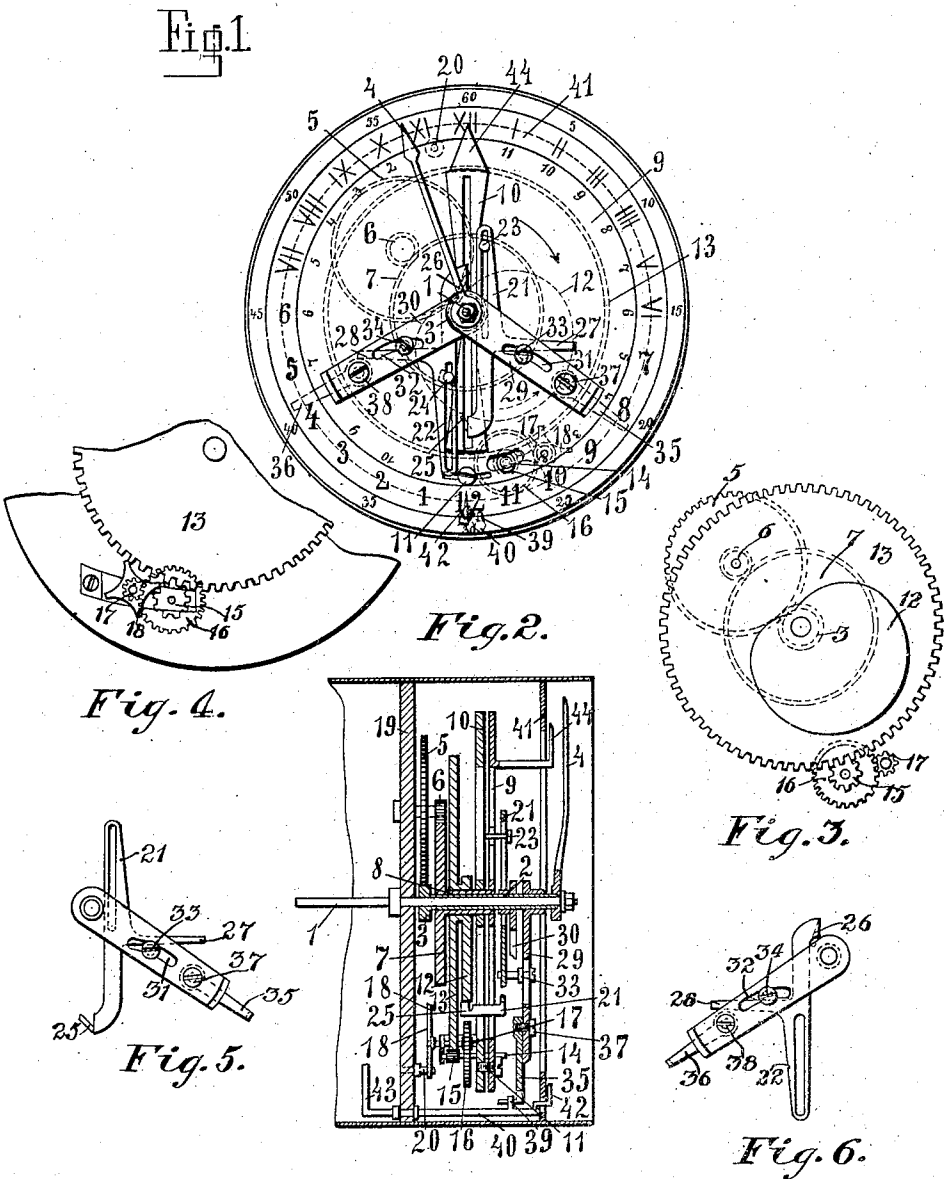


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ARRANGEMENT FOR AUTOMATICALLY LIGHTING AND EXTINGUISHING LAMPS AND THE LIKE.
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UNITED STATES PATENT OFFICE.

MAGNUS VILHELM BRÖNDUM, OF AARHUS, DENMARK.

ARRANGEMENT FOR AUTOMATICALLY LIGHTING AND EXTINGUISHING LAMPS AND THE LIKE.

1,053,004.

Specification of Letters Patent.

Patented Feb. 11, 1913.

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To all whom it may concern:

Be it known that I, MAGNUS VILHELM BRÖNDUM, engineer, a subject of the King of Denmark, residing at Aarhus, Denmark, have invented certain new and useful improvements in Arrangements for Automatically Lighting and Extinguishing Lamps and the Like, of which the following is a specification.

