N. S. McNAB & J. S. LINK.

AUTOMATIC APPARATUS FOR LIGHTING AND EXTINGUISHING GAS LAMPS.

APPLICATION FILED SEPT. 27, 1909.

969,182.

Patented Sept. 6, 1910.

4 SHEETS—SHEET 1.

Fig. 1.

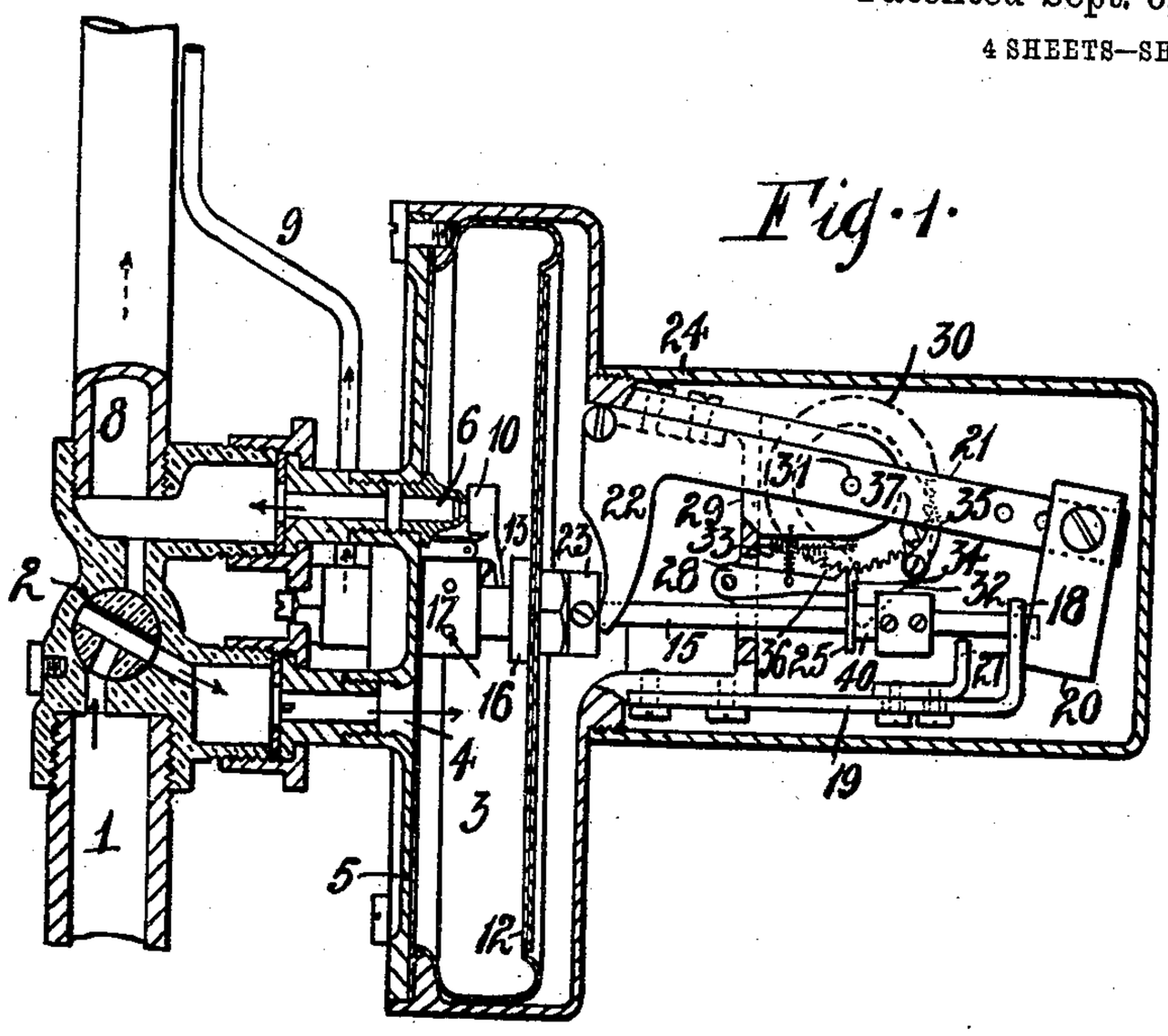


Fig. 2.

