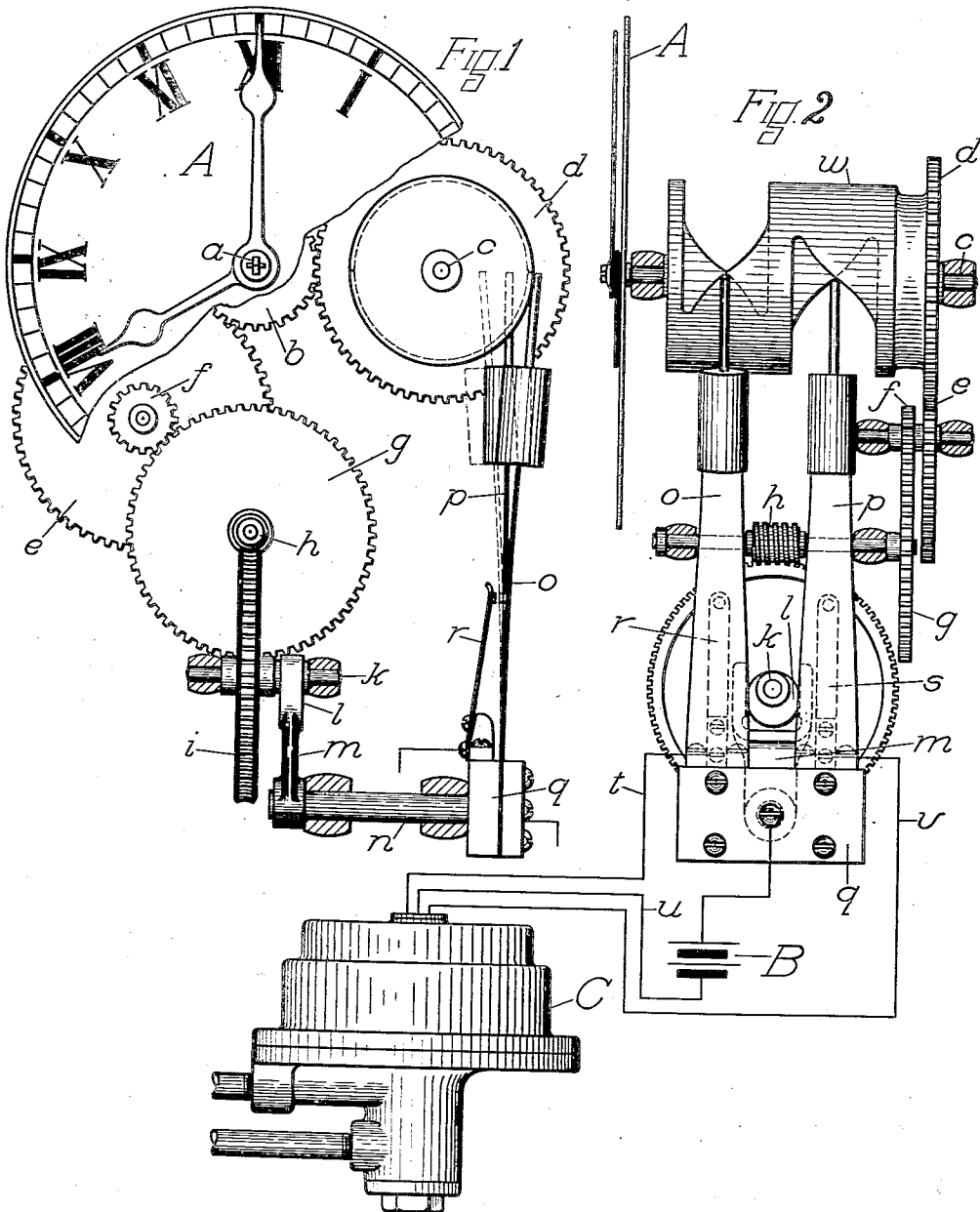


H. E. WARREN.
 AUTOMATIC TIME LIGHTING MECHANISM.
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1,158,397.

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WITNESSES:
 Florence A. Collins
 Charles S. Wiskey

INVENTOR.
 Henry E. Warren,
 BY
 Ruben L. Roberts,
 ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY E. WARREN, OF ASHLAND, MASSACHUSETTS, ASSIGNOR TO THE LOMBARD GOVERNOR COMPANY, OF ASHLAND, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

AUTOMATIC TIME LIGHTING MECHANISM.

