No. 679,683. Patented July 30, 1901.

C. H. MAYERS.

TIME OPERATING MECHANISM.

(Application filed May 29, 1901.)

(No Model.) 2 Sheets—Sheet 1.

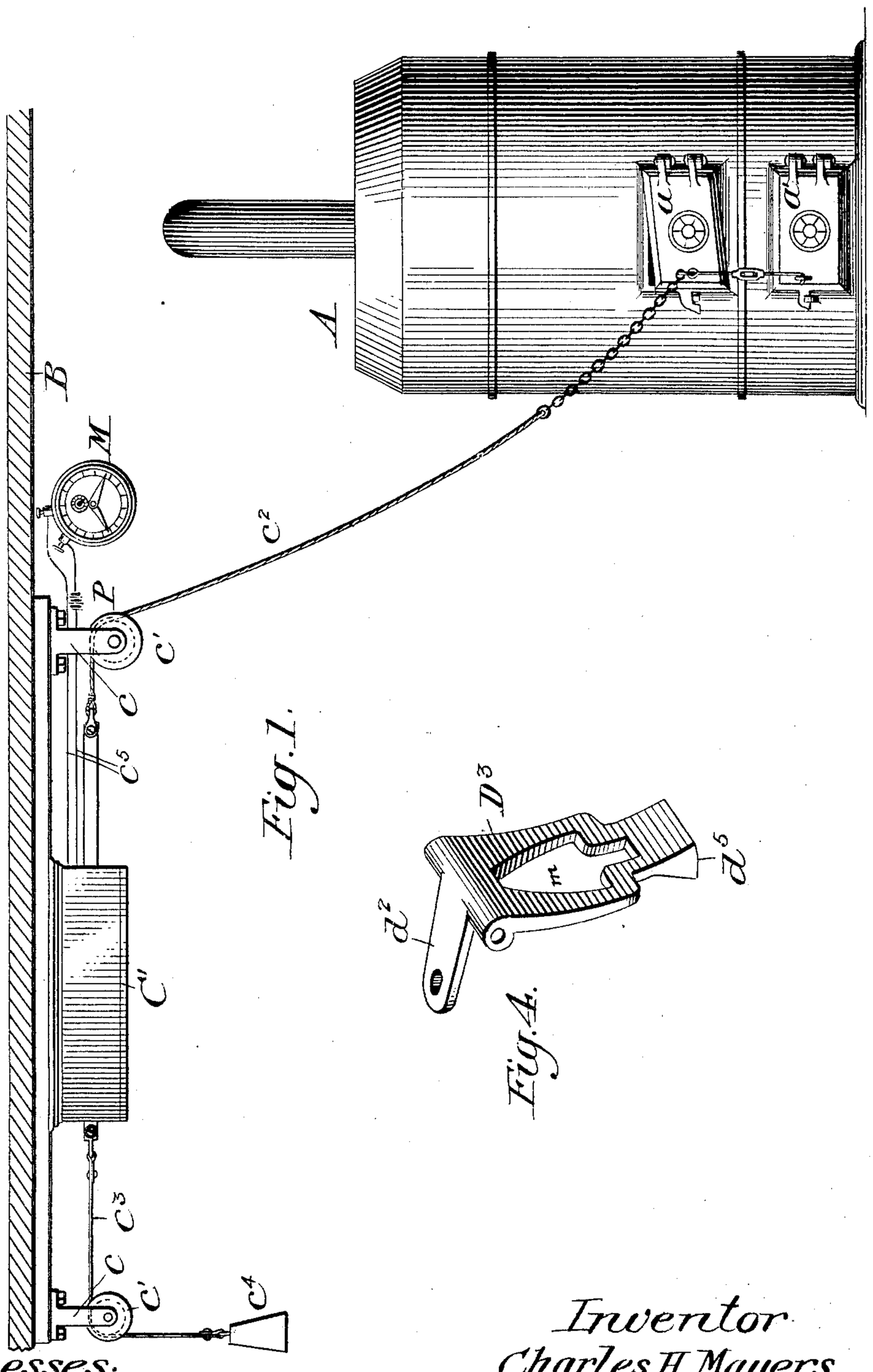

Fig. 1.

Fig. 4.

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Fig. 2.