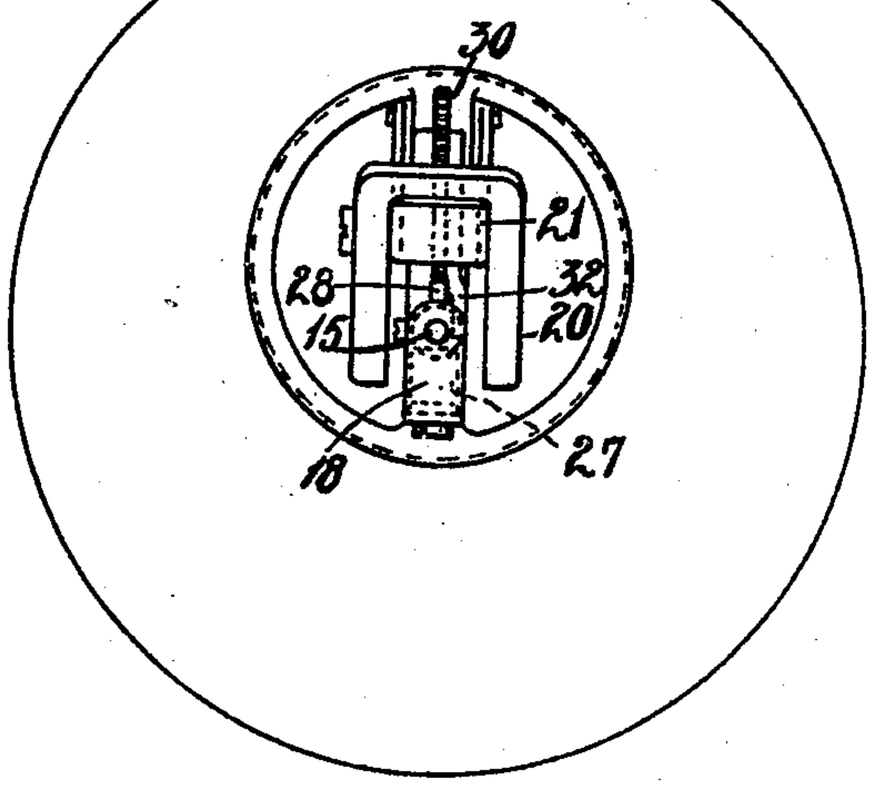


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Fig. 3.

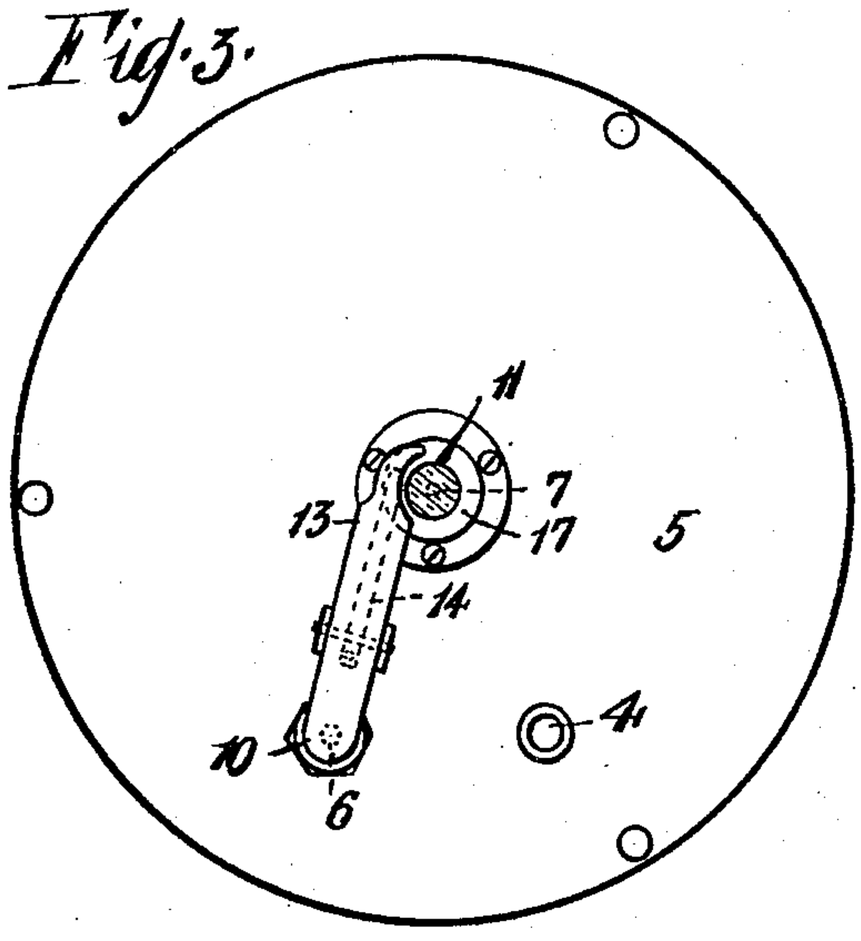


Fig. 4.

