

A. J. EUCHENHOFER.
ELECTRIC SWITCH TIMING APPARATUS.
APPLICATION FILED OCT. 24, 1910.

1.058,418.

Patented Apr. 8, 1913.

4 SHEETS—SHEET 1.

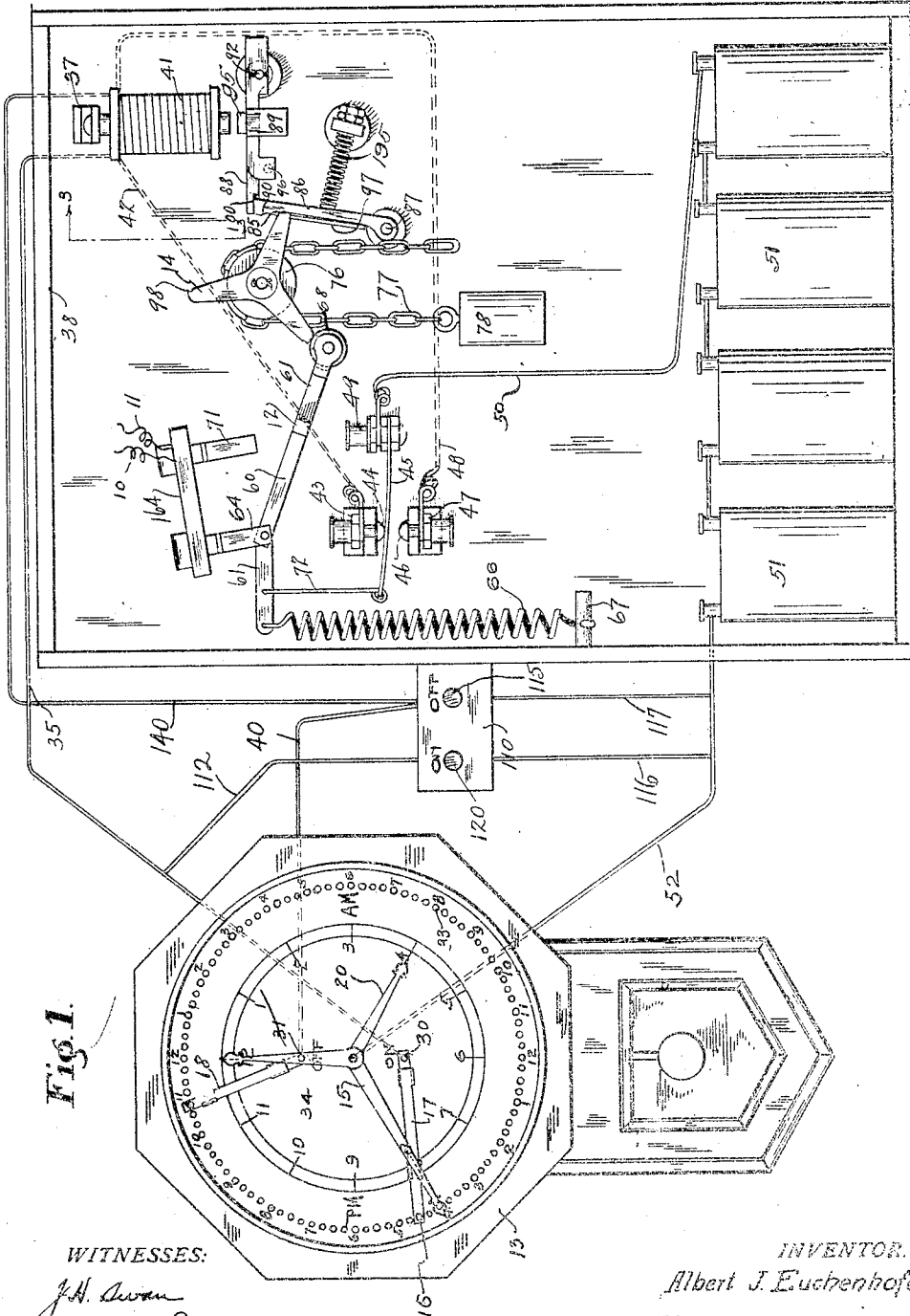


Fig. 1.

