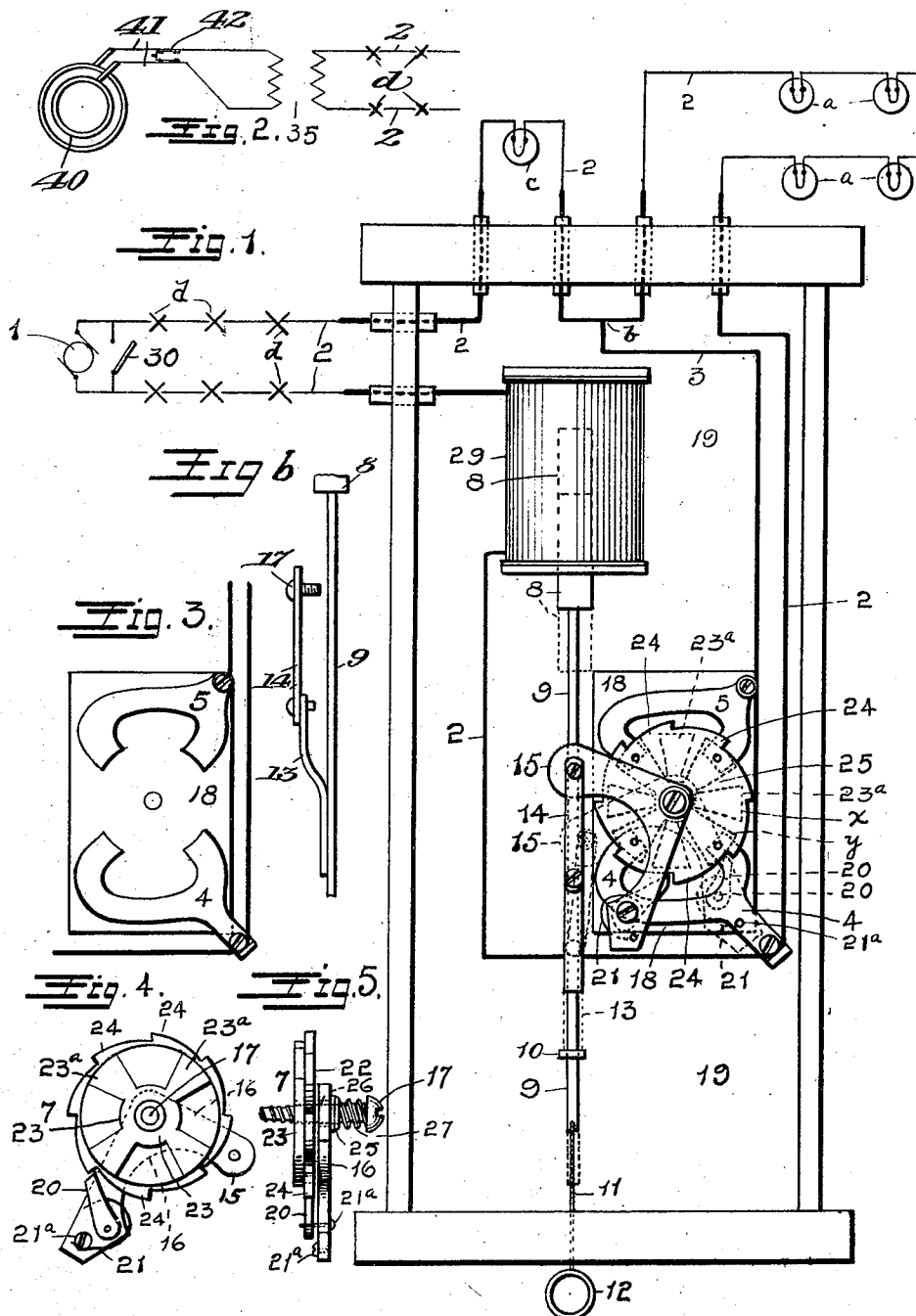


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 APPARATUS FOR CONTROLLING ELECTRIC LIGHT SYSTEMS.
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WITNESSES:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CONTROLLING ELECTRIC-LIGHT SYSTEMS.

1,058,986.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALFRED W. KNUTSON, a citizen of the United States, and a resident of Galesburg, in the county of Knox and State of Illinois, have invented a new and useful Apparatus for Controlling Electric-Light Systems, of which the following is a specification.

