No. 868,297. PATENTED OCT. 15, 1907.

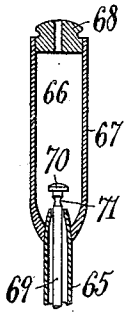
A. B. SHAW.

AUTOMATIC GAS LIGHTING AND EXTINGUISHING APPARATUS.

APPLICATION FILED APR. 16, 1906.

2 SHEETS—SHEET 1.

FIG. 10.



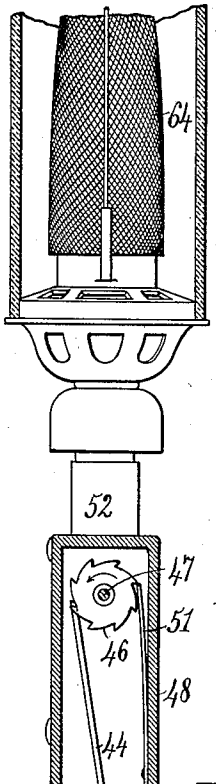
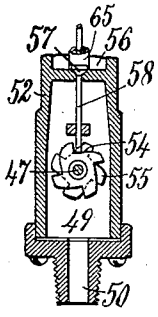


FIG. 9.



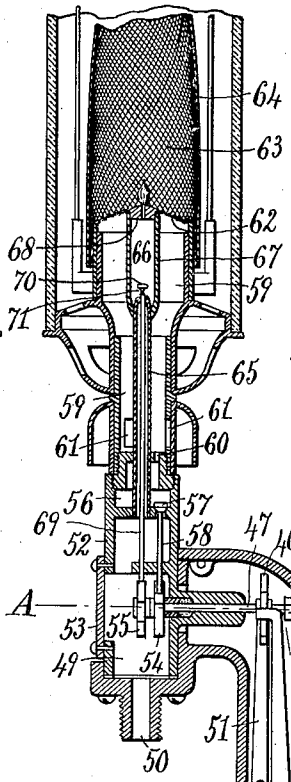


FIG. 11.

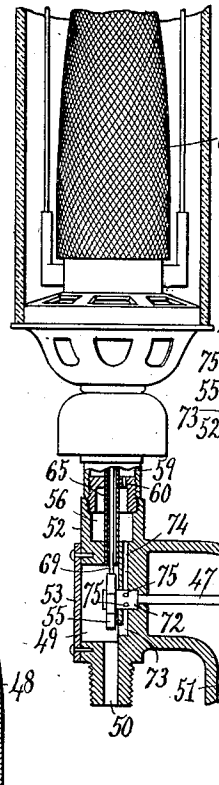


FIG. 12.

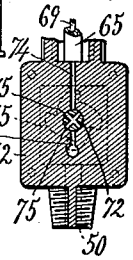


FIG. 1.

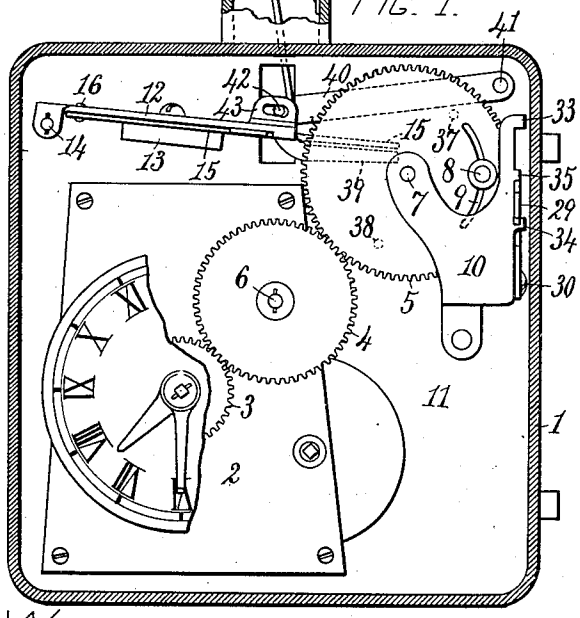
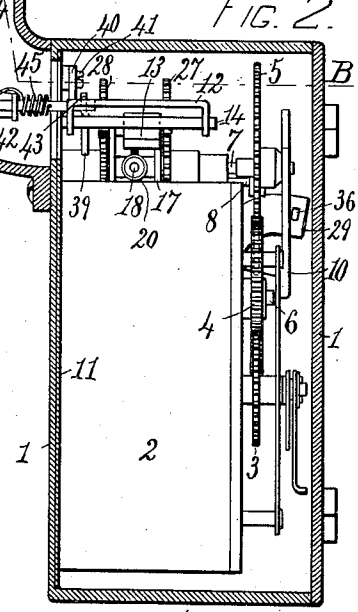


