(No Model.) 2 Sheets—Sheet 1.

C. E. WHITNEY.

AUTOMATIC ELECTRIC CUT-OFF.

No. 549,556. Patented Nov. 12, 1895.

Fig. 1.

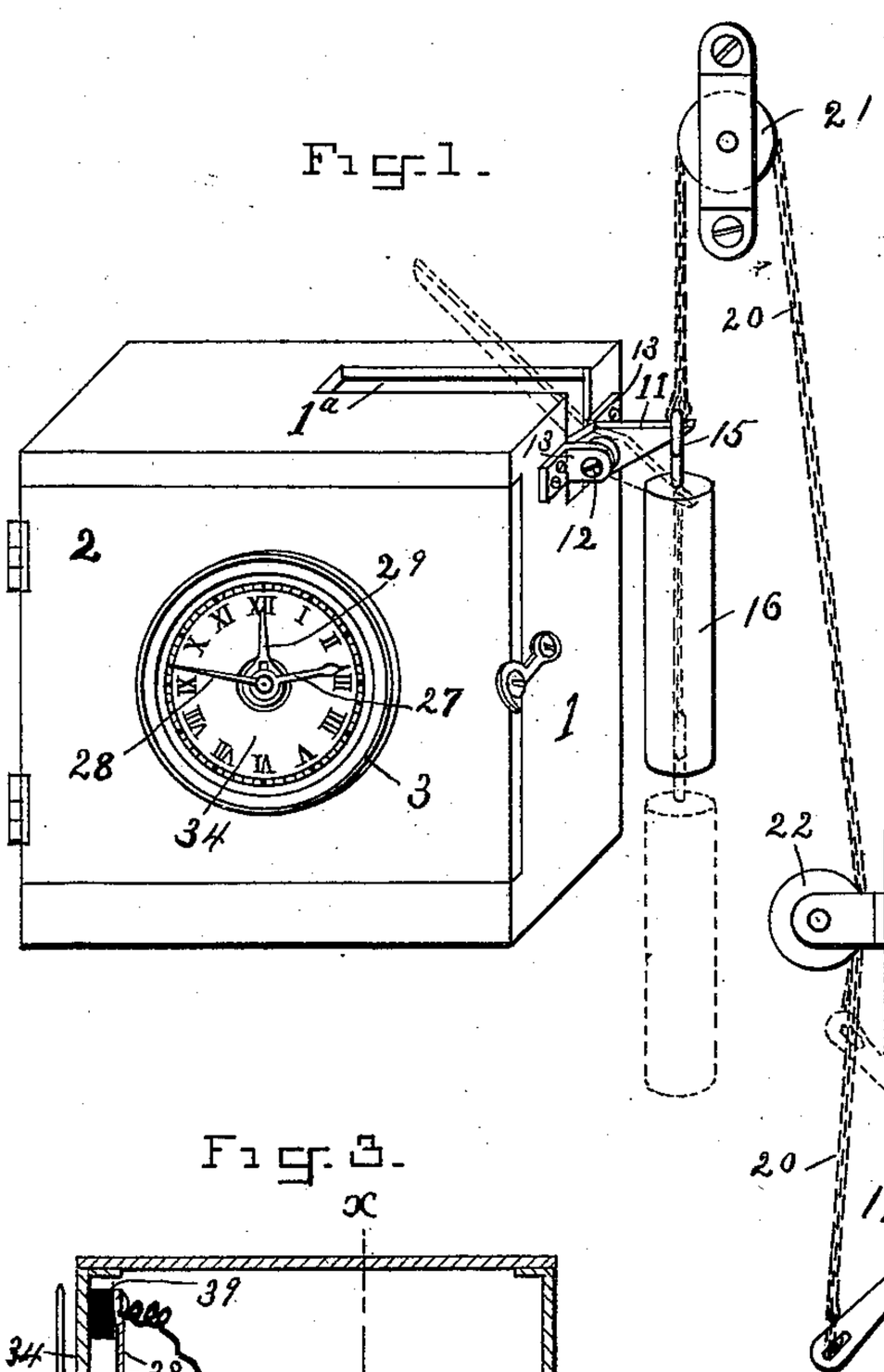


Fig. 2.

