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Patented Apr. 17, 1900.

T. ALLEMANN.

SWITCH APPARATUS FOR ELECTRIC CURRENT DISTRIBUTING CIRCUITS.

(No Model.)

(Application filed Nov. 22, 1899.)

4 Sheets—Sheet 1.

FIG - 1 -

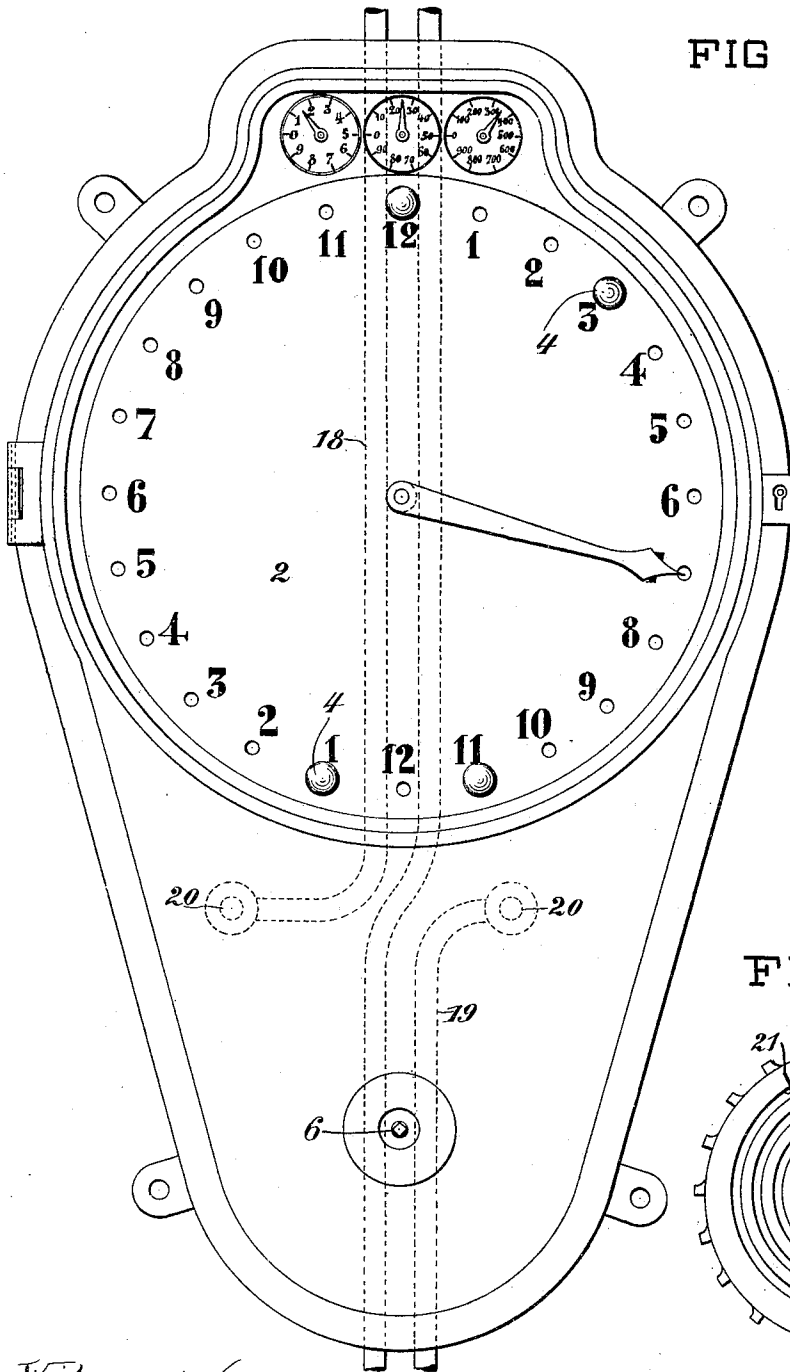
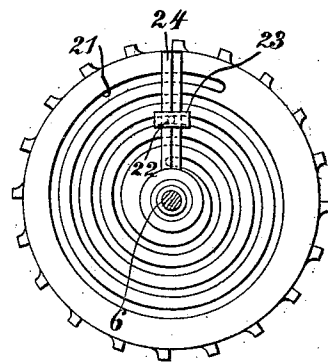


FIG. 4.