FIG. 2.



WITNESSES

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Nelson Curtis

INVENTOR

Ai B. Shaw

by Henry Chadbourn

his attys.

No. 868,297. PATENTED OCT. 15, 1907.

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AUTOMATIC GAS LIGHTING AND EXTINGUISHING APPARATUS.

APPLICATION FILED APR. 16, 1906.

2 SHEETS—SHEET 2.

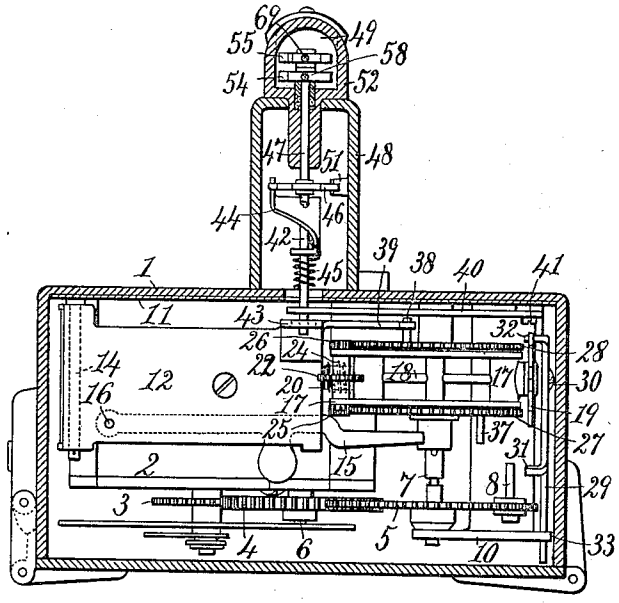

FIG. 3.

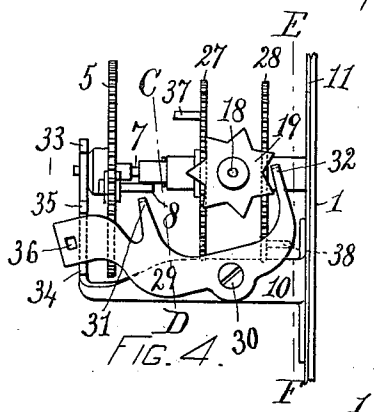

FIG. 4.

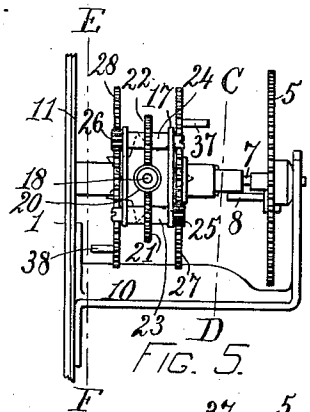

FIG. 5.

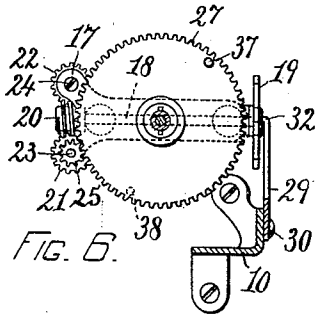

FIG. 6.