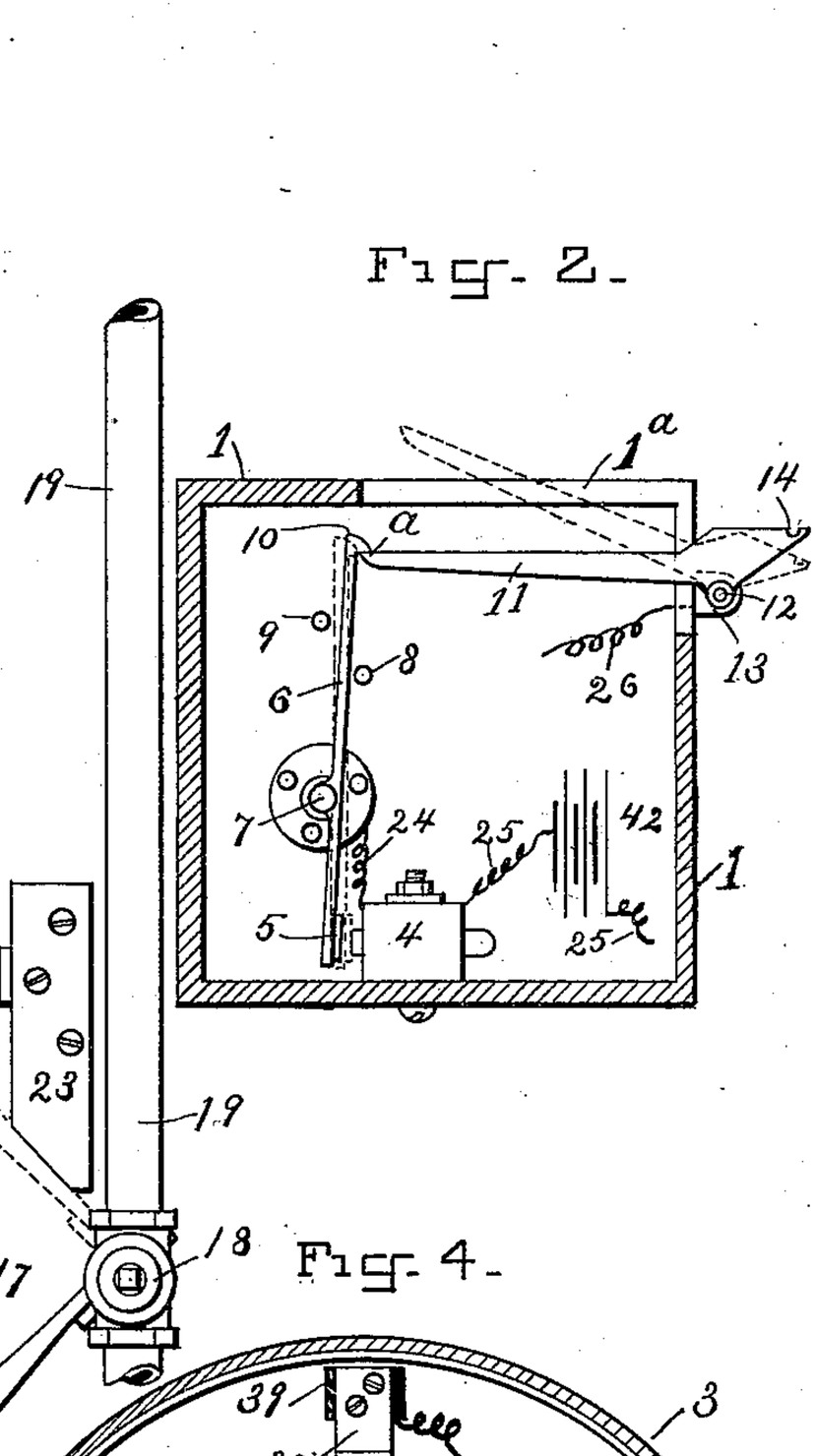


Fig. 3.

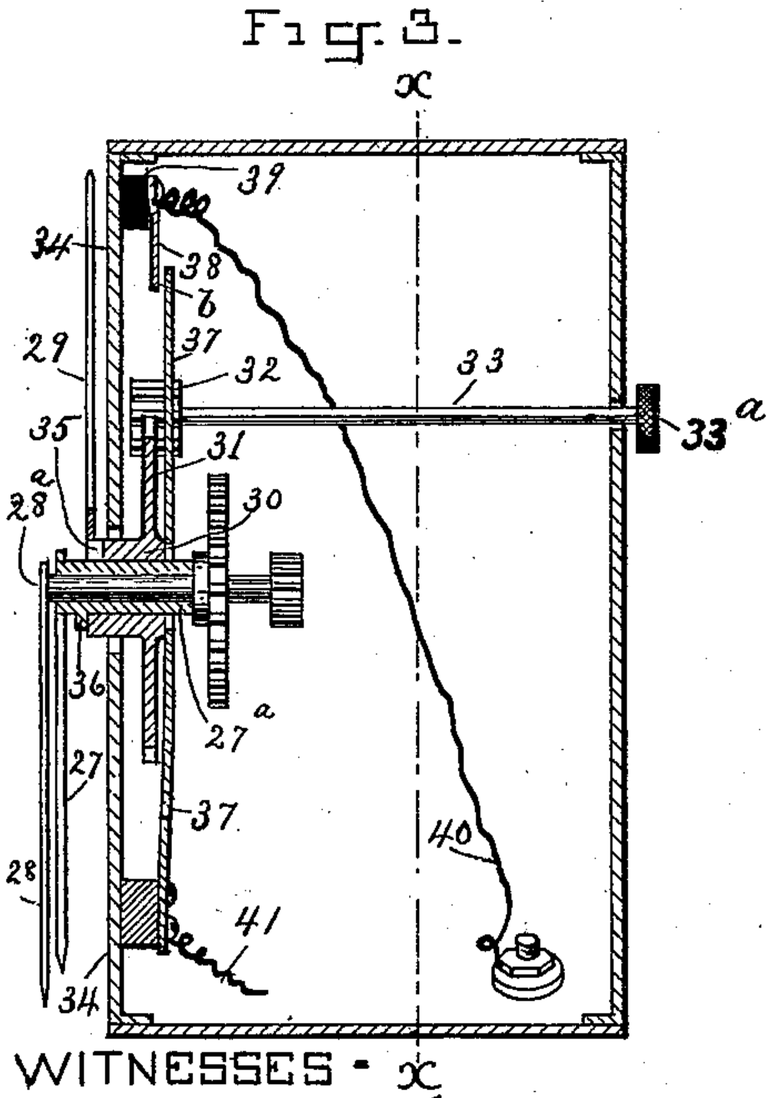
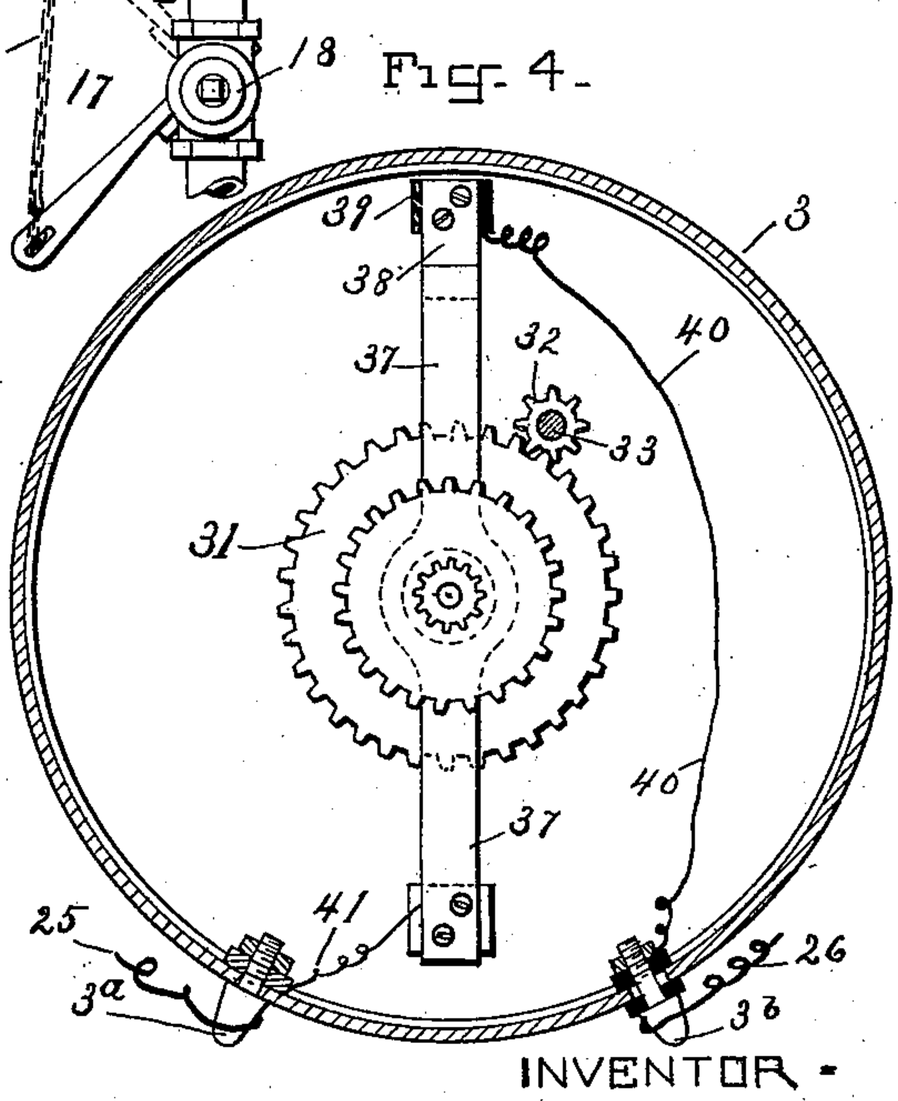