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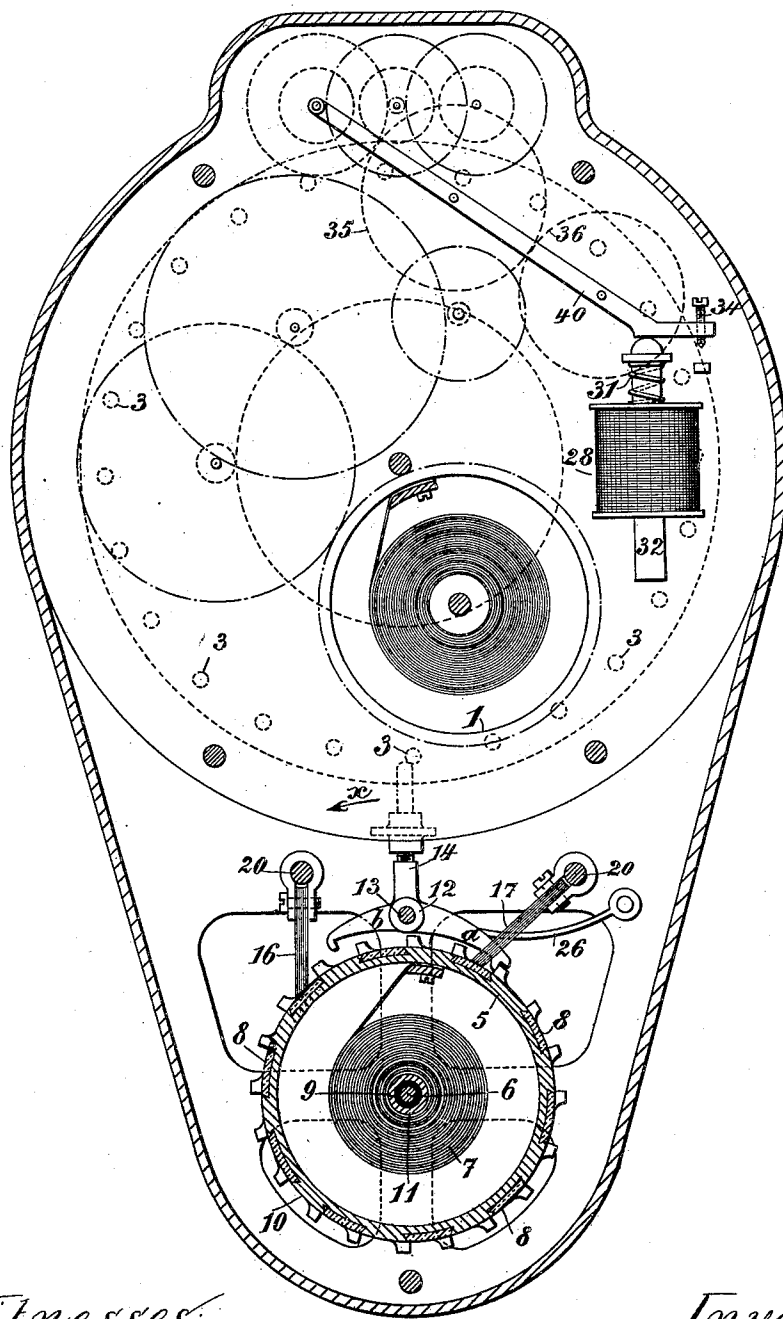
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4 Sheets—Sheet 2.

FIG. 2.