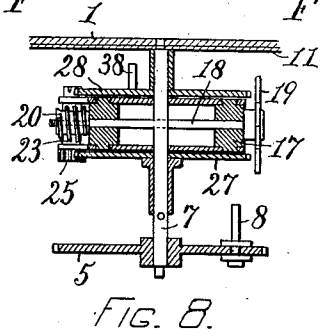

FIG. 8.

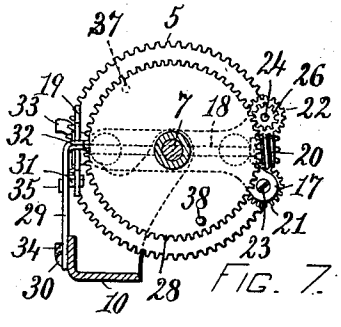

FIG. 7.

WITNESSES

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AI B. SHAW, OF MEDFORD, MASSACHUSETTS.

AUTOMATIC GAS LIGHTING AND EXTINGUISHING APPARATUS.

No. 868,297. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed April 16, 1906. Serial No. 311,897.

To all whom it may concern:

Be it known that I, AI B. SHAW, of Medford, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Gas Lighting and Extinguishing Apparatus, of which the following is a specification.

This invention relates to improvements in automatic gas lighting and extinguishing devices, and has for its objects to simplify the construction of such devices; to increase their efficiency; to provide the same with a suitable compensating device, so controlling the time of automatically lighting and extinguishing the gas, as to cause it to correspond with the relative lengthening or shortening of the days at different seasons of the year; and to otherwise improve devices of this class as will be fully described hereinafter.

The invention consists of the novel constructions, arrangements, and combinations of parts, substantially as described and particularly set forth in the claims annexed hereto, and it is carried out substantially as illustrated on the accompanying drawings, which form an essential part of this specification, and whereon like characters of reference refer to like parts wherever they occur thereon.

On the drawings: Figure 1 represents a sectional front elevation of my improved device. Fig. 2 represents a sectional side elevation of the invention. Fig. 3 represents a sectional plan view of the device, on the line A—B in Fig. 2. Fig. 4 represents a detail side elevation of the equation device. Fig. 5 represents a detail opposite side elevation of the equation device. Fig. 6 represents a section of the equation device on the line C—D in Figs. 4 and 5. Fig. 7 represents a section of the equation device, on the line E—F in Figs. 4 and 5. Fig. 8 represents a horizontal section of the equation device, through the shaft of the same. Fig. 9 represents a detail section showing the mechanism to control the opening and closing of the valves which govern the flow of gas to the burners. Fig. 10 represents an enlarged detail sectional view of the pilot burner used in my invention and the valve controlling the supply of gas thereto. Fig. 11 represents a partial vertical section of a modified construction of the valve controlling the supply of gas to the main burner. Fig. 12 represents a detail vertical section of the modified construction of the main valve, in a plane at right angles to that shown in Fig 11.

Within a casing 1, is placed a time or clock mechanism 2, from the moving parts of which motion is derived to operate the gas controlling valves and other moving parts of the device. The hour wheel 3 of the time mechanism meshes into a train of spur gears, which has been shown on the drawing as consisting of the gears 4 and 5, the former loosely mounted upon the stud 6 and the latter firmly mounted upon the shaft 7.

Upon the gear 5 is mounted a projecting stud 8 which projects in a line substantially parallel to the shaft 7, and said stud is adjustable upon said gear within a segmental slot 9 which is concentric with the shaft 7; this stud 8 therefore forms substantially a crank pin on the gear 5. The forward end of the shaft 7 is rotatably mounted in a bearing in the bracket 10, attached to the casing 1, or to a plate 11 secured within the casing, which plate also acts as a support for the time mechanism.