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Specification of Letters Patent.

Patented Oct. 26, 1915.

Application filed March 7, 1913. Serial No. 752,653.

To all whom it may concern:

Be it known that I, HENRY E. WARREN, a citizen of the United States of America, and resident of Ashland, in the county of Middlesex and Commonwealth of Massachusetts, have invented Improvements in Automatic Time Lighting Mechanism, of which the following is a specification.

This invention pertains to improvements in automatic timing devices, especially clocks for gas and electric lighting.

It is a well known fact that the time of sunrise and sunset varies from day to day throughout the year, the rate of change being very considerable during certain seasons. The clocks which are constructed to light and extinguish illuminating devices at the same hour each day require very frequent correction, in order to follow an ordinary light schedule. Likewise, clocks which vary the lighting time at a uniform rate, that is to say, those which light at a certain number of minutes earlier and extinguish at a certain number of minutes later each day, or vice versa, are hardly better than those which run at a uniform rate, for the reason that the rate of change throughout the year is constantly varying, following approximately a sinusoidal curve. Such clocks need frequent adjustment in order to correspond with the correct lighting schedule. In order to overcome the objectionable features of previous mechanism of this type, I have devised a clock mechanism which changes the time of lighting and extinguishing according to a yearly cycle or any other predetermined arrangement which can be made to correspond with an ordinary lighting schedule so that the light shall be turned on and off each night throughout the year at the most effective time, and thereby give the best service with the least consumption of the lighting agent.

A convenient form of my invention is shown in front and side elevation in Figure 1 and Fig. 2, respectively; and the parts shown are constructed and arranged to operate according to a yearly cycle, as the most comprehensive.

Referring to the drawings, the central shaft *a* for clock A carries gear *b* which rotates twice in twenty-four hours, and which drives a secondary shaft *c* through gear *d* so as to revolve once in twenty-four hours. *b* also, through a train of gears *e*, *f* and *g*

and a worm *h* and worm wheel *i*, drives another shaft *k*, which revolves once each year. Upon the shaft *k* is mounted an eccentric *l*, which oscillates a rocker arm *m* through a small angle. *m* is connected through a shaft *n* to a device consisting of two weighted vibratile reeds *o* and *p*, which are clamped firmly at their lower ends to a support *q*, which rocks with the shaft *n*. Upon the shaft *c* is mounted a double cylindrical cam *w*, the operating surfaces of which are of three dimensions and engage the upper ends of the reeds *o* and *p*. Contact points *r* and *s* respectively in circuit with a battery, but insulated from the support *q*, are arranged with respect to the reeds *o* and *p* so that when the reeds are in their central vertical position they are out of contact with *r* and *s*, but if the reeds are caused to vibrate, they pass sufficiently far beyond their central position so as to make repeated momentary contacts with *r* or *s*. In circuit with the two reeds and their contact points are a battery B and an electromagnetic valve C, the arrangement of the wires being such that when *o* makes contact with *r*, current will flow from the battery B through *o*, into *r*, thence through *t* to the valve C, and back again through *u* to the battery B, thus actuating the valve in one direction; and when *p* comes into contact with *s*, current will flow from the battery through *p* into *s*, thence through *v* into the valve C, and back again to the battery through *u*, thus actuating the valve in the opposite direction.

In the operation of this improved mechanism the daily rotation of the cam *w* holds back the vibratile reeds *o* and *p* for about one half the time each day, and suddenly releases one at a time as the cut-away portion of the cam-cylinder passes up beyond the upper extremity of the vibrating reeds. In Fig. 2, reed *p* has just been released. In the act of releasing, the reed vibrates very strongly for a number of oscillations, due to the energy stored up in the elastic material when it was bent back by the cam-cylinder. In the act of vibrating, contact is made as described above, and the valve C actuated. The relation of the cut surfaces on the cam *w* is such that the reed which is released at about sunset, causes lighting of gas or electric lights, or some equivalent performance through the mechanism in C, while the next reed *o* it not released until it is time for the

lights to be extinguished. If the shaft n remained stationary, the act of lighting and extinguishing would occur at the same time each day, but on account of the yearly cycle of motion of shaft n , the upper ends of the reeds o and p are swept through the arc of a circle across the face of the cam-cylinder w , so that the times of release of each reed and of one reed with respect to the other, are constantly varying. In this manner it is possible to so construct the cam surface of the cylinder w that the lighting and extinguishing times shall follow a standard lighting schedule, whether corresponding to the rising and setting of the sun, or any other predetermined periods as may be desired.