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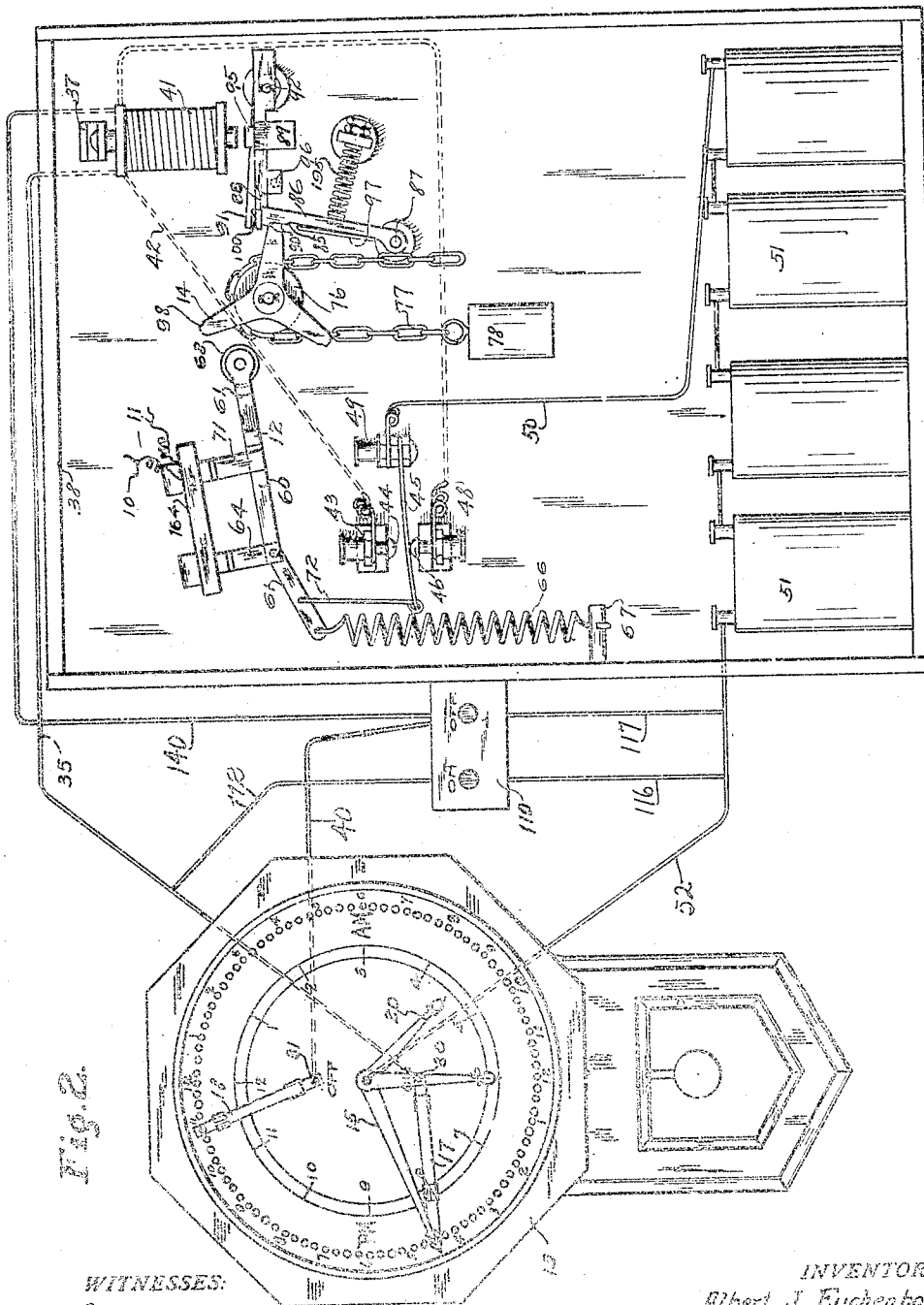
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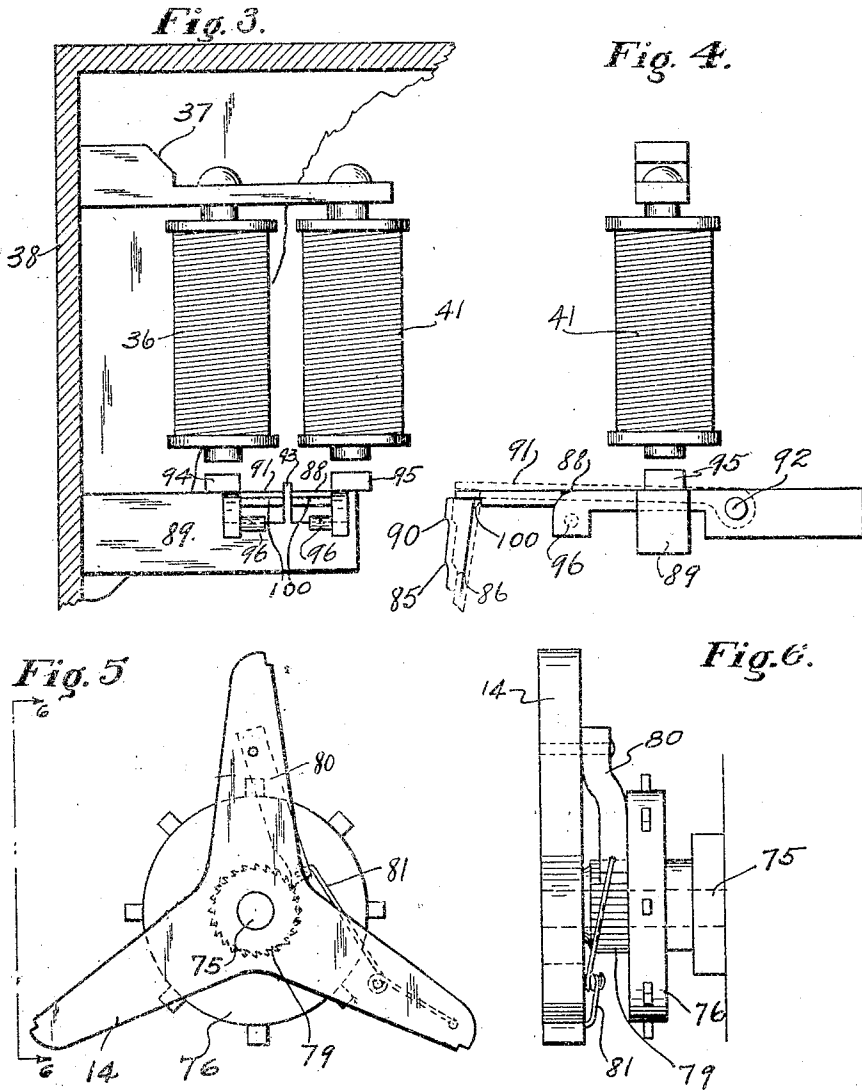
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