Fig. 4.



WITNESSES - x

Alvin K. Goodwin

E. L. Brown.

INVENTOR -

Clinton E. Whitney

(No Model.) 2 Sheets—Sheet 2.

C. E. WHITNEY.

AUTOMATIC ELECTRIC CUT-OFF.

No. 549,556. Patented Nov. 12, 1895.

Fig. 5.

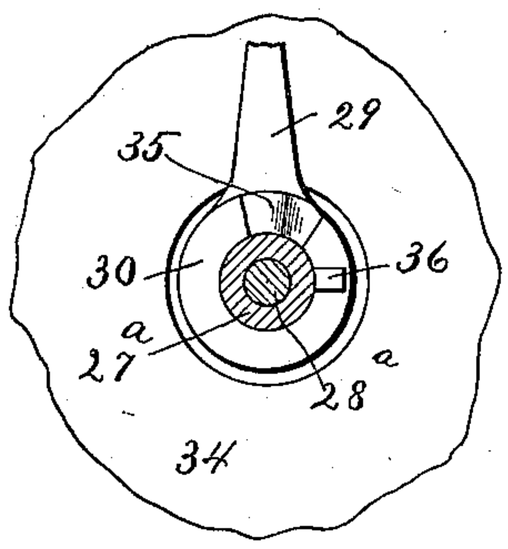


Fig. 6.

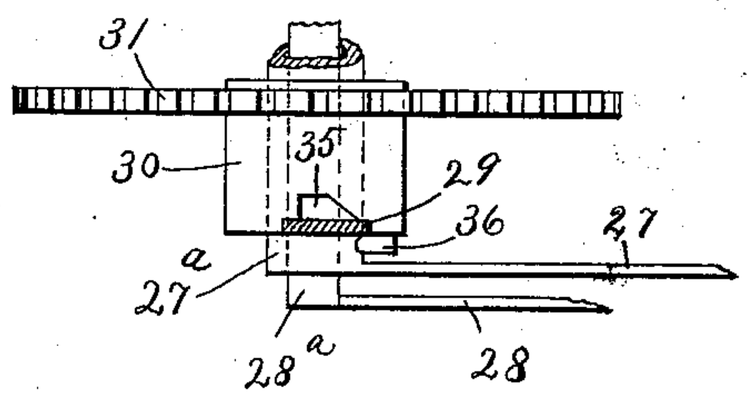


Fig. 9.