A lever 12, provided with a weight 13, is pivotally attached at 14 to the plate 11 in such a manner that its free end is free to be raised or lowered at will. The lever 12 is preferably made in the form of a flat plate as shown, and a lever 15 is pivotally attached to said lever at 16, in such a manner that its free end can be moved towards or from the back of the gear 5 into and out of the path of the rotations of the stud or crank pin 8 on said gear, around the shaft 7. As the gear 5 is twice as large in diameter as that of the hour wheel 3, and as the hour wheel is rotated twice in every twenty-four hours or a day, it will be seen that the gear 5 will be rotated once every twenty-four hours, and when the lever 15 is turned into the path of the rotations of the stud 8 on the gear 5, it will be seen that the free end of said lever will be raised and allowed to drop by the influence of its weight, once every twenty-four hours.

Upon the shaft 7 is firmly mounted a frame 17, within which is rotatably mounted a shaft 18, having its axis of rotation at right angles to the axis of rotation of the shaft 7 and located within a plane passing through the axis of rotation of the latter shaft. The shaft 18 has a star wheel 19 firmly mounted on one end of the said shaft, and a worm 20 firmly mounted upon the opposite end thereof. The worm 20 meshes into the worm wheels 21 and 22, located diametrically opposite each other in relation to said worm, and these worm wheels are firmly mounted upon the respective short shafts 23 and 24, both of which are rotatably mounted within bearings in the frame 17.

Upon the shafts 23 and 24 are firmly mounted the respective small spur gears or pinions 25 and 26, which mesh into the respective spur gears 27 and 28, loosely mounted upon the shaft 7 at opposite ends of the frame 17 and its shaft 18. As the worm wheels are located on opposite sides of the worm, it will be seen that any rotation of the worm will tend to cause a rotation of the worm wheels in opposite directions to each other, and as the pinions on the shafts which carry the worm wheels each mesh into a spur gear mounted on the shaft 7, it will be seen that the rotation of the worm will cause a rotation of these spur gears on the shaft 7 in opposite directions relative to each other.

In order to cause a partial or slight rotation of the shaft 18 at each complete rotation of the shaft 7 which

carries the shaft 18 and its frame 17, a lever 29 is fulcrumed at 30 to the bracket 10, which lever is provided with the projections 31 and 32, one or the other of which are brought into the path of the teeth of the star wheel 19 on diametrically opposite sides of said star wheel during each complete rotation of the shaft 7, and by the rocking of the lever 29 upon its fulcrum. The rocking movements of the lever 29 are limited in both directions by stop-projections 33 and 34 on the bracket 10 so as to properly position the projections on the lever in relation to the teeth of the star wheel. The bracket 10 is also provided with a projection 35, which in connection with a perforation 36 in the lever 29, acts to hold the lever at a position midway between the stop projections on the bracket and so that the projections on the lever 29 will be out of the path of the teeth of the star wheel during the rotation of the star wheel around the shaft 7. As one or the other of the projections on the lever 29 engage the teeth of the star wheel, on diametrically opposite sides of the star wheel, once in each revolution of the shaft 7, according to the position of the lever 29, and as this engagement of the teeth of the star wheel will cause a slight rotation of the star wheel by each rotation of the shaft 7, but in opposite directions, according to which one of the projections on the lever is brought into the path of said star wheel, it will be seen that the desired direction of the consequent rotation of the shaft 18 may be obtained by the adjustment of the lever 29. As the direction of the rotation of the shaft 18 and its worm controls the direction of the rotation of the spur gears 27 and 28 on the shaft 7, it will be seen that the direction of the rotation of said spur gears may be governed by the adjustment of the lever 29.

The spur gears 27 and 28 are provided with the respective projecting studs 37 and 38 which are preferably immovably attached to said gears as shown, but which may be adjustably mounted thereon in a manner similar to the projecting stud 8 on the gear 5. The lever 15 on the weighted lever 12 may be turned upon its fulcrum so that its end will be in the path of the upward part of the rotation of the stud 37 with its gear 27, and will therefore cause an upward and a downward movement of the free end of the weighted lever 12 at each rotation of the gear 27.