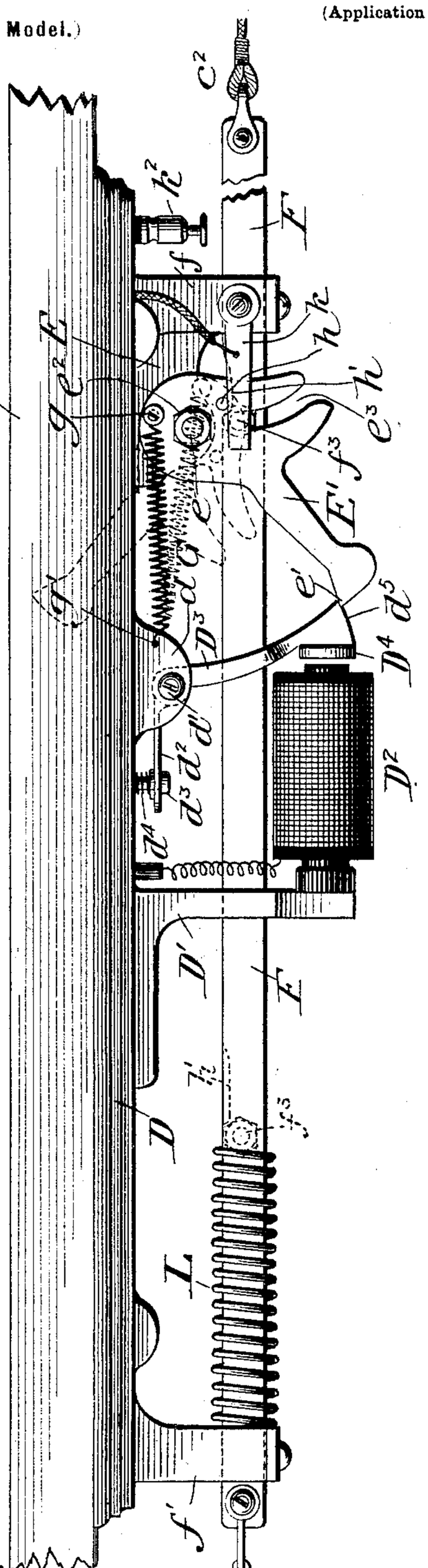
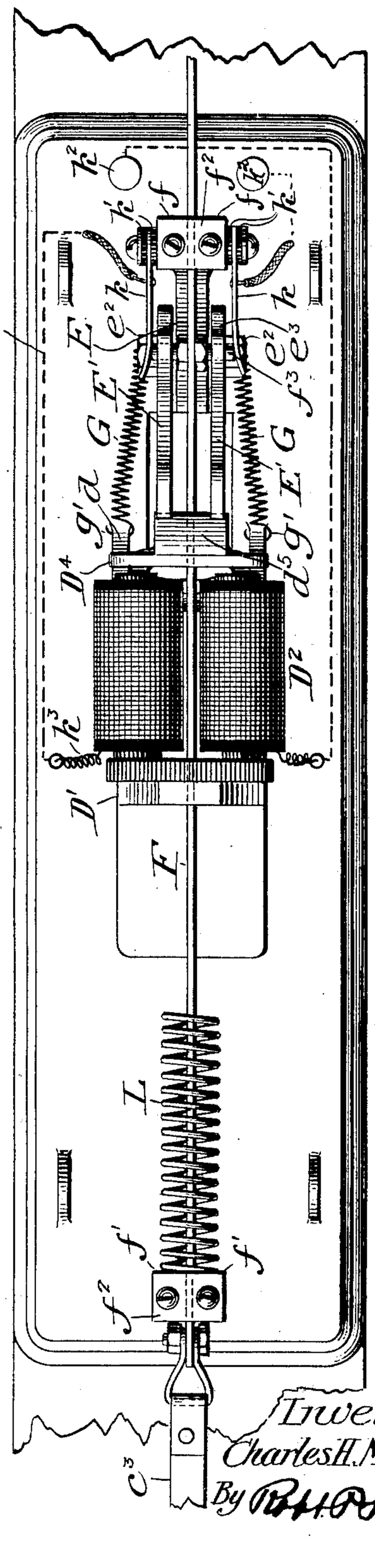


Fig. 3.