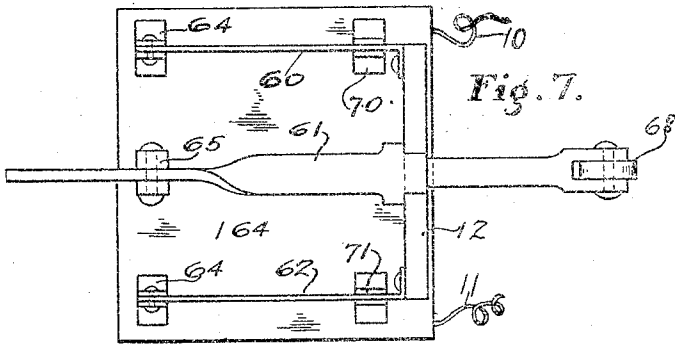


Fig. 7.

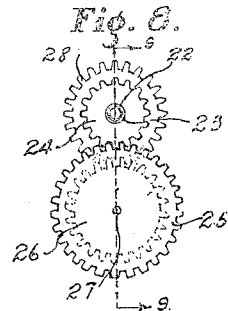


Fig. 8.

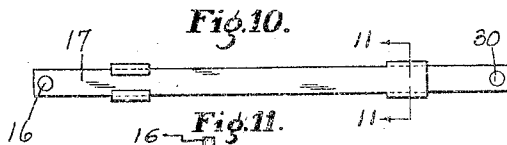


Fig. 10.