The present invention refers to an arrangement for automatically lighting and extinguishing lighting fixtures at predetermined times, the releasing apparatus being regulated automatically according to the length of the day,—the latter feature being considered as a known one.

In the accompanying drawing a mode of carrying out the invention is exemplified, Figure 1 being a front view of the arrangement, and Fig. 2 giving a longitudinal section through the same, Figs. 3-6 giving any details.

The shaft 1 is driven by say a clockwork in the direction of the arrow in known manner so that it makes one revolution in an hour. The same as in other clockworks on shaft 1 a sleeve 2 is fitted, which carries a toothed wheel 3 and a hand 4. Sleeve 2 is clamped to shaft 1, so that the hand attached to said sleeve will likewise make one revolution in an hour. The toothed wheel 3 is coupled by means of the intermediate gears 5 and 6 with wheel 7, the ratio of the transmission being such, that this wheel completes one revolution in twenty-four hours. Wheel 7 is coupled rigidly with the forward disk 9 by means of a rigid sleeve 8, so that said disk will also complete one revolution per day.

On sleeve 8 turns loosely a disk 10, which is carried along by the disk 9 in front of it by means of a screw 11. Behind disk 10 an eccentric 12 is arranged loose on sleeve 8, but rigidly coupled with the toothed wheel 13. The latter again is coupled by means of the two intermediate gears 15 and 16, which are fitted on the shaft 14 attached to disk 10, with the gear wheel 17 likewise arranged on disk 10, and the shaft of which carries a cam-wheel 18. The eccentric 12 is thus driven from the disk 10.

On the forward side of the rigid partition 19 is arranged a pin 20 (shown in Fig.

2 below by dotted lines) which pin projects so far, that the cam-wheel 18 will strike against it with its cams and will be turned so far that at the next passage the other cam will engage therewith.

On the front of disk 9 two slides 21 and 22 are adjustable in a rectilinear manner, the one end of which slides is guided by means of a slot on pins 23 and 24 respectively fitted in disk 10, the other ends being bent at right angles 25 and 26 respectively passing through slots provided in the disks 9 and 10 rest on the periphery of the eccentric 12 arranged behind disk 10. Each of the said slides 21 and 22 has an arm 27 and 28 respectively, which may be adjustable on its respective slide, these arms however being shown in the drawing as if made in one piece with the said slides.

In front of disk 9 and loose on sleeve 2 are arranged arms 29 and 30, said arms having slots 31 and 32 respectively in which pins 33 and 34 are adjustable by means of screws. These pins project toward inside so far, that they are carried along by the arms 27 and 28 of the slides 21. The arms 29 and 30 are made of two parts, so that their outer sections 35 and 36 swivel around the coupling screws 37 and 38. These outward sections are bent over inward, so that on the arms 29 and 30 revolving, they will move the lever 39 and thereby turn the shaft 40, the front set off end of which is guided in the dial-flange 41 and fitted with a hand 42. The other end of this shaft penetrates the rigid partition 19 and terminates in the release lever 43.

The disk 9 completing its revolution once every twenty four hours carries a hand 44, projecting over the dial-flange 41 and also longer and wider radial slots than the loose disk 10 behind it and also a slot parallel to its periphery, in which slot moves the screw 11 coupling the two disks.

The new arrangement operates as follows: When shaft 1 is revolved once in an hour, the hand 4 will likewise pass once around the flange-dial 41, and indicate the minutes, the same like a minute hand of a clock. The disk will complete one revolution in twenty four hours and indicate the hours with its hand 44, the same as the hour hand of a clock, if the flange-dial is provided