The cam surfaces may be described as consisting of a series of elements or elementary sections indicated by the path traversed by the contact point of the said reeds each day.

It will be observed that this device is especially economical in the use of electricity, for the reason that the electrical circuit is never closed except momentarily, the mechanism in the valve C being of such a nature that it performs its functions properly under such conditions.

An important advantage of the mechanism herein described, is that through the action of the vibrating reeds a number of recurring electrical impulses are sent out at the time of lighting, also at the time of extinguishing; these recurring impulses being well adapted to produce especially reliable operation of suitable valve mechanism, and also being adapted to generate a lighting spark through the interposition of a suitable induction coil, thus avoiding the necessity of a pilot light.

It is evident that the mechanism herein described could be utilized, although less conveniently, to operate a valve or equivalent device without the use of electricity, because the vibrating reeds o and p might act by direct pressure upon the valve or valve operating mechanism instead of the contact points r and s .

Although the device described is arranged to operate over a yearly cycle, it is obviously as useful for other purposes and is equally well adapted to operate over a shorter or longer cycle.

I claim:

1. In an apparatus for automatic operation at predetermined time intervals, a cam formed in three dimensions, a follower, adapted to move to-and-fro by its contact with an elementary section of the cam, a clock, and means actuated by the clock to move the follower across the several elementary sections of the cam.

2. In an apparatus for automatic operation at predetermined time intervals, a

clock, three dimensional cam surfaces which receive complete daily rotation therefrom, and a follower for the various surfaces, each of which is moved by the clock in the direction of one dimension of its operating cam.

3. In an apparatus for automatically operating electric actuators at predetermined time intervals, a clock, a vibratory contact maker normally in open circuit position, means actuated by the clock to impart potential energy to the vibratory contact without closing the electric circuit and to suddenly release said contact maker and cause it to vibrate and make periodic contacts during the interval of dissipation of its imparted energy.

4. In an apparatus for automatic operation at predetermined time intervals, a clock, cam surfaces rotated thereby, a follower for each cam which is moved in one direction thereby to impart energy thereto and then suddenly released, and means to utilize the energy of the followers when released, to close and open an electric circuit.

5. In an apparatus for automatically operating electric actuators, at predetermined time intervals, a clock, cam surfaces rotated thereby, a follower for the cam surfaces, which is thereby slowly moved in one direction to impart potential energy thereto and suddenly released, means to utilize the energy thus imparted to the followers when released, to close and open an electric circuit successively for a limited period.

6. In an apparatus for automatically operating electric actuators at predetermined time intervals, a clock, three-dimensional cam surfaces which receive motion therefrom, a vibratory device for each cam which is given potential energy by the action of the cam, and expends such energy when suddenly released, in successively closing and opening an electric circuit during a limited period.

7. In an apparatus for automatically operating electric actuators at predetermined intervals, a clock, at least one vibratory device normally at rest, means by which the clock may force the vibratory devices from their position of rest and suddenly release them at predetermined times, and means by which the energy of vibration of said devices is utilized to close and open an electric circuit successively at intervals during their period of vibration.

8. In an apparatus for automatically operating electric actuators at predetermined intervals, a clock, a plurality of electric circuits, a vibratory device normally at rest connected with each circuit, means by which the clock may force the vibratory devices from their position of rest and suddenly release them at predetermined times, and means by which the energy of vibration of said devices is utilized to close and open the

electric circuits successively at intervals during the period of vibration of each device.

9. In an apparatus for automatically operating actuating devices, a clock, a plurality of cam surfaces, each composed of a series of juxtaposed elementary sections corresponding to the desired diurnal path of actuating electrical contacts which are operated by the clock, electric circuits having vibratory contact devices connected therewith normally at rest, and adapted to be forced

from such position by said cam surfaces and then suddenly released at predetermined times, and means by which the vibration of said devices will close and open the electric circuits at intervals during the periods of vibration of each device. 15

HENRY E. WARREN.

Witnesses:

FLORENCE A. COLLINS,
JOSEPHINE H. RYAN.