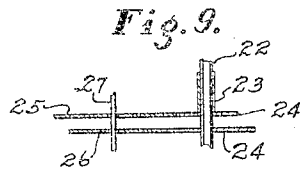


Fig. 9.

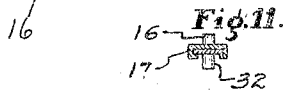
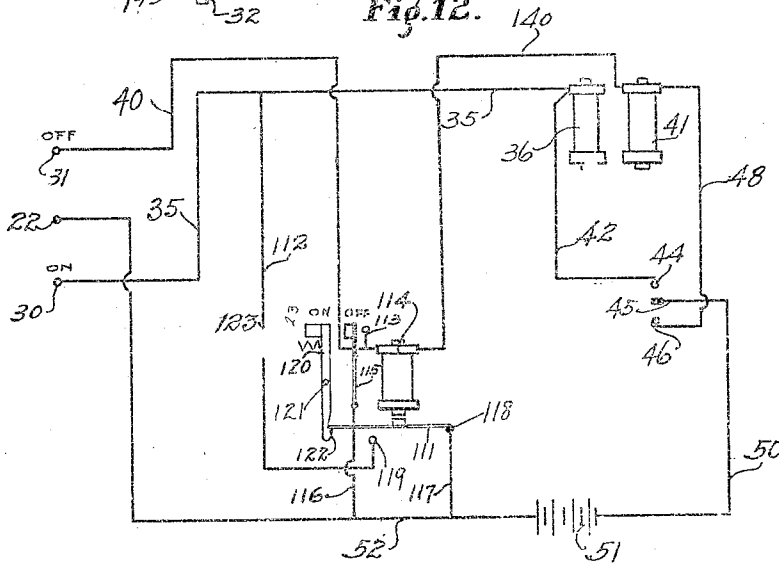


Fig. 11.

Fig. 12.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-SWITCH-TIMING APPARATUS.

1,058,418.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALBERT J. EUCHENHOFER, of Indianapolis, county of Marion, and State of Indiana, have invented a certain useful Electric-Switch-Timing Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

10 This invention was made particularly for the purpose of opening electric lighting circuits in stores and the like and closing the circuits at certain hours in the day or night, and aside from the novel switch controlling means, a further feature of the invention is the provision of an eight-day clock arranged in connection with the remainder of the mechanism so that said clock will open and close the switch automatically for eight days 15 without any attention on the part of any person. Thus the lights in a store or store window can by such clock arrangement be turned on, say at 6:00 p. m. each day and turned off at 11:00 p. m., and this will occur 20 on Sundays, holidays and all other times without any presence or attention of any person. Hence, as compared with prior devices which had to be turned off and on each day by an individual, there is great saving 25 of money as well as greater regularity in the lighting of a store or store window.

The nature of the invention will be understood from the accompanying drawings and the following description and claims.

35 In the drawings Figure 1 is a front elevation of the apparatus with the door of the switch box removed, and showing the position of the parts when the switch and electric lighting circuit are open. Fig. 2 is the same showing the position of the parts when the switch and lighting circuit are closed. Fig. 3 is an elevation of the magnets and associated parts viewed from the line 3—3 of Fig. 1. Fig. 4 is an elevation of the right-hand side of what appears in Fig. 3, excepting that the cabinet is omitted and a part of the stop lever is shown in one position by full lines and in another position by dotted lines, and altered positions of the trip levers are also shown. Fig. 5 is a front elevation of the construction for opening the main switch construction. Fig. 6 is an elevation of the right-hand side of what appears in Fig. 5. Fig. 7 is a front elevation 55 of the main switch construction. Fig. 8 is

an elevation of a portion of the gearing in the clock for controlling the 12-hour and 24-hour hands. Fig. 9 is a section on the line 9—9 of Fig. 8. Fig. 10 is a plan view of one of the switch arms on the clock. Fig. 11 60 is a section on the line 11—11 of Fig. 10. Fig. 12 is a diagram of the wiring of the circuits for controlling the main switch.