with a twenty four hour graduation. In Fig. 1 the Roman figures indicate the hours of the day, the Arabic figures those of the night. The clock in the drawing is showing the time as 11.57 a. m. Of the two arms 29 and 30, the arm 29 serves for lighting and arm 30 for extinguishing. The figures marked on disk 9 give under the lighting arm 29 the P. M. hours, and under the extinguishing arm 30 the A. M. hours. As shown in Fig. 1 the arrangement is set for lighting up at 3.35 p. m. and extinguishing at 7.50 a. m. If now the disk 9 and with it arms 29 and 30 are revolved, the lighting arm 29 will on the hand 44 reaching the time 3.35 p. m. turn the lever 39. By the thereby effected revolution of the shaft 40 the release lever 43 will in known manner release a spring, which will thereby open say a gas-valve, close an electric circuit or do some other work of the kind. When the hand 44 has advanced as far as the time 7.50 a. m. the extinguishing arm will by turning lever 39 cause the reverse action, so, say, the closing of the previously opened gas-valve. The four-pronged cam-wheel 18 will pass within every twenty four hours once the stationary pin 20 and be given by the same a quarter turn. The wheel 17 fitted on the shaft of the cam wheel 18 has 8 teeth and meshes with wheel 16 which has 38 teeth. The wheel 15 fitted together with wheel 16 on shaft 14 has 9 teeth and meshes with the wheel 13 attached to the eccentric 12, said wheel 13 having 173 teeth. By this gearing the eccentric will after

$$\frac{38}{2} \cdot \frac{173}{9} = 365.2$$

days complete one revolution to disk 10. At the same time, the slides 21 and 22 will carry out a reciprocating motion, by their ends 25 and 26 resting on the periphery of the eccentric, whereby the lighting and extinguishing arms are also given a corresponding travel over the disk 9.

The outward shape of the eccentric 12 is made according to the annual light diagram, so that the shortest radius vector corresponds with the shortest distance of the slides from the center, and the largest radius vector represents the largest distance of the slide ends from the center. The increase and decrease of the intermediate radii vectors during the daily rotation of the eccentric are of the same proportion to each other as the increase and decrease of the sine of the corresponding angles, which are inclosed by the release lever and an imaginary abscissa-axis at the daily movement, if the direction of movement of the slides form the direction of the ordinate-axis.

As the two slides contact with the periphery of the eccentric at opposite points, and are moved by the said eccentric, the arms

29 and 30 will receive a daily adjustment, which corresponds to the variation of the time of the sun-rise and sun-set. As however according to astronomical charts for the sun-rise and sun-set the time for the earliest lighting up is ahead of the time for the earliest extinguishing by one half year and three days, and the time for the latest lighting up is ahead of the time for the latest extinguishing by one half year and six days, the ends 25 and 26 of the slides 21 and 22 are bent slightly aside (cfr. Fig. 1 to the left), the end 25 however somewhat more than end 26, so that their points of contact with the eccentric are no more diametrical to each other in the line of the slots in disk 10. As the eccentric rotates according to the relation between disks 9 and 10 to each other, the suitable bending of the said ends 25 and 26 will have the consequence, that between the extreme outward position of the slide 21 (lighting up) and the extreme outward position of slide 22 (extinguishing) there lies a rotation of the eccentric equal to one half year and three days, and a rotation of one half year and six days between the innermost position of slide 21 (lighting up) and the innermost position of slide 22 (extinguishing).

If the pin 20 is fitted between the shaft 1 of the cam-wheel 18, and if the eccentric 12 shall turn like the hands of the clock to disk 9, the ends of the slides 25 and 26 must be bent to the right. As the new arrangement must release according to astronomical time, in order to work correctly at various places, and as there is a more or less great difference between ordinary time and astronomical time, the releasing mechanism has to be somewhat adjusted, said adjustment being effected in the present arrangement by loosening the screw 11 and advancing or returning the loose disk 10 together with the entire releasing mechanism with respect to the hour-disk 9, whereupon the screw 11 is again tightened after completion of such adjustment. Further adjustments with respect to the local lighting up and extinguishing time may be effected by loosening the screws 37 and 38 and moving the outer sections 35 and 36 of the releasing arms 29 and 30 forward or backward as may be, and thereupon again tightening the screws.

As the same days have varying lengths on different altitudes, longitudinal slots for the pins 33 and 34 are provided in the arms 29 and 30, so that after the respective screws have been loosened, the said pins may be set at greater or smaller distance from the center by adjusting them in the slots.