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UNITED STATES PATENT OFFICE.

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TIME OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 679,683, dated July 30, 1901.

Application filed May 29, 1901. Serial No. 62,357. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. MAYERS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Time-Controlled Operating Devices, of which the following, in connection with the accompanying drawings, is a specification.

The invention to be hereinafter described relates to devices for setting into operation mechanical means for giving movement to doors, valves, and the like, and more particularly to the type of said devices that are automatically controlled in their action by a timepiece.

In the present embodiment of my invention and to exemplify its operation, without, however, limiting in any way its general application, I have shown and will describe my invention as applied to the automatic control of the fire and lower-draft or ash-pit doors of an ordinary furnace.

It is well understood that ordinary furnaces commonly used for heating buildings have the fires contained therein banked each night to prevent overheating the building, and to further this result the fire-box door is usually opened somewhat, while the lower-draft or ash-pit door is maintained closed. In order to properly heat the building in the morning, it is desirable that the fire-box door be closed and the lower-draft or ash-pit door be opened, to effect which in the absence of automatic devices requires the services of an attendant.

The object of my invention as thus applied is to provide means which can be set to operate automatically at any desired time to close the fire-box door and to open the lower-draft or ash-pit door with certainty, and, further, the more general object of my invention is to simplify the construction of the operating devices, whereby they will not become disarranged or be rendered inoperative under careless handling of inexperienced persons and will be certain in their actions even after long periods of non-use.

In the drawings, Figure 1 represents in side elevation any ordinary furnace with my improvement as applied to the fire-box and ash-pit doors thereof. Fig. 2 is a side elevation of the operating devices, and Fig. 3 is a plan view thereof. Fig. 4 is a detail of the trip.

In the drawings, A represents an ordinary furnace having the fire-box door *a* and lower-draft or ash-pit door *a'*, the said doors being constructed and connected for operation as fully exemplified in my prior patent, No. 666,814, dated January 29, 1901, and which therefore need not be further described herein.

Mounted in any suitable or convenient location in proximity to the furnace A and preferably upon the ceiling B is the supporting-piece C, upon which are secured the hangers *c c*, carrying guide pulleys or rolls *c' c'*, over which run the flexible connections c^2 and c^3, the former leading to and connecting with the parts to be operated, as the doors *a a'*, and the latter, c^3, having a weight c^4 suspended therefrom, all as common to and fully set forth in my prior patent, No. 666,814. In suitable location is mounted a circuit-closing timepiece M, of any ordinary construction, connected to the operating devices by the conductors c^5 c^5 through any suitable battery P or other source of electric energy, the said operating devices being preferably inclosed in a box C'.

Suitably cast with the base-piece D or secured thereto by any desired means is the standard D', slotted or perforated for the passage of the actuator F and carrying the electromagnet D^2, the armature D^4 of which is mounted on a trip-arm D^3, also provided with an opening *m* for the passage of actuator F and pivotally mounted on a pin *d'*, passed through supports *d*, the said trip-arm having at its lower pivotal end a tailpiece d^2, through which a screw or other adjusting device d^3 passes to limit the outward-swinging movement of the trip-arm D^3, a spring D^4 interposed between the base-piece D and the under side of the tailpiece and preferably surrounding the screw d^3, normally maintaining the trip-arm D^3 in the position shown by Fig. 2, with the armature away from the magnet. It will be noted that the free end of the trip-arm D^3 is beveled or rounded at d^5 and for a purpose that will hereinafter more fully appear.

Pivotally mounted on a suitable pin *e*, car-

ried by the bracket or lug E, cast with or secured to the base-piece D, is a holding and releasing trigger E′, the free end *e′* of which is adapted to engage and rest upon the beveled or curved end d^5 of the trip-arm D^3. The holding and releasing trigger is preferably formed of two like members rigidly connected by the pivotal pin, being each clamped thereto by the nuts e^2, so that they move in unison, the pivot-pin *e* turning at such times in its bearings in the lug E, thus providing a space between the members of the trigger for the passage of the actuator F, shown in the present form of my invention as a sliding rod movable between and guided by the projections or posts *f f* and *f′ f′*, the said projections or posts being united on top by plates f^2.