The main or lighting circuit includes the wires 10 and 11 and the switch 12. This 65 circuit is controlled by the clock 13 through the intervention of the switch actuating device 14, so that when the switch is in the position shown in Fig. 1, the lighting circuit is open and maintained in open condition, and when the parts are in the position shown in Fig. 2, the lighting circuit is closed. To regulate this switch an eight-day clock is used with only the following changes: A 24-hour hand 15 is provided so 75 that at one time during each 24 hours its outer end will engage the outwardly projecting pin 16 on the switch closing bar 17 and also later will engage the corresponding pin 16 on the outer end of the switch opening 80 bar 18. The 24-hour hand 15, therefore, comes in engagement once in every 24 hours with each of the bars 17 and 18 in the order named. The gearing in the clock is modified, as shown in Figs. 8 and 9, for driving 85 the 24-hour hand 15. This arrangement is combined with the means for driving the 12-hour hand 20, but geared so that the 24-hour hand 15 will move only half as fast as the 12-hour hand 20. 90

The 24-hour hand 15 is secured on a shaft 23, which is mounted about the 12-hour hand shaft 22, and on the latter a gear 24 is secured which meshes with a large gear 25, so that the latter will be driven by the 12- 95 hour hand gear 24 at exactly half the speed of the gear 24. A gear 26 is secured on a shaft 27 to which a gear 25 is secured and meshes with the 24-hour hand gear 28, which is secured on the shaft 22. Since the wheels 100 26 and 28 are of the same diameter, the shaft 22 will be driven only at half the speed of the shaft 23.

The bars 17 and 18 are made alike but both so as to be lengthened or shortened. 105 This is accomplished by making each of said bars out of two overlapping inter-engaging strips, but for convenience each pair of strips is herein called a bar. One end of the bar 17 is fulcrumed to a pin 30, and one 110

end of the bar 18 is fulcrumed to the pin 31 extending through the dial of the clock, and the other end of each bar has a pin 32 adapted to be inserted in one of the series of holes 33 arranged in the dial 34 of the clock, and concentric with the center thereof. Therefore, the outer ends of the bars 17 and 18 can be set to any particular time in the day. In Figs. 1 and 2 the circuit closing bar 17 is set so as to close the circuit at 4:30 p. m., and the circuit opening bar 18 will open the lighting circuit at about 11:00 p. m.

The wire 35 runs from the pin 30 in the clock to the magnet 36, which is carried by the arm 37 secured to the cabinet 38, as shown in Fig. 3. A wire 40 runs from the pin 31 in the clock to the magnet 114 in the hand switch 110, and wire 140 runs thence to magnet 41 carried also on said arm 37. A wire 42 extends from the magnet 36 to the binding post 43, which is secured to the cabinet 38. The binding post 43 has a contact 44 situated on one side of what may be called the clock circuit switch 45 and in position to be engaged by said switch at times. There is a contact 46 opposite the contact 44 and in communication with the binding post 47, which is connected by the wire 48 with the magnet 41. The switch 45 is flexible and is secured at one end of the binding post 49 from which a wire 50 extends to the battery 51 and from said battery the wire 52 extends to the shaft 22 of the 24-hour hand 15, see Figs. 1 and 12. Therefore, when the switch 45 is in touch with the contact 44, as shown in Fig. 1, and the 24-hour hand 15 comes in contact with the pin on the arm 17, it will close a circuit which includes the arm 17, wires 35, magnet 36, wire 42, contact 44, switch 45, wire 50, battery 51, wire 52, shaft 22, and the 24-hour hand 15. The energization of the magnet 36 caused by the closing of such circuit will cause the closing of the lighting circuit, as will hereafter be explained. On the other hand, when the 24-hour hand 15 comes in contact with the pin on the arm 18, a circuit through the magnet 41 will be established, as follows: arm 18, pin 31, wire 40, magnet 114, wire 140, magnet 41, wire 48, contact 46, switch 45, wire 50, battery 51, wire 52, shaft 22 and 24-hour hand 15. This by means hereafter explained will cause the opening of the lighting circuit.

