7 is a detail perspective view of a second spindle and tripping-levers hereinafter described. Fig. 8 is a detail perspective view of a third spindle and tripping-levers hereinafter described. Fig. 9 is a detail perspective view of a fourth spindle and tripping-levers hereinafter described. Fig. 10 is a detail perspective view in their assembled position of the tripping members illustrated in Figs. 6, 7, 8, and 9, showing the manner in which they engage certain cams and a trip-wheel, as hereinafter set forth; and Fig. 11 is a detail sectional view illustrating the manner of mounting the setting-wheels.

Like numerals designate similar parts in all of the figures of the drawings.

Referring to the drawings, the numeral 5 designates a casing of any desired form, having its upper portion 6 separated from its lower portion 7 by a horizontal wall or shelf 8 and having its front portion 9 separated from its rear portion 10 by a vertical wall 11. A clock-frame 12 is secured to wall 11 by screws 13, which pass through perforated ears or lugs 14 of said clock-frame. Rotatively mounted in clock-frame 12 is the main arbor 15 of an ordinary clock mechanism, (indicated in dotted lines in Fig. 3,) upon which are mounted in the usual manner the hour and minute hands 16 and 17. Secured to the shaft of hour-hand 16 and rotating at equal speed therewith is a gear-wheel 18, which meshes with gear-wheels 19 and 20, said gear-wheels having twice as many teeth as the gear-wheel 18, in consequence of which they make but one revolution to two revolutions of said gear-wheel 18. Short studs 21 and 22 are rigidly attached to clock-frame 12. Ratchet-wheels 23 and 24 are sleeved upon said studs 21 and 22 and carry pointers 25 and 26, which coact with setting-dials 27 and 28, stamped or otherwise inscribed upon the main dial 29 of the clock. Gear-wheels 19 and 20 are loosely mounted upon the shafts of and abut ratchet-wheels 23 and 24 in such manner that spring-pressed pawls 30 and 31, carried by the inner faces of gear-wheels 19 and 20, will engage the teeth of said ratchet-wheels.

A motor mechanism (see Figs. 3 and 4) is mounted in frame 12 and comprises a gear-wheel 32, adapted to be driven in the direction of the arrow *a* by a spring 33, one end of which is secured in the well-known manner to shaft 34 of gear-wheel 32 and the other end of which is secured to a tie-rod 35, which, together with tie-rods 36 and 37, binds the plates 38 and 39, comprising clock-frame 12, together. A ratchet-wheel 40, carried by shaft 34, engages a spring-pressed pawl 41, carried by gear-wheel 32, thereby providing means for winding spring 33 in the well-known manner, to which end the shaft 34 is squared, as at 34′, said squared portion of shaft 34 registering with the keyhole 42 formed in main dial 29.

Mounted for rotation in frame 12 is a shaft 43, carrying a pinion 44, which meshes with

gear-wheel 32, a gear-wheel 45, and cams 46 and 47, having recesses 48 and 49 formed therein of such shape as to produce shoulders 50 and 51. Shaft 43 and the elements carried thereby being driven by gear-wheel 32 are rotated in the direction indicated by arrow *b*. Gear-wheel 45 meshes with a pinion 52, carried by a shaft 53, rotatively mounted in frame 12. A gear-wheel 54, fast upon and rotative with shaft 53, carries transverse stop-lugs 55 and 56, said gear-wheel 54 meshing with a pinion 57, fast upon a shaft 58, which carries a fly-fan 59.

Mounted side by side in frame 12 (see Figs. 3 and 10) are transverse spindles 60, 61, 62, and 63, spindle 60 carrying trip-levers 64 and 65, spindle 61 carrying trip-levers 66, 67, and 68, spindle 62 carrying trip-levers 69 70, and spindle 63 carrying trip-levers 71, 72, and 73. A torsional spring 74 is wound upon spindles 60 and 63 and has its ends secured to each of said spindles in such manner that said spring normally tends to throw said spindles to their limit of movement to the left in Fig. 3, which results in the trip-levers carried by said spindles being thrown downwardly to their limit of movement. A torsional spring 75, wound in like manner upon spindles 61 and 62, performs a similar function in regard to those spindles.

Mounted for oscillatory movement upon short studs 76 and 77, carried by frame 12, (see Fig. 2,) are trip-actuating levers 78 and 79. Lever 78 comprises an upwardly-extending arm 80, having its upper end slotted, as at 81, and a downwardly-extending arm 82, the lower end of which lies in the path of movement of an inwardly-extending pin 83, carried by ratchet-wheel 23. A transverse extension 84 of arm 69 engages the slotted end 81 of lever 78 for a purpose hereinafter described. The trip-actuating lever 79 comprises a downwardly-extending arm 85, the lower end of which lies in the path of movement of an inwardly-extending pin 86, carried by ratchet-wheel 24, and an upwardly-extending arm 87, to which is pivoted a link 88, the opposite end of said link being pivoted to trip-lever 71 for a purpose which will be hereinafter described. Stop-pins 89 and 90 limit the movement of trip-actuating arms 78 and 79 to the left.