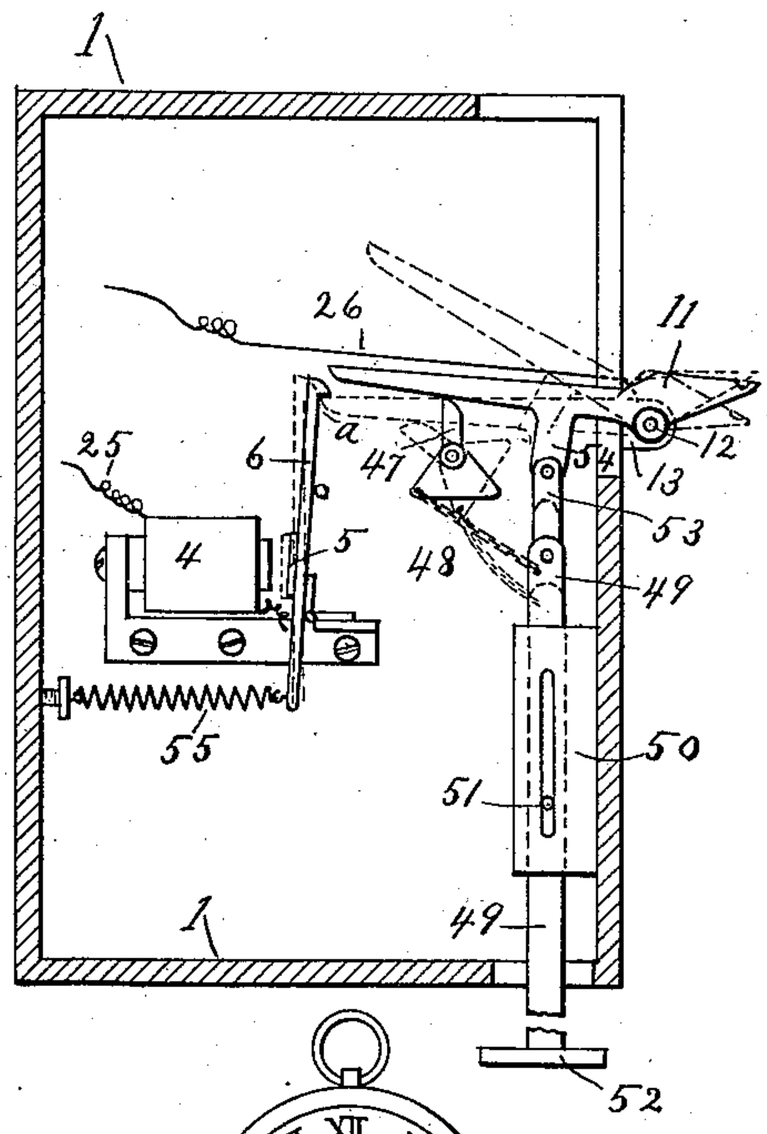


Fig. 7.

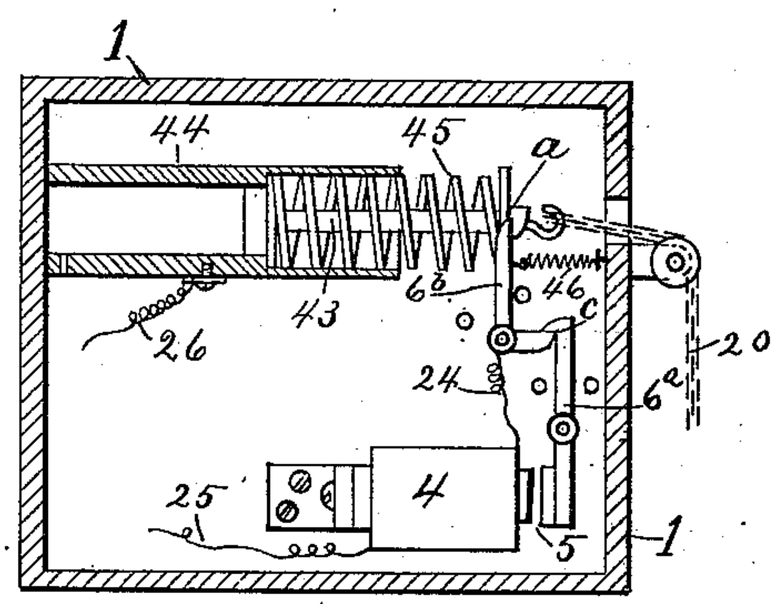


Fig. 8.