The weighted lever 12 is provided with a rigidly attached projection 39 which is in the path of the upward part of the rotation of the stud 38 with its gear 28 and this rigid projection, in combination with the rotation of the stud 38, will cause the end of the weighted lever to be raised and lowered once for each and every rotation of the gear 28. As the frame 17 is rigidly attached to the shaft 7, the shaft 18, worm 20, worm wheels 21 and 22 and pinions 25 and 26 firmly mounted upon the worm wheel shaft, will act as a locking device to hold the gears 27 and 28 in their adjusted positions relative to each other upon the shaft 7 excepting when changed by the engagement of the teeth of the star wheel with either of the projections 31 or 32 on the lever 29 as above described, it will thus be seen that the gears 27 and 28 are rotated in unison with the rotations of the shaft 7 which is rotated once in every twenty-four hours.

The upward movements of the free end of the weighted lever 12, due to the engagements of the stud 8 on the gear 5 or the stud 37 on the gear 27 with the adjustable projecting lever 15 on the lever 12, and the engagements of the stud 38 on the gear 28 with the rigid projection 39 on the lever 12; in connection with the downward movements of the end of the weighted lever 12 when released from the action of said studs due to the action of gravity upon its weight; form the movements used to operate the valves controlling the flow of gas to the burners of the light as will be fully understood by the complete description of the device herein contained. As these engagements of the studs 8 and 38, or the studs 37 and 38 with their respective projections on the weighted lever, occur once every twenty-four hours; and as the relative times of the engagements of the studs 37 and 38 respectively with the projecting lever 15 or with the projection 39 can be permanently adjusted as desired by locking the lever 29 in its central position, or intermittingly adjusted once every twenty-four hours by the engagements of the star-wheel 19 with either of the projections 31 or 32 on the lever 29 and consequent slight rotations of the gears 27 and 28, it will be seen that the up and down movements of the end of the weighted lever may be so governed as to occur at any desired time of the night or day.

The movements of the weighted lever due to the engagements of the projecting stud 38 on the gear 28 with the rigid projection 39 on the weighted lever, are used to operate the valves in lighting the lamps, while the movements of the weighted lever due to the engagements of the fixed stud 8 on the gear 5 or the adjusted stud 37 on the gear 27 with the adjustable projecting lever 15, are used to operate the valves to extinguish the lamp. By this means it will be seen that the time of lighting and extinguishing the lamp may be constantly at the same hour of the day or night if so desired; that the time of extinguishing the lamp may be constantly at the same hour and the time of lighting the lamp be intermittingly and automatically adjusted once every twenty-four hours so as to light the lamp slightly earlier or slightly later every day if so desired; and that both the times of lighting and of extinguishing the lamp may be intermittingly and automatically adjusted once every twenty-four hours so as to light the lamp slightly earlier and to extinguish it slightly later, or extinguish it slightly earlier every day if so desired. By this means I am able to automatically compensate for the relative lengthening and shortening of the days and nights. Thus this intermediate mechanism between the gear 5 and the weighted lever acts as an equation device to automatically regulate the time of lighting and extinguishing the lamp.

By the construction and arrangement of the equation device described, which is introduced within the connecting or intermediate mechanism between the time mechanism and the weighted lever, I am able to utilize the same spring or other motive power used to operate the time mechanism to also operate the valve controlling mechanism without the introduction of a separate motive power to operate the valves. This dispenses with cost of a separate motive power to operate the valves and insures unison in the operations of the device.

The mechanisms between the operating weighted lever 12 and the burners of the lamp, which mechanisms are controlled and operated by the movements of 13