The details of the switch construction for opening and closing the main or lighting circuit includes three parallel knife-blade switch levers 60, 61 and 62, see Fig. 7, formed into a frame by a cross bar, which is marked 12 although that numeral has reference to the total switch, and pivoted to the brackets 64 and 65, which are in alinement with each other and secured to the plate 164 which extends outwardly from

the back wall of the cabinet. The needle bar 61, is longer than the bars 60 and 62, and the heel of said bar 61 has a spring 66 connected with it, which runs down to the pin 67 fastened to the casing and arranged so as to tend to throw the switch to its closing position. The other end of the lever 61 projects beyond the cross bar 12 of the switch frame for some distance and it has a roller 68 on it. The bars 60 and 62 of the switch engage the terminals 70 and 71 secured in said plate 164 and with which the wires 10 and 11 of the main or lighting circuit are respectively connected.

The main switch lever 61 is connected with the lever 45 of the clock circuits by a link 72, so that the main switch will control and operate the switch for the clock circuits by moving the latter against one contact when the main switch is closed, and against the other contact when the main switch is opened, as shown in Figs. 1 and 2.

The main switch is operated by a three-arm switch actuating device 14. It is loosely mounted on a shaft 75 which is mounted in any suitable manner in the cabinet and which carries a pin wheel 76, and a chain 77 operates on said pin wheel and carries a weight 78 on one end. A ratchet wheel 79 is secured on the shaft 75 and power is transmitted from said shaft through said ratchet wheel to the arms 14 by a pawl 80 mounted on the arms 14 with its ends pressed into engagement with the ratchet wheel 75 by a spring 81 also mounted on the arms 14. After the weight 78 has run down, in the course of eight days, it is wound up by merely pulling down on the free end of the chain. The arms 14 are mounted so that their ends will engage the roller 68 on the main switch lever 61 and move it from the closing position shown in Fig. 2 to the open position shown in Fig. 1.

The forward movement of the switch actuating arm 14 is first stopped by the shoulder 85 on the stop lever 86 fulcrumed at one end to the cabinet at 87. The upper end of said lever 86 is held by a trip lever 88 fulcrumed at 92 at its other end to the frame plate 89, which is secured to the cabinet, see Fig. 3. The stop lever 86 has also another shoulder 90 adapted to catch the end of an arm 14, and on that occasion the upper end of the lever 86 is stopped and held by the trip lever 91 fulcrumed to the frame 89 by a pin 92. The trip levers 88 and 91 are parallel with each other and similarly mounted on the frame plate 89 and lie on each side of a projection 93 which separates them. They are lifted or actuated by the armatures 94 and 95 which lie respectively under the cores of the magnets 36 and 41, and are fulcrumed at one end to the frame plate 89, and when either of said armatures is lifted, a pin 96 on the turned down ends

of the armatures engages the undersides of the trip levers 88 and 91, respectively, and lifts them out of holding engagement with the end of the lever 86, which is wide enough to be engaged by either trip lever. The outer ends of the trip levers 88 and 91 are notched, as indicated in Figs. 1 and 4, so as to have shoulders 100, but the shoulder 100 on the trip lever 88 projects farther out toward the lever 86 than the corresponding shoulder on the other trip lever. Hence the shoulder 100 on the trip lever 88 will hold the lever 86 so that its shoulder 85 will engage and stop the end of the arm 14, as shown by dotted lines in Fig. 4, but when the trip lever 88 is lifted, then the arm 14 can move farther until it engages the shoulder 90 on the lever 86, and at that time the upper end of the lever 86 will be held by the shoulder 100 on the trip lever 91, which is slightly farther back than the shoulder 100 on the lever 88, as appears by full lines in Fig. 4. Therefore, the stop lever 86 stops the arms 14 twice, once in order to hold the main switch in open position, as shown in Fig. 1, and which is brought about by the clock circuit being closed by the bar 18, thus energizing the magnet 41 and lifting the trip lever 81 from the position shown in Fig. 2, whereupon the weight 78 will move the arms 14 and the main switch to the position shown in Fig. 1. It will stay there until the time for the main circuit to be closed and when the 24-hour hand reaches the bar 17, the other clock circuit will be closed and the magnet 36 energized, which will lift the lever 91 and let the arms 14 pass from the position shown in Fig. 1 to the position shown in Fig. 2, and then the main switch will close and stay closed until the 24-hour hand reaches the bar 18.