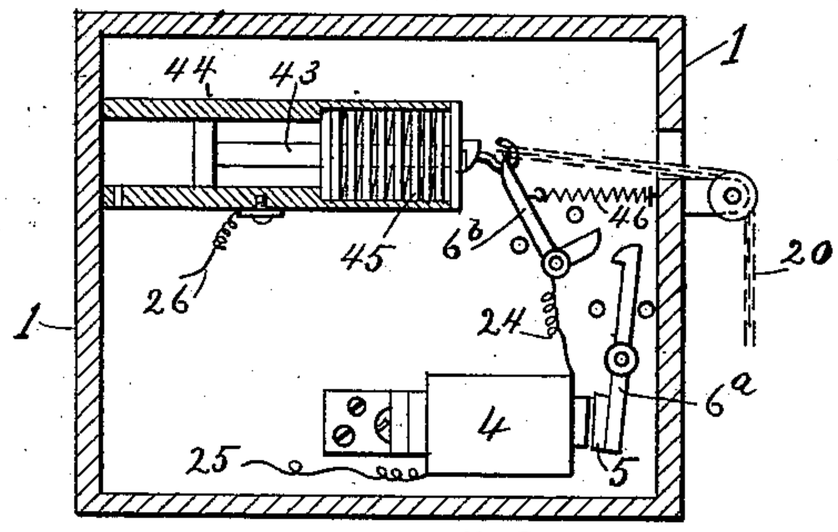
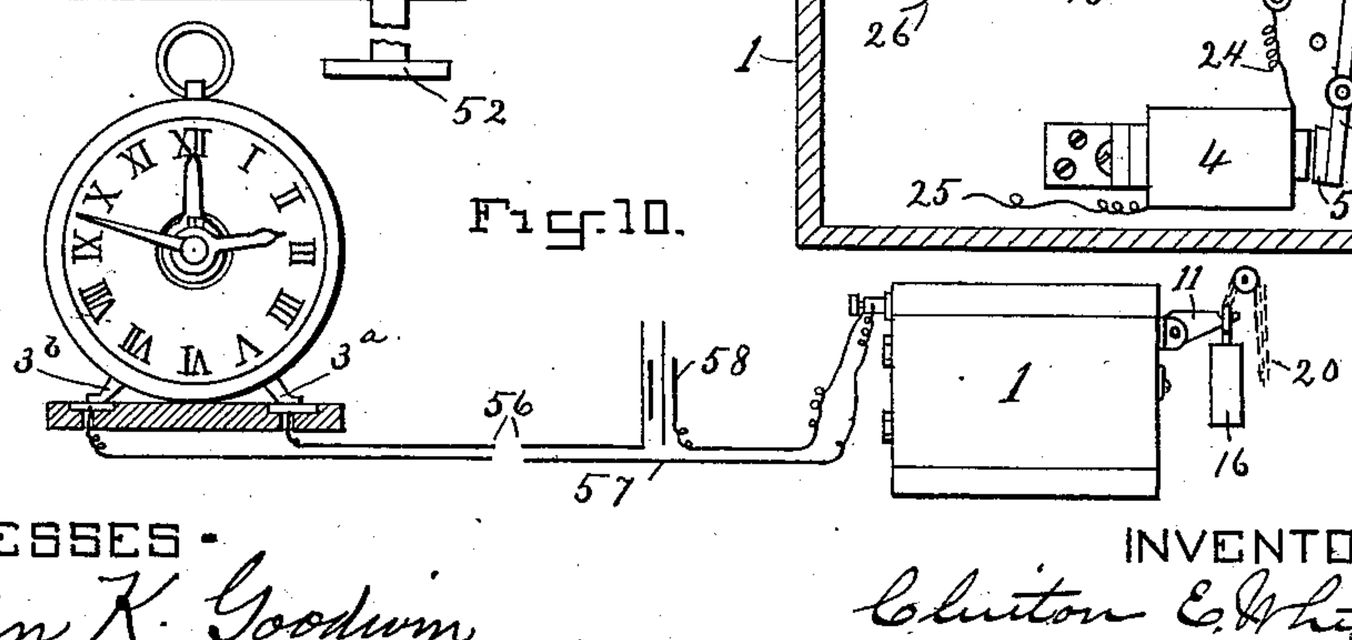


Fig. 10.



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UNITED STATES PATENT OFFICE.

CLINTON E. WHITNEY, OF NEW YORK, N. Y.

AUTOMATIC ELECTRIC CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 549,556, dated November 12, 1895.

Application filed January 2, 1895. Serial No. 533,518. (No model.)

To all whom it may concern:

Be it known that I, CLINTON E. WHITNEY, a citizen of the United States, residing at the city of New York, county and State of New York, have invented certain new and useful Improvements in Automatic Electrical Cut-Offs and Time Mechanism, of which the following is a specification.

My invention relates to an electrically-controlled cut-off and time mechanism intended more especially to automatically stop the flow or supply of illuminating-gas at any predetermined time in show-fronts or other parts of stores or in offices and elsewhere, but adapted, also, for use in cutting off supply of water, steam, or any other fluid, or for operating draft-flue dampers or other mechanisms at any predetermined time and at place or places more or less distant from the time mechanism or clock.

In some of its features the invention is applicable in various other ways as an electrically-actuated time-controlled trip device.

The invention has for its object to provide simple, inexpensive, and efficient apparatus for the above-named purposes.

After giving a detailed description of the several parts and their relations to each other and then explaining the principles of their operation, I will particularly point out the features of novelty in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and numerals indicate corresponding parts in the several views.

Figure 1 is a front perspective veiw of the apparatus as employed for cutting off supply of illuminating-gas by the aid of a falling weight. Fig. 2 is a detail sectional front view of one preferred form of electromagnetic trip-latch device. Fig. 3 is an enlarged vertical sectional view of parts of the time mechanism or clock for electrically controlling the mechanical cut-off devices. Fig. 4 is a rear view in section on the line *x x* in Fig. 3. Figs. 5 and 6 are enlarged detail views of parts of the time mechanism, hereinafter referred to. Figs. 7 and 8 are vertical sectional views illustrating, respectively, latched and tripped conditions of a modified apparatus, in which a spring substitutes the weight as the direct motor of the valve or other supplemental controlled mechanism. Fig. 9 is a vertical sectional view of another part of the invention, comprising a guard which prevents unintentional contact or latching of the trip device in order to avoid too quick exhaustion of battery-current; and Fig. 10 illustrates the use of the apparatus with the trip devices or prime-motor mechanism arranged at a distance from the time-controlling mechanism and in electrical circuit therewith.

In a preferred compact form of apparatus all the principal parts are contained within or are connected with a suitable box or casing 1 in the front hinged or removable cover 2, of which the time-mechanism casing 3 is supported in order to allow this mechanism to be turned back with the cover or be otherwise accessible for adjustments, hereinafter explained.