the weighted lever, are substantially as follows. A lever 40 is fulcrumed at 41 within the casing and is provided at its free end with a stud or pin 42 which projects on opposite sides of the lever. The forward portion of the pin 42 enters a slotted perforation in a projecting ear 43 on the weighted lever 12, and a hooked pawl 44 is fulcrumed to the rearwardly projecting portion of the pin 42. A spring 45 acting upon the pawl 44 tends to keep its upper hooked end in contact with the teeth of a ratchet wheel 46 firmly mounted upon a short shaft 47. The shaft 47 has its bearings within a bracket arm 48 which is attached to the casing 1 and which forms the means whereby the casing is hung or secured to a lamp post or other device on which the lamp is used. The end of the shaft 47, opposite to that on which the ratchet 46 is mounted, enters a chamber 49 which is in open communication with the inlet 50 through which gas or other suitable illuminating material is supplied, and the bearing for that end of the shaft 47 is provided with a suitable packing which prevents the escape of the gas from around the shaft, or said shaft may fit its bearing sufficiently tight to accomplish this object. It will be understood that an up and down movement of the weighted lever 12 will cause corresponding up and down movements of the end of the lever 40 with the pin 42 and the pawl 44 carried thereby. This up and down movement will cause the end of the pawl to engage the teeth of the ratchet and intermittingly rotate the ratchet and the shaft on which it is mounted in one direction, said ratchet and shaft being prevented from rotating in the opposite direction by means of the detent spring 51 secured within the bracket arm and engaging the teeth of the ratchet, or by other equivalent means.

The gas-chamber 49 has been shown as being within a casing 52 detachably attached to the bracket arm 48, but the casing 52 might be made integral with said arm if so desired. The casing 52 is preferably provided with a removable cap 53, by which access may be had to the chamber 49 when so desired.

Upon the shaft 47, within the chamber 49, are firmly secured the star-shaped cams 54 and 55. A second chamber 56 is formed within the casing 52 and a valve 57 controls communication between the two chambers 49 and 56. This valve is provided with a valve stem 58 which projects downward into such a position as to be engaged by the star-cam 54, when said cam is rotated with the shaft 47, and this valve is intermittingly opened and closed by the action of the cam upon said valve stem. The second chamber 56, within the casing 52, is in open communication with the mixing chamber 59 of the burner, by means of the perforation 60, said mixing chamber being provided with regulated air inlets 61 through which the required amount of air is drawn by the flow of gas into said chamber as usual in all mantle burners. After the desired amount of air has been mixed with the gas in the mixing chamber, the same passes through the perforated or grated cap 62 of the burner into the combustion chamber 63 within the mantle 64, and is consumed causing the incandescence of the mantle. As the valve 57 controls the flow of gas from the chamber 49 to the combustion chamber 63 through the grated cap, it will be seen that said valve is the main gas valve to the burner and is controlled by the action of the cam 54 upon the stem 58 of the main valve.

A tube 65 is in open communication with the gas chamber 49 within the casing 52 and said tube extends to a position slightly below the grated cap 62 of the main burner. The upper end of the tube 65 is slightly contracted, as shown in detail in Fig. 10 and for a purpose to be fully understood by the complete description of the device. The upper end of the tube 65 enters a chamber 66 formed within an enlarged tube 67, the lower end of which is contracted so as to fit substantially gas tight upon the upper part of the tube 65, and thus form an extension of the tube 65. The upper end of the enlarged tube 67 is provided with a perforated cap 68 which forms the pilot burner and enters the combustion chamber 66 within the mantle, through the grated cap 62. It will thus be seen, that a communication may be established between the gas chamber 48 and the combustion chamber 66, through the tubes 65 and 67 and the perforated cap 68 which forms the pilot burner, that gas may therefore be supplied to the combustion chamber in this manner and be burned at the pilot burner 68.