The invention has relation to systems in which it is desirable, for various and obvious purposes, to cut out or shut off a portion of the lamps in a circuit, and while it pertains and is applicable to either series or multiple systems, and to systems other than street lighting, it is purposed primarily for that style of lighting arrangement commonly termed the "boulevard system", in which clusters of lamps are maintained in spaced groups. In the use of this system it is generally desirable to cut out a portion of the lights about the middle of the night, leaving a single lamp of each cluster alight. In order to cut out said lamps it has heretofore been necessary for some person, usually a patrolman, to throw a switch at each cluster-support or pole. It will be obvious that this was but an indifferent expedient, inasmuch as the clusters being some distance apart, and there frequently being a large number thereof, each of which required a separate actuation, simultaneous shutting out of the lights was not attained, but such operations were drawn out to an extended period of time, and the object being primarily to save expense said object was to a great extent nullified. Again, as heretofore constructed, two wires were required in series lighting while three were essential in a multiple system.

It is an object of my invention to provide a means for cutting out a predetermined portion of the lamps in a circuit, (leaving others burning,) simultaneously and from a single point.

It is a further object to accomplish this operation by means actuated by the current.

It is also an object to accomplish the first recited object without resultant sparking or flashing and resultant injury to the parts.

It is one of the most important objects to change the path of the current while no current is flowing, thus positively eliminating all possible danger of sparking or flashing.

It is a still further object to save approxi-

mately one-half the wire heretofore used in series and one-third of that employed in multiple systems.

Other objects will be in part obvious and in part pointed out.

In order that my invention may be fully understood and successfully carried into effect I have in the accompanying drawings illustrated a preferred means embodying it and for carrying it out.

In said drawings:—Figure 1 is a plan view, showing a direct constant current series system, a portion of the lamps shown as lighted and another portion out; Fig. 2, a modification, showing a fragment of an alternating constant current series system; Fig. 3, a plan, showing a portion of the commutator; Fig. 4, an inverted plan of the other portion of the commutator; Fig. 5, an edge elevation of the parts shown at Fig. 4; and Fig. 6, a detail, showing the connections, in side elevation, between the solenoid core and the switch member.

The same reference character refers to the same part in the different figures of the drawing.

1 denotes a direct constant current generator to which is connected the series circuit wire, which, for the purposes hereof, I shall designate as being composed of two parts, 2 and 3, the former connected to a solenoid or magnet coil 29 comprising a plurality of convolutions of wire of suitable size connected in the circuit to a series system. The wire 2 leads from the solenoid to a contact segment 4, thence through a cluster of lamps *a*, thence through a union *b*, thence through a single lamp *c*, thence through lamps *d*, and thence back to the generator to complete one loop of the circuit. It will of course be apparent that this arrangement and disposition is optional and that it may be altered to suit any location or condition. The wire 3 leads from the union *b* to another contact segment 5 adapted for electric connection with the segment 4 by interposed means 7, see Figs. 3 and 4. For the purposes of this specification I shall term this the main circuit when connected by the contact wheel presently described. A wire extending from the union *b*, taking in the cluster *a* and running thence to the contact segment 4, comprises a loop which I shall term the auxiliary circuit.

To the solenoid core 8 is fixed a rod or plunger 9 which passes through a guide 10 and supports at its lower end a cord 11 to which is secured a ring 12 whereby it may be manually actuated when the current is on. Suitably secured to the plunger 9, by soldering or otherwise, is a projection 13, to the free end of which is pivotally connected a link 14 the other end of which is in like manner connected with the power arm 15 of a fiber bell-crank lever 16 by means of a pivot screw 17, the threads of which engage those of a fiber plate 18 fixed on any suitable backing or base 19. To the under side of the weight arm 16^a of said lever is pivoted a pawl 20 actuated by a bent spring 21 fixed at one end by a rivet-screw 21^a to and near the extremity of the same lever-arm, its free end passed through an aperture in said pawl.

22 denotes a ratchet-wheel of fiber, into the lower face of which is embedded a metallic star-wheel 23, the contact spokes 23^a of which are "timed" with relation to the ratchets 24 of the wheel 22, preferably in the ratio of 2 to 1.

A washer 25 having a collar or hub 26, the latter seated in the centrally disposed aperture in the lever, supports one end of an expansion spring 27 the other end of which takes against and resists the head of the pivot-screw or screw bolt 17 which passes also through the centrally disposed aperture in the wheels 22 and 23.

Any other insulating material than fiber may be substituted for those parts so herein designated.

In Fig. 2 I have shown an alternating current motor 40, wires 41 41 connecting it with a switch 42, a transformer 35, and the wires 2 and lamps *d* hereinbefore described. The illustration is for the purpose of showing the adaptation of my improvements to an alternating system.