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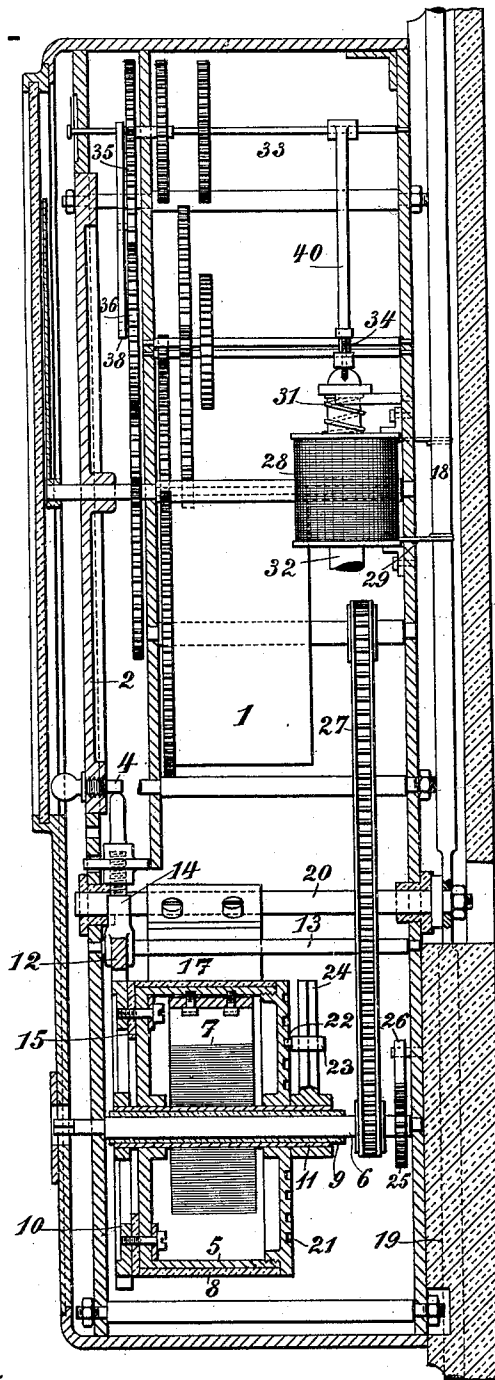
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4 Sheets—Sheet 3.

FIG. 3.



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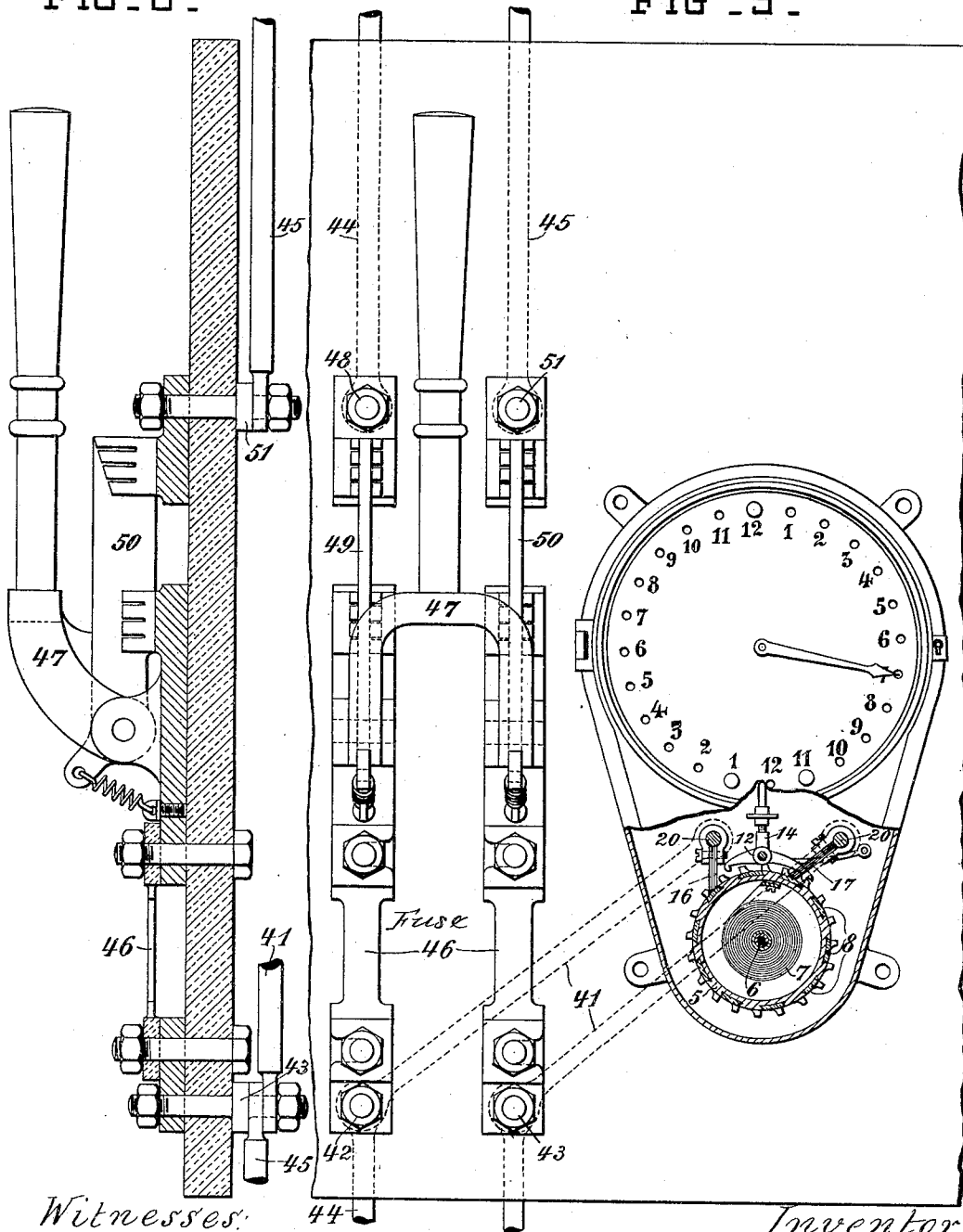
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4 Sheets—Sheet 4.