Before particularly describing the time mechanism I will explain the electromagnetic trip-latch devices, as follows: Within the casing 1 is an electromagnet 4, the core of which is adapted to attract an armature 5 at one end of a latch 6, which is pivoted to a bearing 7 on the casing and may vibrate between stops 8 9 therein. The beveled hook end 10 of the latch is adapted to engage and temporarily retain one end of the long arm of a trip-lever 11, which is pivoted at 12 to and between lugs 13 13 on the casing 1 and may play through a slot 1^a thereof. At the outer part of its short arm the lever 11 preferably has a notch 14, in which to place the suspension-eye 15 of a weight 16. The weight may be variously arranged relatively with a lever-arm 17 of a valve 18 in a gas or fluid supply pipe 19, in order to have the gravity of the falling weight close the valve and cut off supply of gas or fluid from the pipe. Should the valve be below the weight, as is usual, the weight-suspension chain 20 will run over an upper pulley 21, and thence on a guide-pulley 22, which is preferably held to a bracket 23, which also forms a stop, limiting the fall of the weight when the valve is closed. Should the valve be above the trip-lever and weight, the guide-pulleys may be dispensed with. One end of the wire coil of the electromagnet 4 connects by a wire 24

with the bearing 7 of the armature-latch 5 6 or with the latch itself. The other end of the coil connects by a wire 25 with a binding-post 3^a (not necessarily insulated) on the metallic time-mechanism casing 3, and a wire 26 connects one of the insulated bearing-lugs 13 of the trip-lever 12 with an insulated binding-post 3^b on the casing 3.

The time mechanism (shown in Figs. 3, 4, 5, and 6 of the drawings as fully as is necessary to describe my invention) is provided with an hour-hand 27, a minute-hand 28, and an index-hand 29, which I herein term the "indicator." This indicator 29 is fast to a hub 30 of a setting-wheel 31, which has peripheral teeth engaged by a pinion 32 on a shaft 33, which extends through the time-mechanism casing 3 and has a milled head 33^a, by which the pinion and wheel 32 31 may be turned to set the indicator at any point on the clock-dial 34, indicating the time at which it is desired to electrically trip the lever 11 and close the valve 18 to cut off the flow of gas or fluid. The setting-wheel hub 30 has a notch 35, which may be entered by a radial stud 36 on the sleeve 27^a of the hour-hand 27. This sleeve is suitably connected to proper wheel-works of the timepiece or clock and rotates within the hub 30 of the setting-wheel and indicator. The shaft 28^a of the minute-hand 28 revolves within the sleeve 27^a and is also appropriately coupled to the clock-works.

To the dial 34 or other suitable portion of the clock-casing 3 is fastened one end of an elastic-metal contact-plate 37, which preferably has a central opening through which the hour-hand hub 27^a passes. This contact 37 normally throws the setting-wheel 31 and indicator 29 outward the instant the hour-hand-hub stud 36 comes opposite the notch 35 of the hub 30. This movement of the contact-plate 37 brings it against another contact 38, which is held to the casing 3 with an interposed insulation 39 and is in electrical circuit by a wire 40 with the insulated binding-post 3^b, to which the wire 26 from the bearings of the trip-lever 11 also is connected. Another wire 41 may connect the fixed end of the contact-plate 37 with the binding-post 3^a, to which the wire 25 from the electromagnet 4 is attached; but this wire 41 need not be used, as the current may pass through the metal casing 3 to the contact 37 or to any other connected part of the time mechanism.

The operation of the invention as thus far described is as follows: Supposing the apparatus to be set for use and that the trip-lever 11 is engaged at *a* with the latch 6, whose armature 5 is disengaged from the electromagnet 4, as shown in full lines in Fig. 2 of the drawings, and supposing, further, that the weight 15 is hung on the trip-lever and allows the arm 17 of the valve 18 to be in lowermost position to allow the gas or fluid supply valve 18 to remain open and as shown in full lines in Fig. 1 of the drawings, and, further, supposing that the indicator 29 had been set on the clock-dial 34 to the time at which it is desired to cut off the gas or fluid at the valve 18, and that by thus setting the indicator the spring-contact 37 had been forced back, so as to stand clear of the opposing contact 38 of the time mechanism, as shown in Fig. 3 of the drawings, the parts now are adjusted to assure passage of the electric current from the battery 42 through both the trip-lever and its latch at their point of temporary connection at *a* the instant the contacts 38 37 come together. Immediately the clock or time mechanism runs to the time at which the indicator had previously been set—say, for instance, at twelve midnight, as shown in Fig. 1 of the drawings—the hour-hand lug 35 will come opposite the notch 36 of the indicator and setting-wheel 30, and the spring contact 37 will then force the setting-wheel and indicator with their hub 30 outward, and the two contacts 37 38 will come together, whereupon the current from the battery will for an instant pass through the contacts 37 38, the lever 11, latch 6, and the magnet 4, and the latter will attract its armature 5, thereby disconnecting the trip-lever and latch at their relative setting-point *a* and allowing the weight 16 to drop and move the valve-arm 17, as indicated by dotted lines in Fig. 1 of the drawings, thereby closing the valve 18 and cutting off the gas or fluid at precisely twelve midnight, the predetermined time.

It will be noticed that in the operation of this apparatus the electrical circuit is completed only for an instant, and then traverses the trip-lever and latch 11 6 at or across their point of connection or mutual setting at *a*, and that the instant the armature 5 is attracted to the magnet 4 the separation of the parts 11 6 at *a* is effected and the contacts 37 38 come together. Hence the current passes in complete circuit from the battery only long enough to exchange the connection of the parts 11 6 at *a* for the connection of the contacts 37 38 at *b*. Hence there is no waste of battery-current, and an ordinary battery will last many months, and the apparatus may be kept in complete running order at trifling expense. This mode of operation, involving the temporary passage of the electric current through the weight-sustaining trip-lever 11 and its armature-latch 5 6 and across their point of temporary connection at *a*, whereat the circuit is broken the instant the armature is attracted and the weight 16 or other actuating motor is released, I consider one of the most important features of my invention.

To reset the apparatus to be tripped at the same hour of a following night or day, it is only necessary to lift the outer end of the trip-lever, and thereby lower its inner long arm, which will automatically latch again at *a* under the head 10 of the armature-latch, and then hang the valve-motor weight 16 upon the trip-lever. If the time of closing the valve 18 to shut off the gas or fluid is to be

changed, it is only necessary to set the indicator at a different place or hour on the face of the clock-dial to assure closing of the valve at that predetermined time.