Formed in each member of the trigger E′ is a curved and extended slot e^3, adapted to be engaged by a cross-pin f^3, carried by the actuator F, the latter being connected at one end by the flexible cord c^2 or other means to the furnace-doors or other devices to be operated, and at the other end to the connection c^3, to which a weight c^4 or other equivalent means is secured to normally tend to move the actuator toward the left in Figs. 2 and 3.

From the construction thus far described it will be evident that upon movement of the end d^5 of the trip D^3 toward the electromagnet D^2 the end *e′* of the trigger E′ will be released from its engagement with the trip, and by virtue of the constantly-acting weight c^4 the actuator F will turn the trigger until the pin f^3 passes from the curved slot e^3, whereupon the actuator will be free to move under the actuating force of the weight c^4 and give the necessary movement to the flexible connection c^2 to operate the furnace-doors or other devices, as set forth in my prior patent, to which reference may be had.

After the pin f^3 of the actuator has left the curved slot e^3 of the trigger it is necessary to maintain the trigger in such position that upon the return movement of the actuator to the right to set the device by a manual pull on the connection c^2 the pin f^3 will again enter the slot e^3 in the trigger and turn the latter back to the holding position with the end *e′* in engagement with the beveled end d^5 of the trip, and to secure this object I have provided springs G, one end of each of which is connected to suitable lugs *d* at *g′* and the other end to pins *g*, secured to the members of the trigger below the pivot-pin *e* in such position that when the parts are set, as shown in Fig. 2 in full lines, the said springs will act in opposition to the weight c^4 to lessen the binding contact between the ends d^5 and *e′* of the trip and trigger, and when the pin f^3 of the actuator has turned the trigger to free the actuator the pins *g*, to which the springs G are connected, will pass slightly above the pivot *e*, as shown in dotted lines, to maintain the trigger in the position it is left as the pin f^3 moves from the slots e^3. It is evident, of course, that if the slot e^3 were straight and at right angles to the actuator when the parts are in set or holding position, as shown by full lines, Fig. 2, in the releasing movement the pin f^3 would move the trigger less than ninety degrees, and the springs G might not act with sufficient certainty to one side of the pivot to hold the trigger in position for the pin f^3 to enter the slots when the actuator is pulled to the right. I have therefore curved the slots e^3, so that as the pin f^3 leaves the slots it will act to turn the trigger somewhat more than ninety degrees and will insure that the pins *g* are carried sufficiently above the pivot-pin *e* to cause the springs G to hold the trigger in proper position to receive the pin f^3 into the slots upon return movement of the actuator. By this construction also I am enabled to place the pins *g* in such position that when the parts are in set position, full lines, Fig. 2, the springs G will act almost or quite at right angles to the line joining the pins *g* and the pivot-pin *e*, and thereby exert their maximum force in opposition to the weight c^4 to minimize the pressure of the end *e′* of the trigger upon the end d^5 of the trip. From this also it will be evident that by proper adjustment of the relative tensions of the springs G and the weight c^4 the pressure of the end *e′* upon the end d^5 may be very nicely adjusted, so that very little frictional resistance to movement will exist between these parts, and a very weak current through the magnet will be sufficient to move the armature and its carrying-trip.

In order further to insure the proper positioning of the trigger, so that the slots e^3 may receive the pin f^3 of the actuator when the latter is being moved to set the device, and especially to guard against the weakening of the springs G, I have provided a pin *h*, which joins the two members of the trigger above the actuator F, which when the actuator has moved to the left and turned the trigger into dotted-line position will ride on the straight upper edge of the actuator and hold the trigger from turning under the gravitating influence of its free end, and in order to permit the trigger to be turned as the pin f^3 enters the slot e^3 I have provided a recess *h′* in the upper edge of the actuator of sufficient size and extent to permit the pin to travel in an unobstructed path as the trigger is turned into the set position by engagement of the pin f^3 with the slots e^3, as will be evident.