FIG. 6.

FIG. 5.



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SWITCH APPARATUS FOR ELECTRIC CURRENT-DISTRIBUTING CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 647,783, dated April 17, 1900.

Application filed November 22, 1899. Serial No. 737,875. (No model.)

To all whom it may concern:

Be it known that I, THEODOR ALLEMANN, engineer; a citizen of the Swiss Republic, and a resident of Olten, canton of Soleure, Switzerland, have invented a new and useful Switch Apparatus for Electric Current-Distributing Circuits Operating Automatically at Predetermined Periods, of which the following is a clear, full, and exact specification.

The object of the present invention is a switch apparatus which has for its purpose to automatically interrupt the current in electrical distribution-circuits at a given previously-determined moment and to automatically reinstate it at another fixed period. In this manner the current can be withdrawn from a current consumer for certain purposes between these predetermined periods. This apparatus may be used, for example, where current is distributed from an electrical circuit for transmission of power, as well as for lighting purposes, and in which at certain times—as, for instance, at twilight and at dawn—much more current is required for lighting purposes. At these times, therefore, the supply of current for power purposes must be cut off, which is effected automatically by this apparatus, as it interrupts the current which supplies the power-circuits. On the other hand, it reinstates the service again as soon as the interval has elapsed during which more current than usual is needed for lighting purposes.

In the accompanying drawings one constructional form of the new apparatus is illustrated by way of example with a suitable system for connecting it with the main current-circuit, in which—

Figure 1 shows the apparatus in front elevation. Figs. 2 and 3 illustrate it in two sections vertical to one another, while Fig. 4 shows a detail of the apparatus in back elevation. Figs. 5 and 6 illustrate a suitable system of connecting the apparatus with the main wires with the necessary additional devices.

In the closed casing of the apparatus illustrated (see Figs. 1, 2, and 3) a powerful clock-work mechanism is placed, the spring-box 1 of which is enabled, by means of gearing, to revolve a disk 2 once in twenty-four hours.

This disk 2 is provided with holes 3, placed at equal distances apart around its periphery and at an equal distance from the center, in which releasing-pins 4 can be placed.

The automatic switching off and on of the current is effected by means of a switch-drum 5, placed in the lower part of the apparatus and forming a spring-box, which drum is provided with an escapement. The escape-wheel 10 of this escapement, as well as the switch-drum 5, is placed loosely on a sleeve 11, which is firmly connected with the winding-shaft 6 of the actuating-spring 7, placed in the drum 5, by means of an insulating-envelop 9. The two-detent lever 12 of this escapement, under the action of the spring 26, is located on an axle 13 and is connected with an upwardly-directed lever-arm 14, the length of which arm can be altered for the purpose of effecting accurate adjustment. The releasing-pins 4 can strike against the top of this arm at the predetermined periods.