For northern altitudes the pins 33 and 34 should be moved toward the inside, for southern altitudes toward outside. The twilight lasts generally longer on the northern altitudes than on southern, wherefore

the slots are not arranged radially, but in a curved line, so that the lighting up arm 29 may be moved a suitable distance forward and the extinguishing arm correspondingly backward with relation to the other mechanism, when the pins 33 and 34 are moved toward the inside. By moving the pins 33 and 34 toward outside, the opposite adjustment is effected. If for instance in larger cities the lights are to be lighted earlier and extinguished later in the center of the city than in the suburbs, this may be effected by loosening screws 37 and 38 and moving the outer end of the lighting up arm 36 backward. If this adjustment were only done to the lighting up arm, only the lighting up time would be advanced, whereas the lights would be extinguished everywhere at the same time. If the arrangement is to light up at different times, but to extinguish at a given hour, say mid-night, the slide 22 is removed, and the extinguishing arm 30 is moved beyond 12, whereas the hand 44 would have to be fixed in another manner than shown in the drawing. The pin 34 of the extinguishing arm is then made so long, that it projects into a slot in disk 10, or disk 9 is provided with a rigid projection in the shape of the outward section 35 of the extinguishing arm.

If in lanterns with several burners all are to be lighted at the same time, but only part of the burners or all but one shall be extinguished at a given time, and this last one is to be extinguished at day-break, the arrangement is provided besides the movable arms 29 and 30 with a rigid projection at midnight, whereby three releases per day are obtained.

In order to allow of adjusting the eccentric according to the season, in which the arrangement is employed, first, the shaft 14 is extended in front, so that it projects beyond disk 9. At the end of this shaft is arranged a square end, on which a spanner can be fitted, and the shaft be thus positively turned. Thus the eccentric 12 can be moved forward or backward as may be required, and its position may be controlled through the slots in the disks 9 and 10 and by the position of the slides 27 and 28.

Should the releases have been exchanged, and say the lights be extinguished when they should be lighted, separate releases may be effected by turning the release shaft 40 and thereby obtaining the release in the proper sequel. The clockwork required to drive the arrangement is not shown nor described, as it may be considered as known. Also the engagement of the releasing lever 43 with the releasing gear has not been shown nor described, as such releasing gear may be made of any design, say like the striking mechanism of a clock.

Having now described my invention, what

I claim and desire to secure by Letters Patent of the United States is:

1. In an arrangement for automatically operating gas valves or the like at predetermined times, according to the sunrise and sundown, the provision of a rotatable twenty-four hour disk, slides adjustable thereon in a rectilinear direction, an eccentric for adjusting both slides simultaneously, a shaft journaled in the casing, a release lever attached to said shaft, arms controlling said release lever being actuated by the above-mentioned slides, a stationary stop, a train of gearing having a cam-wheel engaging with said stop, shafts for said train of gearing, a disk adapted for journaling therein the shafts of said gearing and coupled to the said twenty-four hour disk with relation to which a daily rotary motion is given to the said eccentric if said cam-wheel is turned by said stationary stop, substantially as set forth.

2. In an arrangement for automatically operating gas valves or the like at predetermined times according to the sunrise and sundown, the provision of a rotatable twenty-four hour disk, slides adjustable thereon in a rectilinear direction, an eccentric for adjusting both said slides simultaneously, a shaft journaled in the casing, a spring actuated release lever fastened to said shaft being fitted with a striking lever and a hand, arms controlling said striking lever and release lever being actuated by the above-mentioned slides, a stationary stop, a train of gearing having a cam-wheel engaging with said stop, shafts for said train of gearing, a disk fitted with a bracket, for journaling the shafts of said train of gearing, and a coupling pin adapted for adjustably connecting said disk to the said twenty-four hour disk, so that the difference between ordinary time and astronomical time at the various places can be compensated, substantially as set forth.

3. In an arrangement for automatically operating gas valves or the like at predetermined times according to the sunrise and sundown, the provision of a rotatable twenty-four hour disk, slides adjustable thereon, an eccentric for adjusting both said slides simultaneously, a shaft journaled in the casing, a spring-actuated release lever fastened to a loose shaft fitted with said hand and a striking lever being attached thereto, arms provided with stop-pins adjustably attached to curved slots thereof and adapted to work with said slides respectively, and fitted with inwardly bent end-pieces linked thereto respectively and adapted for controlling the release lever, a stationary stop, a train of gearing having a cam-wheel engaging with said stop, shafts for said train of gearing, a disk adapted for journaling therein the shafts of said train

of gearing coupled with the said eccentric,
and a screw pin adapted for adjustably
coupling said disk to the said twenty-four
hour disk in order to enable the compensa-
5 tion of the difference between ordinary time
and astronomical time at the various places,
substantially as set forth.

In testimony whereof I have hereunto set
my hand in the presence of two witnesses.

MAGNUS VILHELM BRÖNDUM.

Witnesses:

R. ORTWED,
PAUL HAMBURGER.