Shaft 43 of the hereinbefore-described motor mechanism extends through the vertical wall 11 of casing 5 and has secured thereon a crank 91, carrying a wrist-pin 92, which engages one end of a connecting-rod 93, the other end of said connecting-rod being secured at 94 to a handle 95 or an ordinary electric switch 96. Said switch comprises the usual terminals 97 and 98 and circuit-completing bars 99, said bars being pivoted at 100 to terminals 98, whereby upon the rotation of crank 91 circuit-completing bars 98 will be rocked upon pivots 100, and thereby open and close the electric circuit, as will be hereinafter described.

The operation of the device is as follows: Since the gear-wheel 18 is fast upon and rotates with hour-hand 16, it follows that said gear-wheel will make two revolutions in twenty-four hours. Gear-wheels 19 and 20, having twice as many teeth as gear-wheel 18, make but one revolution in twenty-four hours. Both of the last-mentioned gear-wheels rotate in the direction indicated by arrow C. Gear-wheels 19 and 20 drive the ratchet-wheels 23 and 24 through the medium of pawls 30 and 31. The dials 27 and 28 are numbered from "1" to "24," and pointer 25 is turned to such position upon dial 27 as will cause pin 83 to engage the lower end of trip-actuating lever 78 at the time it is desired to have the motor mechanism act to close the switch, while pointer 26 is set at such a position upon dial 28 as will cause pin 86 to engage the lower end of trip-actuating lever 79 at the time it is desired to have the motor mechanism act to open said switch. The pawl-and-ratchet engagement between gear-wheels 19 and 20 and ratchet-wheels 23 and 24 permits the turning of said ratchet-wheels and their pointers with relation to said gear-wheels, as will be readily understood. When the switch is open, the crank 91, carried by shaft 43 of the motor mechanism, is in the position indicated in full lines in Fig. 5, at which time lever 66, carried by spindle 61, lies in recess 49 of cam 47, which permits lever 67, also carried by spindle 61, to be depressed by spring 75 far enough for the end of said lever to move into the path of stop-lug 55 of gear 54 to thereby hold the motor mechanism against rotation. When pin 83 engages the lower end of trip-actuating lever 78, said lever is rocked upon its pivot, the upper end thereof being thrown to the right in Fig. 2, and through the engagement of lever 69 therewith spindle 62 is turned slightly to the right against the tension of spring 75. When this action takes place, lever 70, carried by spindle 62, is raised until it engages the under side of lever 68, carried by spindle 61, raising said lever, and thereby turning spindle 61 against the tension of spring 75 until lever 66 is lifted from recess 49 of cam 47 and lever 67 is lifted from engagement with stop-lug 55, thereby leaving the motor mechanism free to act until gear-wheel 54 makes a half-revolution, when stop-lug 55 engages the raised end of lever 70, which has in its upward movement come into the path of said lug, again arresting the motor mechanism. Gear 54 makes four revolutions to one revolution of cams 46 and 47, so that in the half-revolution of gear 54 said cams and shaft 43, upon which they are mounted, have made an eighth-revolution, thereby moving crank 91 to the dotted-line position *d* (see Fig. 5) and leaving the end of

lever 66 upon the high part of cam 47, thereby holding lever 67 out of engagement with stop-lug 55. The parts maintain the position just described until pin 83 passes from engagement with lever 78, thereby permitting said lever and levers 69 and 70 to return to their normal positions. The motor mechanism is then free to act until shaft 43 makes three-eighths of a revolution, at which time the outer end of lever 64, carried by spindle 60, drops into recess 48 of cam 46, and the outer end of lever 65, also carried by spindle 60, drops into position to engage stop-lug 56 of gear 54, (see Fig. 10,) thereby again arresting the motor mechanism. The above-described three-eighths revolution of shaft 43 carries crank 91 to dotted-line position *e*, Fig. 5, and closes the switch, as will readily be understood. The switch now remains closed until pin 86, carried by ratchet-wheel 24, engages the lower end of lever 85, turning said lever upon stud 77 and through link 88 partially rotating spindle 63 to the right in Fig. 3, which results in the outer end of lever 72 engaging the under side of lever 64, thereby raising the end of said lever from recess 48 of cam 46 and the outer end of lever 65 from engagement with stop-lug 56 of gear 54, leaving the motor mechanism free to act until gear 54 makes a half-revolution, at which time stop-lug 56 engages the outer end of lever 73, which by reason of the partial rotation imparted to spindle 63 has been raised into the path of said lug, thereby again arresting the motor mechanism. During the half-revolution of gear 54 shaft 43 makes an eighth-revolution, which brings crank 91 to the dotted-line position *f*, (see Fig. 5,) thereby opening switch 96. The parts remain in the position just described until pin 86 passes from engagement with lever 79, when said lever and levers 72 and 73 resume their normal position under the influence of spring 74, thereby leaving the motor mechanism free to act until shaft 43 makes three-eighths of a revolution, at which time recess 49 of cam 47 comes into position for the outer end of lever 66 to drop therein, thereby permitting the outer end of lever 67 to be thrown downwardly until it engages stop-lug 55 preparatory to repeating the above-described operation of closing and opening switch 96; it being obvious that the three-eighths revolution of shaft 43 will again bring crank 91 to the position illustrated in full lines in Fig. 5.