The escape-wheel 10 and the switch-drum 5 are connected with each other with interposition of an insulating layer 15. The drum 5 consists of conducting material, such as bronze or the like, and strips 8 of insulating material are inserted at regular intervals in its outer circumference, while the actuating-spring 7 is connected, on the one hand, with the inner circumference of the drum and, on the other hand, with the sleeve 11, fixed on the winding-shaft 6. The number of insulating-strips 8 is equal to half the number of teeth of the escape-wheel 10.

There are two collector-brushes 16 and 17 on the circumference of the drum 5, each located on an axle 20 in insulated bearings, one of which, 16, is in electric connection with the wire 18, conducting the current into the apparatus, and the other, 17, with the wire 19, conducting the current out of the apparatus.

The back of the drum 5 is provided with a spiral groove 21, Figs. 3 and 4, which can move radially, by means of a catch-pin 22, a sleeve 23, which is placed on a quadrangular guide-piece 24, fastened on the sleeve 11. Thereby the drum 5 can be stopped after a certain number of revolutions, as the catch-pin 22, arriving at the outer end of the spiral groove 21, stops the drum 5. The length of

the spiral groove is such that when the drum 5 is thus stopped by the catch-pin 22 the brushes 16 and 17 must each be on one of the insulating-strips 8 of the drum, so that the circuit is broken. The consumer is therefore obliged to keep the apparatus continually going if he wishes to obtain current. Of course in order to effect this the spring-box 1 of the clockwork mechanism must be capable of keeping it going at least until the drum 5 has been stopped by the catch-pin 22.

By turning the winding-shaft 6 not only the spring 7 but also the spring of the box 1 of the clockwork can be wound up by means of the chain mechanism 27, while the winding-shaft 6 is prevented from turning backward by the ratchet-wheel 25 and catch 26. As the clock-spring is wound up at the same time as the spring 7 of the switch-drum, naturally a standing still of the clockwork is prevented.

In order to be able to read off the quantity of current required directly on the apparatus, it is provided with an hour-meter. In the case of the apparatus there is an electromagnet 28, the coil-winding of which is supplied with current by a branch wire 29, and the core 32 of which, being under the influence of a spring 31, is drawn into the magnet-coil as soon as current flows through the winding of the electromagnet 28. On the top of the core 32 rests one end of an arm 40, supported on a shaft 33 and limited in its downward movement by an adjustable stop-screw 34. This shaft 33 carries, by means of an arm 38, a gear 35 36, which, on the one hand, is in engagement with the meter mechanism and, on the other hand, can be placed in engagement with a wheel of the clock mechanism by lowering the arm 40, so that in this manner the meter mechanism is worked from the clock mechanism.

The method of operation of the apparatus described is as follows: Fig. 2 shows the apparatus in a deenergized condition. The clock mechanism of the apparatus is supposed going and a releasing-pin 4 of the disk 2 has passed the arm 14 of the two-detent lever 12 and the switch-drum 5 has taken the position shown in Fig. 2, in which the brushes 16 and 17 are each on an insulating-strip of the drum 5, so that the current coming from the conductor 18 into the conductor 19 is cut off. A tooth of the escape-wheel 10 is kept pressed by the spring 7 against the arm *a* of the two-detent lever 12 through the medium of the drum 5. While this lever-arm is in engagement with the tothing of the escape-wheel under pressure of the spring 26, the other arm of the lever 12, on the contrary, is out of the engagement therewith. As no current flows through the apparatus, the mechanism of the meter is cut out and remains at rest. The apparatus remains deenergized and the consumer obtains no more current until the next releasing-pin 4 on the disk 2, continuously