In Figs. 7 and 8 of the drawings is shown a modification wherein the power of a retracting-spring is utilized instead of a falling weight to close the valve at the appointed time. In this construction the armature-latch, acting with the magnet 4, is made in two parts 6^a 6^b, the latter adapted to engage the former at *c*, while 6^a is adapted to engage a contact-shoulder at *a*, which is at the head or outer part of a plunger-rod 43, to which the valve-chain 20 is to be attached, substantially as shown in Fig. 1 of the drawings. The plunger-rod is fitted within a suitable guide 44, in the counterbored outer part of which a normally-contracting spring 45 is placed between a shoulder of the guide and the plunger-head. The wire 24 connects the coil of the magnet 4 with the part 6^b of the latch, and wires 25 26 connect with the magnet 4 and guide 44. Hence the electric current will pass through the magnet, the latch, and across the engaged shoulder at *a* to the plunger-rod or spring, and thence through the wire 26, to complete circuit through the latch and time mechanism, substantially as above described for the weight-actuated device. To set this modified apparatus for operation, the chain 20 is drawn upon to pull forward the plunger-rod 43, and thereby expand the spring 45, the inner end of which is suitably fastened to the guide 44, while its outer end is secured to the head of the plunger-rod. The head or shoulder of the rod will strike the extremity of the part 6^b of the latch and swing it outward against the normally-expanding resistance of its spring 46, and about as the two parts 6^a 6^b of the latch engage each other at *c* the plunger-rod 43 engages the part 6^b at *a*, as shown in Fig. 7 of the drawings. If now the electric circuit be closed through the time mechanism at the predetermined hour, the armature 5 of the latch portion 6^a will be attracted to the magnet 4, whereby the two parts of the latch are disengaged at the auxiliary or intermediate latching-point *c*, and the spring 45 now is free to contract within the guide 44, and in so doing draws the chain 20 with it, thereby closing the valve 18, which is attached by its arm 17 to the chain.

A further improvement (shown in Fig. 9 of the drawings) consists in combining with the trip-lever means for automatically preventing contact of the lever and its latch after they have been once electrically disengaged, except at the pleasure of the owner or operator. The latch 6 is adapted to engage the trip-lever 11 at *a*, substantially as above described and as shown by the dotted lever in the drawings. Beneath the lever 6 is hung a weighted gravitating stop-pawl 47, to which, at the farther side of its center, is attached a chain or cord 48, which is connected at its other end to a pull-rod 49, fitted to slide and also to have limited lateral play in a guide 50, fastened in the casing 1 of the apparatus. This pull-rod has a pin 51, working in a slot of the guide, and also has a head or knob 52, by which it may be operated by hand. At its upper or inner end the pull-rod is pivotally connected by a link 53 with a pendent lug 54, provided on the trip-lever, in order to give room for operation of the gravitating stop 47. After the lever 11 has been tripped or thrown upward at its inner end by the weight 16 or spring 45 or other means, subsequent to the attraction of the latch 6 to the magnet 4, and the link 53 and pull-rod 49 has been pulled upward by the lever, the stop 47 gravitates to the full-line position, and then prevents the fall of the lever 11 far enough to touch the latch 6. Hence electric circuit cannot be again established between the trip-lever and latch across the point *a* until after the stop 47 is operated by hand. Hence the battery-current cannot be prematurely exhausted. The stop 47 is actuated to permit re-engagement of the trip-lever and latch 11 6 by first giving the pull-rod a lateral rocking movement on its pin 51 in the guide 50, which swings the stop sufficiently to carry its effective extremity from under the lever and present its rounded upper face to the disengaged lever, whereupon a downward pull of the rod 49 will through the link 53 draw the lever downward and cause its engagement at *a* with the latch 6, as shown by the dotted position of the lever, and the stop 47 also then takes its dotted position beneath the lever. When the magnet 4 is next energized by current passing through the time mechanism and through the latch 6 and trip-lever 11 across their point of engagement at *a*, the lever will again be unlatched or tripped, and as it swings upward the stop 47 will again gravitate to its full-line position and will temporarily prevent further contact of the lever and latch, or until after the stop-pawl 47 and the trip-lever are again actuated by hand, as above described, to again engage the lever by the latch, which latter has a spring 55 normally drawing it over into the full-line position in readiness to catch and hold the depressed trip-lever.

Fig. 10 of the drawings illustrates how the time mechanism or clock may be located at any desired distance from the weight or spring actuated mechanism in the casing 1, which has two binding-posts connected, respectively, to the wires 25 26 within the casing and in circuit with the magnet and the trip-lever, as above described. From these binding-posts line-wires 56 57 run to the binding-posts 3^a 3^b of the clock, a suitable battery 58 being interposed in the line. I find in practice that several or any desired number of trip mechanisms in their respective casings 1 and adapted each to close or open its own valve 18 by the weight 16 or a spring may be connected in the same electric circuit and may be operated or tripped simultaneously at the hour at which the time mechanism is set. Hence

with but one clock located in the office any number of valves controlling supply of gas, water, steam, or other fluid, and located at different places throughout a building or in different buildings, may be either closed or opened automatically, or some valves may be closed and others opened at pleasure, or a number of electrically actuated or controlled mechanical devices of various kinds may be operated simultaneously at the appointed time by the use of but one time mechanism or clock.

It will be understood that I do not limit myself to the precise time mechanism herein shown and described, as any suitable mechanism adapted for automatic control or adjustment of electric circuits at any predetermined time may be used within the scope of my invention.

The term "battery" includes any suitable source of electricity.