A rod 69 is placed within the tube 65, the upper end of which rod is enlarged so as to rest upon and close the upper end of said tube, thus forming a valve 70 controlling the flow of gas through said tube. The rod 69 forms the valve-stem of the valve 70 and extends below the lower end of the said tube into the path of the star cam 55, so that said cam when rotated will intermittingly raise said valve from its seat on the end of the tube, and allow it to drop against its seat by the action of gravity. The rod 69 is of such a diameter as to nearly fill the contracted upper end of the tube, leaving only a slight annular space around said rod through which the gas may escape into the upper tube 67 and thence to the pilot burner, when the rod rests upon the high portions of the star-cam 55. The rod 69 is reduced in size immediately below the valve 70 thereon, as shown at 71 in Fig. 10, for a sufficient distance to insure an increased annular space for the escape of the gas from the lower tube 65 into the upper tube 67 during the time that the valve 70 is being raised from its position on its seat on the tube 65 to its highest position by the action of the star-cam 55. By this increase in the size of the annular space between the rod 69 and the contracted upper end of the tube 65, and the consequent increase in the amount of gas supplied to the upper tube 67 and the pilot burner 68, I am able to increase the size of the blaze of the pilot burner at this time, for a purpose to be fully understood by the complete description of the device. By interposing the enlarged tube 67 between the pilot burner and the valve 70 which controls the supply of gas to the pilot burner, I form a chamber or reservior within which a limited supply of gas under pressure will remain after the valve 70 has been closed, which supply of gas will continue to flow through the pilot burner and continue to be burned for a short time after the valve has been closed. This insures the lighting of the gas supplied through the main burner before the pilot burner is extinguished.

The movements of the pawl 44, by the up and down movements of the weighted lever 12, are such that the

shaft 47 and its attached star-shaped cams 54 and 55 will be rotated so as to bring a high part of each cam into engagement with the respective valve stems 58 and 69 alternately. The cams 54 and 55 are so placed upon the shaft 47 that when a low part of the cam 54 is under the valve stem 58, a high part of the cam 55 will be in engagement with the valve stem 67 and vice versa. By this arrangement of the valve stems and their operating cams, it will be seen that when gas is being supplied to the main burner by the valve 57 being open, the valve 70 will be closed and the gas be shut off from the pilot burner; also that when the valve 70 is opened and gas is being supplied to the pilot burner, the valve 57 will be closed and gas be cut off from the main burner. As the valve stems 58 and 69 move freely within their guides and the cams 54 and 55 are positively and partially rotated with the shaft 47 twice every twenty-four hours, it will be seen that the lighting and extinguishing of the gas at both the main and the pilot burners will be positive and sure.

Although I have thus far described the valves which control the supply of gas to both the main and the pilot burners, as being provided with valve stems which are engaged and operated by star-shaped cams on a rotary shaft, which shaft is intermittingly and partially rotated by the up and down movements of the weighted lever, through intermediate mechanism, it will be understood that either or both of the valves controlling the supply of gas to either or both of the burners may be made in the form of spigot or plug valves and I have illustrated in Figs. 11 and 12 the valve controlling the supply of gas to the main burner as being made in the form of a spigot or plug valve.

In Figs. 11 and 12 the star-cam 54 is omitted from the shaft 47 and the shaft is provided with a cylindrical plug or block 72, which fits gas-tight within a cylindrical chamber made in the casing. A gas passage or port 73 forms communication between the gas inlet and said cylindrical chamber, and a gas passage 74 forms communication between the cylindrical chamber and the mixing chamber in the main burner. The plug or block 72 is provided with passages 75, 75, which may be brought into such positions as to connect the passages 73 and 74 through said plug, or so as to cut off the communication between said passages. Thus the plug or block 72 forms a valve controlling the supply of gas to the main burner.

The passages 75 through the plug 72 are so placed in relation to the cam 55 which controls the supply of gas to the pilot burner, that when the valve 70 is opened and gas is being supplied to the pilot burner, the passages 75 will be turned out of communication with the passages 73 and 74, and when the cam 55 has been moved so as to release the valve stem of the valve 70 and allow the valve 70 to be seated and cut off the supply of gas to the pilot burner, one of the passages 75 will be in line between the passages 73 and 74 and thereby open communication between the gas inlet and the main burner. Although this use of spigot valves upon the shaft 47 will accomplish the desired result, it is not so reliable as the use of the star cam operating upon the stems of the valve, as there is great liability of the plug becoming stuck in the cylindrical chambers and failing to work when necessary.