revolved by the clockwork, strikes against the arm 14 of the lever 12, which hereby is turned in the direction of the arrow *x*, so that its arm *a* is brought out of engagement with the tothing of the escape-wheel 10, at the same time bringing the other arm *b* into engagement with the tothing of the escape-wheel 10. Under the influence of the coiled spring 7 a tooth of the escape-wheel slips under the arm *a*. The escape-wheel remains, however, held by means of the arm *b* of the lever until the releasing-pin 4 leaves the top of the arm 14 and the lever 12 is replaced by means of the spring 26 in the position illustrated in Fig. 2, in which the next tooth of the escape-wheel is pressed against the arm *a* of the lever 12. The escape-wheel therefore only advances one tooth. By this the brushes 16 and 17 are passed on from the insulating-strips 8 to conducting parts of the drum's circumference, so that the circuit is closed and the current coming from the conductor 18 can take its way through the drum 5 again. At the same time as the closing of the circuit the core 32 is drawn into the coil of the electromagnet 28, so that the gear 35 36 is brought into engagement with the clock mechanism in consequence of the lowering of the arm 40 and the mechanism of the hour-meter is actuated. The circuit remains closed until another releasing-pin 4 of the disk 2 effects the release of the drum 5 and the escape-wheel again springs forward a tooth, &c. The spring 7 gradually uncoils until at last the drum 5 is stopped by the catch-pin 22, which is guided in its spiral groove 21 and arrives at the outside end thereof. In consequence of this the collector-brushes 16 and 17, owing to the suitably-proportioned spiral groove 21, stop on the insulating-strips 8 of the drum 5, breaking the circuit. The current consumer is thus forced to wind up the spring 7 when he wishes to obtain current. Consequently the clockwork, which has not yet run down completely, is also wound up again by means of the chain mechanism 27.

The releasing-pins 4 are inserted as occasion requires in the respective holes of the disk 2, which performs one entire revolution per twenty-four hours. In the form of the construction illustrated this disk has twenty-four holes, corresponding to the number of hours of one day and night.

Such an apparatus inserted, for instance, in the main-line circuit of a consumer using it for power and light will automatically cut off the power-current at a certain period of the time and reinstate it automatically at a predetermined period, so that the current at disposal within this period can only be applied to illuminating purposes. Moreover, by means of this apparatus the supply of current can be charged to the consumer on the basis of a different price for power and light and, respectively, in an easier and more satisfactory

manner both for the seller and the consumer, as in each apparatus by means of the hour-meter connected therewith the quantity of current delivered and used for a certain purpose can be directly read off.

It is obvious that in the apparatus described, by the fact that the switch-drum breaks contact onto insulating-strips instead of in the air (as in some switch apparatus) when breaking the circuit, the formation of sparks is diminished. In order to suppress these entirely, however, it is preferable to join the apparatus to the main line in the manner shown in Figs. 5 and 6.

In contradistinction to the mounting above described in this arrangement the drum 5 is deenergized in normal working, while the collector-brushes 16 and 17 are joined to the main line by means of branch wires 41 at the terminals 42 and 43 on the wires 44 and 45 of the main-current line and the drum is set in shunt-circuit. In normal working the brushes 16 and 17 rest on insulating-strips 8 of the drum 5, so that the shunt-circuit is broken. There is, moreover, in the apparatus a safety-fuse 46 interpolated in the main-line circuit, and this contains also an ordinary hand contact-breaker 47, in this case bipolar. As will be seen in this mounting, the current arrives in normal working from the source of current following the conducting-wire 44 through the terminal 48, contact-piece 49 of the contact-breaker 47, the one strip 46 of the safety-fuse, and terminal 42 to the place of consumption—to a motor, for instance—and from there through the other wire 45 through terminal 43, the other strip 46 of the safety-fuse, the contact 50 of the contact-breaker 47, and terminal 51 back to the source of current. No current can flow through the drum, as the collector-brushes 16 and 17 stand on insulated strips 8 thereof. If the drum is released by means of the clock mechanism, as described above, the brushes 16 and 17 slide onto conducting material of the drum, and consequently effect the short circuit. The current takes, therefore, the shorter and more convenient path through the drum and immediately increases, so that the safety-fuse 46 is melted and the main-line circuit is interrupted.

In order to put in a fresh safety-fuse and make the apparatus again ready for use, the contact-breaker 47 must be opened; otherwise short circuit would again occur. In the next partial revolution of the drum produced by the clock mechanism the brushes run again onto insulating-strips 8, which causes the breaking of the shunt-circuit. Immediately after this movement of the drum the consumer has to close the contact-breaker 47 again in proportion to the current he wishes to obtain, and the current again takes its course, as stated above, without flowing through the apparatus. By this system of mounting the apparatus properly works even

with powerful current entirely sparkless, as the sparking is localized in the safety-fuse.