Instead of the device operating by means of an open circuit, which when closed trips the valve or other time-controlled mechanism into action, the apparatus may be adjusted for working on a closed circuit, or to trip the valves when the circuit is opened or broken, as will be readily understood.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In an automatic electrical cut-off and time mechanism, the combination, with a valve or other device to be operated at a predetermined time, of a trip lever, a latch having catch for temporarily detaining said lever, means adapted for support by the latched trip lever and coupled to the valve or device to operate the latter when the lever is unlatched, an electro-magnet controlling the latch, a time mechanism adapted for automatic adjustment of electric circuits at any predetermined time, a battery or source of electric energy, and electric circuit connections between the battery, electro magnet and the time mechanism which include the trip lever and its latch and establish an electric circuit across the point of engagement of said lever and latch.

2. In an automatic electrical cut-off and time mechanism, the combination, with a valve or other device to be operated at a predetermined time, of a trip lever, a latch adapted to temporarily detain said lever, an electro-magnet whose armature controls said latch, a time mechanism adapted for automatic adjustment of electric circuits at any predetermined time, a battery or source of electric energy, electric connections between the battery, the electro-magnet and the time mechanism, which include the trip lever and its latch; and a detent automatically preventing readjustment of the trip lever and latch into relations for electrical action.

3. In an automatic electrical cut-off and time mechanism, the combination, with a valve or other device to be operated at a predetermined time, of a trip lever, a latch adapted to temporarily detain the trip lever, an electro-magnet whose armature controls said latch, a time mechanism adapted for automatic adjustment of electric circuits at any predetermined time, and comprising clock-works, dial and one or more time marking hands, a loose hub having a notch, an indicator on said notched hub and in setting relation with the dial, an electrical contact normally pressing the notched hub to effect entrance of the hour hand stud into the hub notch, an opposing electrical contact which the first named contact engages when the stud enters the notch, a battery or source of electric energy, and electrical circuit connections between the time mechanism contacts, the electro-magnet and the trip lever and its latch.

4. In an automatic electrical cut-off and time mechanism, the combination, with a valve or other device to be operated at a predetermined time, of a trip lever, a latch having a catch for temporarily detaining said lever, means adapted for support by the latched trip lever and coupled to the valve or device to operate the latter when the lever is unlatched, said lever when unlatched and freed from the valve actuating means, being normally movable toward the latch; an electro magnet controlling the latch, a time mechanism adapted for automatic adjustment of electric circuits at any predetermined time, a battery or source of electric energy, electric circuit connections between the battery, electro magnet and time mechanism which include the trip lever and its latch and establish an electric circuit across the point of engagement of said lever and latch, a detent automatically preventing re-engagement of the unlatched trip lever with the latch, and means for subsequently re-engaging said lever and latch to assure electric circuit across their point of engagement at the next normal operation of the mechanism.

5. In automatic apparatus of the character described, the time mechanism comprising clock works, dial, and one or more time marking hands, a loose hub having a notch, a stud on the hour hand adapted to said notch, an indicator on the notched hub and in setting relation with the dial, an electrical contact normally pressing the notched hub to effect entrance of the hour hand stud into the hub notch, an opposing electrical contact which the first named contact engages when the stud enters the notch, and electrical circuit wires or connections leading from these contacts and adapted to complete electric circuit to and through an auxiliary electrically actuated mechanism.

6. The combination, with a valve or other device to be operated at a predetermined time, of a trip lever 11, adapted to temporarily retain a valve operating device, a latch 6, having a catch adapted to detain the trip lever and carrying an armature, an electro mag-

net opposing the armature, a battery or source of electric energy, and wires 24, 25, 26, adapted to put the battery, the magnet and the engaged trip lever and latch into circuit with a time controlled mechanism, substantially as described.

7. The combination, with a valve or other device to be operated at a predetermined time, of a trip lever 11, a latch 6, having an armature 5, an opposing electro-magnet 4, a battery 42, and wires 24, 25, 26, adapting the battery, magnet, trip lever and latch to be put into circuit with a time controlling or other mechanism, a gravitating detent 47 for the trip lever, and a plunger rod 49 linked to the trip lever and detent, substantially as described.

8. The combination, with a valve or other device to be operated at a predetermined time, of a trip lever 11, a latch 6 having an armature 5, an opposing electro-magnet 4, a battery 42, wires 24, 25, 26, adapting the battery, magnet, trip lever and latch to be put into electrical circuit; a time mechanism having a dial 34, an hour hand 27, whose hub carries a stud 36, a hub 30 on the hour hand hub 27^a, and having a notch 35, an indicator 29 on the hub 30, contacts 37, 38 held apart until the stud 36 enters the notch 35, and wires 40, 41 connecting the contacts 37, 38 and in circuit with the wires 26, 25 of the trip lever and latch mechanism, substantially as described.

9. The combination, in an electric time mechanism, of a casing, a dial, clock works in the casing, an hour hand 27, whose hub carries a stud 36, an indicator 29, and a setting wheel 31, a wheel 32 on a shaft 33 and engaging wheel 31 for setting the indicator, contacts 37, 38, and wires 40, 41 adapted to put the time mechanism in electric circuit with a battery and auxiliary mechanism, substantially as described.

10. The combination, with the trip lever 11, latch 6 having armature 5, electro-magnet 4, a battery or source of electric energy, and wires 24, 25, 26, adapting the battery, the magnet and the trip lever and latch to be put into circuit with a time controlling or other mechanism, of a lever 17 connecting a valve or other mechanism, a weight 16 adapted for suspension by the latched trip lever, and a flexible connection 20 between the parts 17, 16, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

CLINTON E. WHITNEY.

Witnesses:
ALVIN K. GOODWIN,
CHAS. W. THOMPSON.