I have not deemed it necessary in this connection to describe in detail the electric contact-closing timepiece M, as it forms no part of my present invention, it being of the usual form of such devives, which can be set to complete the circuit at any desired time, all as will be evident to one skilled in the art, it being only necessary to state that such timepiece is in circuit with the electromagnet D^2, and upon the closing of such circuit the magnet will be energized, thereby attracting the armature D^4 and moving the trip D^3 to re-

lease the trigger E'. Since after completing the circuit by the timepiece M the circuit would remain unbroken and the battery be depleted unless a switch is provided, I have interposed a switch in the circuit, which is normally closed when the device is in set position, but which is opened to break the circuit upon movement of the actuator, as will now be set forth.

Mounted upon the posts or projections $f\,f$, and properly insulated therefrom by insulation $k'\,k'$, are the two contact-strips $k\,k$, having curved free ends which are adapted to engage the projecting ends of the pin f^3, carried by the actuator F, when the latter is in set position, as shown by full lines, Fig. 2, thereby forming an electric connection between said contact-strips; but when the actuator moves to the left in Fig. 2 the pin f^3 is carried from between the said contact-strips and the electric connection is broken. The circuit from the timepiece M may be joined to the electromagnet D^2 through the contact-strips $k\,k$ in any desired manner; but in the present form of my invention I have shown binding-posts k^2, to which the conductor c^5 from the timepiece M may be joined in the usual manner, and the wire from one of the binding-posts k^2 passes, as shown in Fig. 3, to the lower contact-strip k and then leads from the other contact-strip opposite thereto, preferably below the base-plate D to the winding of the electromagnet, as usual and as shown at k^3, then back to the opposite binding-post k^2, as indicated in said Fig. 3. From this construction it will be apparent that when the pin f^3, carried by the actuator F, is in position to join the contact-strips k the circuit may be closed through the ordinary timepiece M to energize the electromagnet D^2 and move its armature and trip-arm D^3, so as to release the trigger, whereupon the actuator F, by virtue of the weight c^4, will move to the left, carrying the pin f^3 from between the contact-strips k, thereby breaking the circuit and prevent running down of the battery when the clock has closed the circuit at the time set thereby. The movement of the actuator F under the influence of its actuating means, as the weight c^4, is checked at the end of its operative movement by means of the spring L, interposed between the posts f' and projection D' and surrounding actuator F, whereby the pin f^3, moving from its set position (shown by full lines in Fig. 2) to its tripped position, as shown by dotted lines, will engage the spring L and check the movement of the actuator without shock.

It will be noted, as shown in Fig. 2, that the trip D^3 is curved or rounded from its pivotal point to the end d^5, so that it will offer no obstruction to the free movement of the end e' of the trigger when the trip D^3 is moved toward the magnet, and also that as the actuator F is moved from its dotted to its full line position the end of the trigger may ride along the curve of the trip near the end thereof, pushing the latter slightly toward the magnet, after which the spring d^4, acting under the lip d^2, will throw the end d^5 of the trip in the path of the end e' of the trigger to hold the parts in set position, as will clearly appear.

In operating devices where the armature is carried at one end of an arm and the other end of the arm is provided with a catch—as shown, for instance, in my former patent—the rust and corrosion of parts are liable to cause uncertainty in action, and in many cases require a strong battery to trip the catch; but in my present improvements it will be obvious that this objection is entirely overcome, and by reason of the fact that the end e' of the trigger rests on the end d^5 of the trip, with the pressure tending toward the pivot of the trip, the resistance to the movement of the trip under the influence of the energized electromagnet will be reduced to a minimum, and the pressure between the end e' of the trigger and the end d^5 of the trip may be further regulated and rendered very slight by proper adjustment between the actuating-weight c^4, acting on one side of the pivot e, and the springs G, acting on the opposite side thereof.

As shown in Fig. 1, I have further protected the operating parts of the device by providing a cover C' therefor, whereby dust and dirt may be excluded.

While I have shown the time-controlled operating device as applied to the actuation of furnace-doors and the like, it is obvious, of course, that the same may be employed for the actuation of any mechanical devices which require a movement such as is imparted to the connection c^2 by the actuator F, and while I have shown and described the above specific embodiment of my invention it is to be understood, of course, that the details may be varied without departing from the spirit of my invention—as, for instance, in order to prevent rust and corrosion between the contacting ends e' and d^5 of the trigger and trip, respectively, I may form one or the other of these parts of brass or other non-corrosive metal, whereby the contacting points or ends will always remain bright and free from rust or like material, which would tend to increase the frictional resistance to movement between these parts.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an operating device, the combination of an electromagnet, its armature and circuit, a trip carrying said armature, an actuator, means normally tending to move said actuator, and holding and releasing means interposed between said trip and actuator and adapted to engage said trip to hold the actuator in set position and to be released from engagement with said trip on the completion

of the circuit to free the actuator to the action of its operating means.