Various changes may be made in the mechanical construction and arrangement without departing materially from the general spirit and scope of the invention.

Now suppose the parts to be in the relative positions shown in Fig. 1. The operator by imparting movement in one direction to the hand lever of the field switch 30 would shut off the current, thus demagnetizing or deenergizing the coils 8, permitting the core and plunger to fall by their own gravity, or by the action of a spring, not shown, imparting a one-eighth revolution to the ratchet-wheel, through the instrumentality of the lever, and removing the spokes from contact with the segments 4 and 5, as shown by the dot line position 2, Fig. 1, thus throwing the parts into position for the reception of the current through the wire 2, but not elsewhere, but no current flowing. By reversing the direction of

movement of the hand-lever, throwing the current into the circuit and energizing the coil, the magnetic action of the latter will act on the core 8 to draw it upwardly and place the bell-crank lever and pawl into position to actuate the wheel and thereby the contact spokes. The current being now in action, or flowing, and the circuit 2 last described not having been disturbed by the last movement of the actuating parts, all the lamps will be lighted thereby. It being now desirable to cut the current off to deenergize the entire circuit, the operator will impart movement to the switch 30 in a direction reverse to that last described thus deenergizing the coil and permitting the core to fall, thus again imparting a one-eighth revolution to the wheels and placing the parts in the position shown by the dotted lines *y*, Fig. 1, ready for actuation of the switch lever, and all the lights out, inasmuch as the current is entirely cut off from both circuits. On again reversing the direction of movement of the switch-lever, thus turning on the current, the coil being again energized will attract the core 8 and the latter will in rising not disturb the position of the wheel, the contact spokes of which being in contact with the segments 4 and 5 will permit the current to flow therethrough. In other words, the current seeking the path of least resistance, will not follow the wire 2 because of the resistance offered by the cluster of lamps *a* thereon, but will be shunted by the commutator through the wire 3 or main circuit, thus cutting out the aforesaid cluster of the auxiliary circuit but permitting the light *c* to remain in the circuit and to burn.

The first and second movements herein described of the actuating switch at the power station, (or other suitable place,) as well as the third and fourth, are performed at one practically instantaneous movement of the lever thereof, the time elapsing between said movements being so minute that the dark period is imperceptible.

No attention has been herein paid to the lamps *d*, they having been illustrated merely to show that lamps placed elsewhere on the circuit than where shown would not interfere with the practical and successful operation of my invention. It may be stated however, that each of the light-symbols *d* indicates a cluster of lamps, which may be placed selectively in the circuit and my improvements applied thereto.

The operation of the means shown at Fig. 2 will be the same as that above described. Mechanical and structural changes which are well known to those skilled in the art will be all that is required to make the substitution, one for the other.

The National Board of Underwriters, in its "installation rules", prohibits the use of

"multiple-series or series-multiple systems of lighting". This is because of the danger caused by sparking and flashing. It will be evident from the foregoing description that 5 in my apparatus the pathway of the electrical current is changed while there is no current on, or while the wires are dead, and that there is, therefore, no sparking and flashing such as is present in all prior devices of this character, and further evident 10 that its use will cause either abrogation or modification of said rule.

It is not essential that the herein set forth methods of actuating the mechanism shown 15 shall begin with the operation first therein stated, inasmuch as they may begin when a single lamp is burning, when all are burning, or when all are out.

I claim as my invention:

20 1. In means of the character described, a plurality of circuits, a source of electric supply, a switch, a magnetic coil adapted to be alternately energized and deenergized by alternate actuations of said switch, a solenoid 25 core adapted for actuation in one direction by attraction of said coil when the

latter is energized and in the contrary direction by gravity, and a revoluble commutator actuatable by the said core in its falling movement, but not actuatable when the 30 core is being attracted or is attracted, whereby the path of the current is changed from one to the other of said circuits while no current is flowing.

2. In combination with a plurality of circuits, a solenoid, a solenoid core, a plunger 35 secured thereto, a link actuated by said plunger, a pivoted lever actuatable by said link, a spring-actuated pawl pivoted to said lever and adapted to receive movements 40 therefrom, an insulated ratchet-wheel actuatable in one direction by said pawl, a metallic contact-wheel fixed to said ratchet-wheel, and a base on which said wheels and 45 lever are pivotally mounted.

In testimony that I claim the foregoing as my invention I hereto affix my signature in presence of two subscribing witnesses.

ALFRED W. KNUTSON.

Witnesses:

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