What I claim is—

1. Switch apparatus for electric current-distributing circuits operating automatically at predetermined periods, comprising a disk revolved by clockwork, releasing-pins capable of being interchangeably attached thereto, a rotatively-mounted switch-drum of electrically-conducting material capable of being moved under the influence of a source of power, strips of insulating material counter-sunk in the periphery of the said drum at regular intervals, an escape-wheel firmly connected to the drum, an oscillating lever with two detents, capable of being operated by the releasing-pins, which detents cooperate with the teeth of the escape-wheel to cause the intermittent advance of the drum and collecting-brushes resting upon the periphery of the drum, which brushes effect in contact with the drum alternately the interruption and the closing of the main current-circuit.

2. In a switch apparatus for electric current-distributing circuits operating automatically at predetermined periods, the combination of a disk revolved by clockwork, detachable releasing-pins thereto, a rotatively-mounted switch device constructed of electrically-conducting material with insulating-strips, and being under the influence of a source of power, an escape-wheel connected with the said device, an oscillating two-detent lever cooperating with the said escape-wheel and sliding contacts operating together with the switch device, with an upwardly-directed arm on the said oscillating two-detent lever, which arm is adjustable in length for an exact regulation of the actuation of the said lever by means of the releasing-pins.

3. In a switch apparatus for electric current-distributing circuits operating automatically at predetermined periods, the combination of a rotatively-mounted switch device periodically released by a clockwork, and capable of being intermittently moved under the influence of a source of power and of sliding contacts cooperating with the said device, with a spiral groove on the said switch device of a suitably-determined length, a radial guide-piece fastened upon the shaft thereof, and a catch-pin movable thereon, which pin penetrates in the spiral groove and is devised to stop the said switch device after a number of revolutions corresponding to the length of the spiral groove into such a position that the main current-circuit is interrupted.

4. In a switch apparatus for electric current-distributing circuits operating automatically at predetermined periods, the combination of a rotatively-mounted switch device periodically released by a clockwork, and capable of being intermittently moved under the influence of a source of power and of sliding contacts cooperating with the said device, with a chain-gear for connecting the shaft of the

said switch device with the spring-box of the clockwork, for the purpose of insuring that the clockwork must be wound up simultaneously with the switch device.

- 5 5. In a switch apparatus for electric current-distributing circuits operating automatically at predetermined periods, the combination of a rotatively-mounted switch device periodically released by a clockwork, and capable of being intermittently moved under the
10 influence of a source of power and of sliding contacts cooperating with the said device, with an hour-meter, an intermediate wheel-gear, which transmits the motion from the clock-
15 work to the wheels of the meter, a pivoted arm supporting the said intermediate gear and an electromagnet, whose winding is connected to the current-circuit, and the movable core of which stands under spring-pressure and supports the aforesaid arm, for the
20 purpose by the displacement of the said arm (under the influence of the electromagnet) of simultaneously with the current-circuit closing connecting the intermediate gear to the
25 clockwork of the apparatus.

6. In a switch apparatus for electric current-distributing circuits operating automat-

ically at predetermined periods, the combination with a rotatively-mounted switch device of electrically-conducting material with
30 insulating-strips, the said device being adapted to be periodically released by a clockwork and to be moved intermittently under the influence of a source of power, and of sliding
35 contacts cooperating with the said switch device, with a safety-fuse and an ordinary contact-breaker, both inserted in the main current-circuit in front of the apparatus, and shunting-wires from the main line to the said
40 sliding contacts, this arrangement allowing the said contacts to pass for breaking the main current-line by short-circuit and fusion
45 of the safety-fuse from insulating-strips of the switch device to conducting parts thereof and thus preventing sparks on the switching motion of the said switch device.

In witness whereof I have hereunto signed my name, this 10th day of November, 1899, in the presence of two subscribing witnesses.

THEODOR ALLEMANN.

Witnesses:

GEORGE GIFFORD,
AMAND RITTER.