Having thus fully described the nature, construction and the operation of my invention, I wish to secure by Letters Patent and to claim:

1. In an automatic gas lighting and extinguishing device, a time mechanism, a rotary shaft operated by the time mechanism, disks carried by and rotated with said shaft, crank pins carried by said disks, a weighted lever engaged by said crank pins during their rotations to intermittingly raise said lever and allow it to drop, gas controlling means operated by the movements of said lever, and an equation device operated by the rotations of said rotary shaft to automatically and intermittingly vary the time of the engagements of the crank pins and weighted lever, said equation device consisting of a frame carried by the rotary shaft, intermediate the disks which carry the crank pins, a rotary shaft mounted in said frame, a star wheel on said latter shaft, adjustable stop projections to be brought into engagement on the opposite sides of the star wheel to rotate the star wheel in opposite directions, and intermediate mechanisms between the rotary shaft in the frame and the disks which carry the crank pins to vary the positions of the crank pins relative to each other intermittingly at each rotation of said shaft, whereby the times of engagement and disengagement of the crank pins with the weighted lever is automatically varied to compensate for changes in the lengths of the days and nights.

2. In an automatic gas lighting and extinguishing device, a time mechanism, a weighted lever, intermediate mechanism between the time mechanism and weighted lever, whereby the lever is raised and allowed to fall at predetermined times, a rotary shaft, a ratchet on said shaft, a pawl operated by the weighted lever and operating upon the ratchet to intermittingly and partially rotate said shaft, a main and a pilot burner, valves controlling the supply of gas to said burners, controlled by the partial rotations of the rotary shaft, whereby gas will be supplied to the main burner and be lighted by the pilot burner and vice versa.

3. In an automatic gas lighting and extinguishing device, a time mechanism, a weighted lever, intermediate mechanism operated by the time mechanism to automatically and intermittingly raise said weighted lever and allow it to drop, a rotary shaft, intermediate mechanism operated by the movement of the weighted lever to intermittingly and partially rotate said shaft, a gas burner, a valve controlling the supply of gas to the burner, and a cam on the rotary shaft engaging said valve to automatically open the valve or allow it to close.

4. In an automatic gas lighting and extinguishing device, a time mechanism, a weighted lever, intermediate mechanism operated by the time mechanism to automatically and intermittingly raise said weighted lever and allow it to drop, a rotary shaft, intermediate mechanism operated by the movements of the weighted lever to intermittingly and partially rotate said shaft, a main and a pilot burner, valves controlling the supply of gas to said burners, and cams on the rotary shaft engaging said valves opening each valve alternately and allowing it to close, whereby gas will be burning at one or the other of said burners while the device is in operation.

5. In an automatic gas lighting and extinguishing device, a time mechanism, a weighted lever, intermediate mechanism operated by the time mechanism to automatically and intermittingly raise said weighted lever and allow it to drop, a rotary shaft intermediate mechanism, operated by the movements of the weighted lever to intermittingly and partially rotate said shaft, a tube in open communication with a supply of gas contracted at its open upper end, a rod within said tube, headed at its upper end forming a valve when seated on the end of said tube and controlling the flow of gas through said tube but reduced immediately below the headed portion to increase the freedom of the flow of gas through the tube while the reduced portion of the rod is passing the contracted portion of the tube, a burner supplied with gas through said tube, and a cam on the rotary shaft engaging the lower end of said rod to open said valve and allow it to flow.

6. In an automatic gas lighting and extinguishing device, a time mechanism, a weighted lever, intermediate

mechanism operated by the time mechanism to automatically and intermittingly raise said weighted lever and allow it to drop, a rotary shaft intermediate mechanism operated by the movements of the weighted lever to intermittingly and partially rotate said shaft, a tube in open communication with a supply of gas, a rod within said tube headed at its upper end forming a valve when seated on the end of the tube and controlling the flow of gas through the tube, an enlarged extension tube forming a chamber at the upper end of the first tube above the valve thereon, a burner on the extension tube, and means operated by the rotations of the rotary shaft to operate said rod to open the valve and allow it to close.

In testimony whereof I have affixed my signature, in presence of two witnesses.

AI B. SHAW.

Witnesses:
HENRY CHADBOURN,
NELSON CURTIS.