From the foregoing description it will be seen that efficient means are herein provided for accomplishing the objects of the invention; but while the elements shown and described are well adapted to serve the purposes for which they are intended it is to be understood that my invention is not limited thereto, for changes in the details of the device may be resorted to without departure from said invention. Likewise the opening and closing mechanism is not limited to use with the specific form of switch shown, for it may be used in connection with other forms of switches, if desired.

Having thus described my invention, what I claim is—

1. In a switch-controlling mechanism, the combination with a motor mechanism, of a shaft driven by said motor mechanism, a switch-controlling member carried by said shaft, tripping mechanism for alternately arresting and releasing said motor mechanism, a clock mechanism, gear-wheels driven by said clock mechanism, ratchet-wheels driven by said gear-wheels and contact-pins carried by said ratchet-wheels.

2. In a switch-controlling mechanism, the combination with a clock mechanism, of a gear-wheel driven by said clock mechanism and rotative once in twelve hours, gear-wheels meshing with the aforesaid gear-wheel and rotative once in twenty-four hours, ratchet-wheels driven by said gear-wheels and movable with relation thereto, trip-actuating pins carried by said ratchet-wheels, tripping mechanisms with which said pins alternately engage, a motor mechanism and a switch-controlling member driven by said mechanism adapted to be alternately arrested and released by said tripping mechanisms.

3. In a switch-controlling mechanism, the combination with a motor mechanism, of a shaft driven by said motor mechanism, a switch-controlling member carried by said shaft, tripping mechanism for alternately arresting and releasing said motor mechanism, a clock mechanism, gear-wheels driven by said clock mechanism, ratchet-wheels driven by said gear-wheels and movable with relation thereto, pointers carried by said ratchet-wheels and dials with which said pointers coact and contact-pins also carried by said ratchet-wheels adapted to alternately engage said tripping mechanism.

4. In a switch-controlling mechanism, the combination of a motor comprising a rotary cam-carrying shaft, cams mounted upon said shaft and having diametrically-disposed recesses, a trip-wheel in gear with said motor, tripping-lugs carried by said trip-wheel, a plurality of oscillatory spindles, springs for tending to turn said spindles in one direction, tripping-levers carried by said spindles, time-controlled setting mechanisms, means for varying the movement of said setting mechanisms with relation to each other and means controlled by said setting mechanisms whereby at a predetermined time the tripping-levers will be actuated to thereby arrest and release the motor mechanism by being thrown into engagement with or drawn from engagement with the tripping-lugs of the gear-wheel and the recesses of the cams.

5. In a switch-controlling mechanism, the

combination with a rotary spring-driven gear-wheel, of a shaft carrying a pinion which meshes with said gear-wheel, a switch-controlling member mounted upon said shaft, cams mounted upon said shaft, a gear-wheel mounted upon said shaft and meshing with a pinion carried by a second shaft, a trip-wheel mounted upon said second shaft, trip-lugs carried by said trip-wheel, oscillatory spindles, springs for tending to turn said spindles in one direction, tripping-levers carried by said spindles, a time-controlled opening mechanism and a time-controlled closing mechanism, means for varying the movement of said opening and closing mechanisms with relation to each other and pins carried by said opening and closing mechanisms, oscillatory levers, the lower ends of which lie in the path of said pins and connections between said oscillatory levers and the spindles whereby at a predetermined time, said spindles will be rocked to thereby throw the tripping-levers into or from engagement with the lugs of the trip-wheel and the cam to thereby permit the said spring-actuated gear to impart an intermittent movement to the cam-carrying shaft.

6. In a switch-controlling mechanism, the combination with a clock-frame comprising a pair of plates, of a clock mechanism mounted therein, a motor mechanism also mounted therein, a shaft rotated by said motor mechanism, a switch-controlling member carried by said shaft, a pair of gear-wheels driven by the clock mechanism, ratchet-wheels driven by said gear-wheels and movable with relation thereto, pointers carried by said ratchet-wheels, dials with which said pointers coact, pins carried by said ratchet-wheels, oscillatory levers mounted upon the clock-frame, the lower ends of which lie in the path of movement of said pins, oscillatory spindles mounted in the clock-frame and carrying trip-levers and connections between said oscillatory spindles and said oscillatory levers whereby when said levers are oscillated, said spindles will likewise be oscillated to thereby alternately actuate the tripping-levers and permit the motor mechanism to impart an alternate movement to the switch-controlling member.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES E. KATSCH.

Witnesses:

MATTHEW A. REYNOLDS,

M. A. SEGAR.