The spring 195 secured at one end to the cabinet pushes with its other end against the lever 86 and tends to force it toward the arms 14. The pins 96 hold the trip levers 88 and 91 in such position that the backward movement of the upper end of the lever 86 will always cause it to pass under the projecting ends of the trip levers and against the most forward shoulder 100 which is on the trip 91. As the arms 14 turn they engage a spring 97 mounted in connection with the lever 86 and pass beyond its free end against the shoulder 85, and then the free end of the spring 97 snaps behind the arm 14 which is notched at 98 and prevents any return movement of the arms 14 during rewinding of the weight 78.

It is not necessary that the invention should be limited to any particular means for actuating the arms 14, although the weight and chain are convenient, nor to the particular construction of the other parts so long as they perform the functions in the manner indicated. The main switch con-

trols the switch 45 so that it puts the proper clock circuit in condition to be closed by the 24-hour hand when the time comes.

The bars 17 and 18 on the clock can be shifted to any desired space or part so that the main or lighting circuit will be opened for the desired period of time. This period of time may be any fraction of 24 hours.

Provision is made for closing the main or lighting circuit independently of the clock. This is by means of the hand-operated switch construction 110, see Fig. 2, secured to the side of the casing, which is connected by the wire 112 with the wire 35 and is also connected with the wires 40 and 140, and wires 116 and 117 lead from it to the battery through the wire 52. The details of this switch construction are indicated in diagram in Fig. 12. There is a magnet 114 connecting the wires 40 and 140, and, therefore, constantly in the circuit controlled by the clock arm 18. This magnet has an armature switch 111 fulcrumed at 118 and adapted when released from the on-lever 120 to drop down into engagement with the contact 119 which is connected by the wire 112 with the wire 35, and therefore, the circuit controlled by the clock arm 17. The on-switch lever 120 is fulcrumed at 121 and has a hook 122 on the lower end adapted to engage the armature switch 111 and hold it out of engagement with its contact 119, and this locking position of the lever 120 is maintained by the spring 123. Therefore, when said armature lever 111 is down into engagement with contact 119, current will pass from the battery 51, wires 52 and 117, armature lever 111, contact 119, wires 112 and 35, to magnet 36. There is also an off-switch 115 which is adapted to engage contact 113 connected with wire 40, and the switch 115 is connected with the wire 52 by the wire 116. Therefore, when the off-switch 115 is operated, current will pass from battery 51 through wires 52 and 116, switch 115, contact 113, magnet 114, wire 140 to the magnet 41, etc., and that will not only operate the means controlled by the switch closing circuit and in which the magnet 41 is situated, but will also energize the magnet 114 and cause it to lift the armature switch out of engagement with its contact 119 so as to be caught by the notch 122 on the on-switch lever 120. That will open the circuit controlled by the on-switch lever and will turn the parts to their normal position. This hand-operated switch mechanism, however, is such that it does not interfere with the clock in controlling the clock circuits. Thus, if the main or lighting circuit has been closed by pushing the on-button of the hand-operated switch, the clock at 11:00 p. m. will put the lights out, for as soon as the circuit controlled by the clock arm 18 is closed, it will energize the magnet 114 and

lift the armature 111 to normal position. Now suppose after the clock has turned on the main circuit or lights, one should operate the off-button, the same result would follow as if the 24-hour hand had reached the switch arm 18, for its circuit would be closed by pushing the off-button, which would close the circuit between the battery and magnet 41, energize the latter and cause the operation of the arms 14.

I claim as my invention:

1. The combination with an electric switch, of a clock provided with a hand, an electric circuit for opening said switch, an electric circuit for closing the same, a series of perforations in the face of the clock and concentric with the center thereof and over which said hand moves, and a terminal for each circuit which is longitudinally extensible and pivoted at one end to the face of the clock and at the other end provided with a pin adapted to enter said perforations for holding it in position to be engaged by said hand.

2. The combination with an electric switch, of yielding means for closing the switch, rotary means for opening the switch, a pin wheel mounted in connection with said rotary means so as to actuate the same, a chain mounted on said pin wheel, a weight attached to one end of said chain, and means for locking the switch opening means in position to hold the switch open, and time controlled means for releasing said locking means.