2. In an operating device, the combination of an electromagnet, its armature and circuit, a trip carrying said armature, an actuator, means normally tending to move said actuator, and holding and releasing means interposed between said trip and actuator and adapted to engage said trip to hold the actuator in set position and to be released from engagement with said trip on the completion of the circuit to free the actuator to the action of its operating means, and means for breaking the circuit on movement of the actuator from its set position.

3. In a time-controlled operating device, the combination of an electromagnet, its armature, and circuit, a pivotally-mounted trip carrying said armature, an actuator, means normally tending to move said actuator, and a holding and releasing trigger interposed between the said trip and actuator and adapted to engage and rest upon the trip to hold the actuator in set position and to be released from engagement with the trip on completion of the circuit to free the actuator to the action of its operating means.

4. In a time-controlled operating device, the combination of an electromagnet, its armature, and circuit, an endwise-movable actuator, means normally tending to move the actuator, a holding and releasing trigger adapted for detachable engagement with said actuator, and a trip carrying said armature and adapted to be engaged by the trigger for holding the actuator in set position and to release the trigger to free the actuator to the action of its operating means on completion of the circuit.

5. In a time-controlled operating device, the combination of an electromagnet, its armature, and circuit, an endwise-movable actuator, means normally tending to move the actuator, a holding and releasing trigger adapted for detachable engagement with said actuator, and a trip carrying said armature and adapted to be engaged by the trigger for holding the actuator in set position and to release the trigger to free the actuator to the action of its operating means on completion of the circuit and means for breaking the circuit on movement of the actuator.

6. In a time-controlled operating device, the combination of an electromagnet, its armature and circuit, a pivotally-mounted trip having a beveled or rounded end and movable with said armature, an actuator, means tending normally to move said actuator, and a holding and releasing trigger interposed between said trip and actuator and adapted to engage the beveled or rounded end of the trip to hold the actuator in set position against the tension of its operating means and to be released from engagement with the end of the trip on completion of the circuit to thereby free the actuator to the action of its operating means.

7. In an operating device, the combination of an electromagnet, its armature, and circuit, a trigger provided with a slot, an actuator having means for engagement with the slot in the trigger, means normally tending to move said actuator and turn the trigger to free the actuator, and a trip to engage the trigger and restrain movement of the actuator under the impulse of its actuating means.

8. In an operating device, the combination of an electromagnet, its armature, and circuit, a trigger provided with a slot, an actuator having provisions for engagement with and disengagement from said slot, means normally tending to move the actuator and turn the trigger to free the actuator to movement under the impulse of its operating means, a trip to engage the trigger to restrain movement thereof, and means to close the circuit to disengage the trip from the trigger.

9. In an operating device, the combination of an electromagnet, its armature, and circuit, a trigger provided with a slot, an actuator having provisions for engagement with and disengagement from said slot, means normally tending to move the actuator and turn the trigger to free the actuator to movement under the impulse of its operating means, a trip to engage the trigger to restrain movement thereof, means to close the circuit and disengage the trip from the trigger to permit the latter to turn and free the actuator, and means to hold the trigger in its freeing position.

10. In an operating device, the combination of an electromagnet, its armature, and circuit, a trigger provided with a curved slot, an actuator having provisions for engagement with and disengagement from said slot, means normally tending to move the actuator and turn the trigger to free the actuator to movement under the impulse of its operating means, a trip to engage the trigger and restrain movement thereof, and means to close the circuit to disengage the trip from the trigger.

11. In an operating device, the combination of an electromagnet, its armature, and circuit, a movable actuator, means normally tending to move the actuator, a holding and releasing trigger adapted for detachable engagement with said actuator, a trip carrying said armature and positioned to be engaged by the trigger for holding the actuator in set position and to release the trigger to free the actuator to the action of its operating means on completion of the circuit, and means for holding the trigger in its releasing position.

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In presence of—
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