3. The combination with a main electric switch, of yielding means for closing the switch, means for opening the switch, means for locking the switch opening means in position to hold the switch open, a clock controlled electric circuit, means actuated by said circuit for releasing said locking means, and a secondary switch operated by said main switch for placing said circuit in condition to be closed by the clock.

4. The combination with an electric switch, of yielding means for closing the switch, a number of rotary arms rigidly connected together and mounted separately from the switch for opening the switch, a spring actuated locking lever provided with a shoulder in position to engage one of said arms and stop the movement of said arms so that another one of said arms will hold the switch open, and time controlled means for releasing said lever.

5. The combination with an electric switch, of yielding means for closing the switch, a number of rotary arms for opening the switch, a spring actuated locking lever provided with a shoulder in position to engage one of said arms and stop the movement of said arms so that one of said arms will hold the switch open, a spring catch on said lever in position to slip in behind one

of said arms as it is stopped by the shoulder on said lever and prevent the backward movement of said arm, and time controlled means for releasing said lever.

6. The combination with an electric switch, of yielding means for closing the switch, a number of rotary arms for opening the switch, a spring actuated locking lever provided with a shoulder in position to engage one of said arms and stop the movement of said arms so that one of said arms will hold the switch open, a spring catch on said lever in position to slip in behind one of said arms as it is stopped by the shoulder on said lever and prevent the backward movement of said arms, a trip lever in position to engage said locking lever and hold it in locking position, a magnet adapted to be energized, and an armature for said magnet in position to release said trip lever.

7. The combination with an electric switch, of yielding means for closing the switch, rotary means for opening the switch, a clock provided with a pair of circuit opening and circuit closing switch arms, an electric circuit opened and closed by each switch arm of the clock, and means operated and controlled by one of said circuits for stopping said switch opening means in position to hold the switch open and by the other circuit for stopping said switch opening means in position not to open the switch when it is closed.

8. The combination with an electric switch, of yielding means for closing the switch, rotary means for opening the switch, a clock provided with a pair of circuit opening and circuit closing switch arms, an electric circuit opened and closed by each switch arm of the clock, a locking lever, a magnet energized by each of said circuits, an armature operated by each magnet, and a switch lever actuated by each armature and adapted to engage said locking lever and so arranged that one of said trip levers will hold the locking lever in position to stop the switch opening means in position to hold the switch open until the trip lever is operated by its circuit and the other trip lever is in position to hold said locking lever in position to stop said switch opening means in position not to engage the switch when it is closed.

9. The combination with an electric switch, of yielding means for closing the switch, rotary means for opening the switch, a clock provided with a pair of circuit opening and circuit closing switch arms, an electric circuit opened and closed by each switch arm of the clock, means operated and controlled by one of said circuits for stopping said switch opening means in position to hold the switch open and by the other circuit for stopping said switch opening means in

position not to open the switch when it is closed, a battery, and a secondary switch actuated by said main switch for throwing said battery successively into said circuits for energizing the magnets.

10. The combination with an electric switch, of a clock provided with a hand, an electric circuit for opening said switch, an electric circuit for closing the same, terminals for said circuits located in the clock in position to be engaged successively by said hand for closing the circuits, a battery for said circuits, a hand-operated switch provided with a magnet in said switch opening electric circuit, an armature switch for said magnet in communication with the battery, a contact point in communication with said switch closing circuit and in position to be engaged by said armature lever for closing said switch closing circuit, and a spring controlled lever for catching said armature lever when actuated by said magnet, substantially as set forth.

11. The combination with an electric switch, of a clock provided with a hand, an electric circuit for opening said switch,

an electric circuit for closing the same, terminals for said circuits located in the clock in position to be engaged successively by said hand for closing the circuits, a battery for said circuits, a hand-operated switch provided with a magnet in said switch opening electric circuit, an armature switch for said magnet in communication with the battery, a contact point in communication with said switch closing circuit and in position to be engaged by said armature lever for closing said switch closing circuit, a spring controlled lever for catching said armature lever when actuated by said magnet, an off-switch in communication with said battery, a contact point therefor in communication with said switch opening circuit between the clock and said magnet, substantially as set forth.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

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Witnesses:

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O. M. McLAUGHLIN.