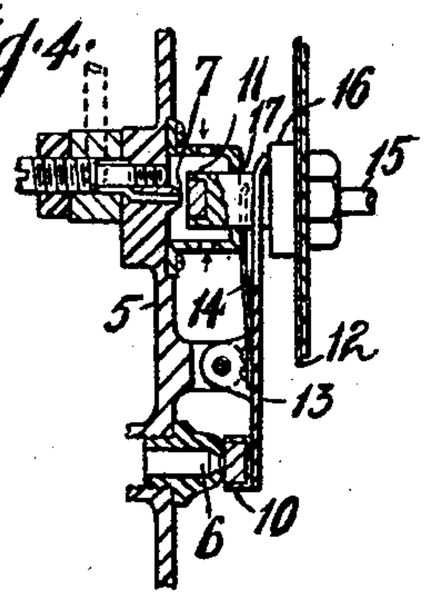


Fig. 5.

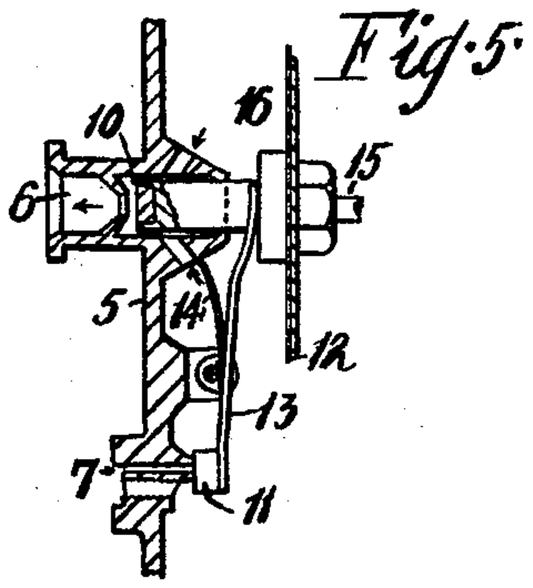


Fig. 6.

Fig. 7.

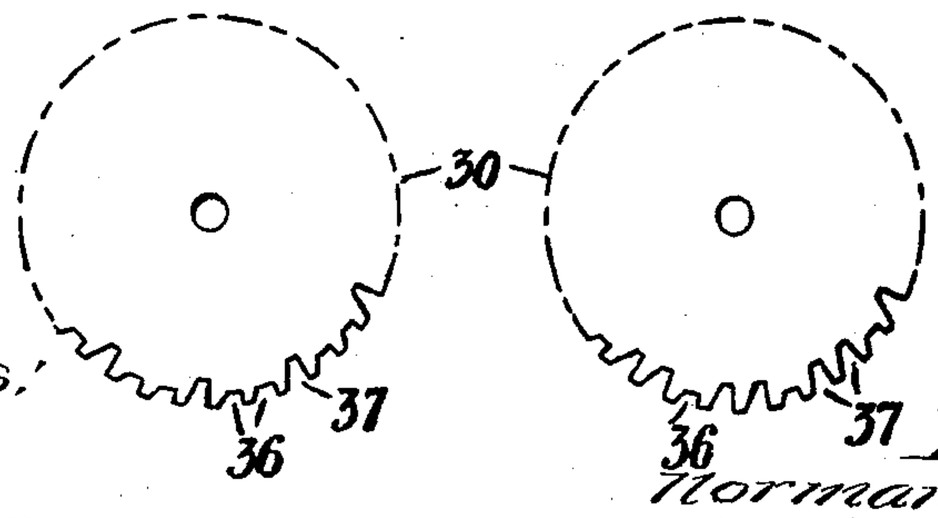


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Fig. 9.

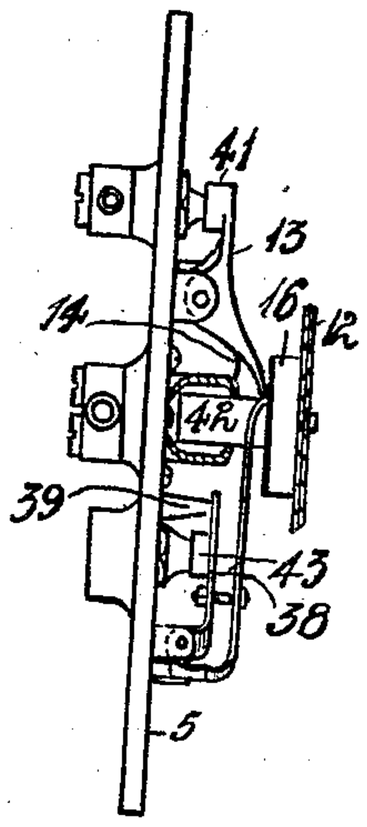



Fig. 8.

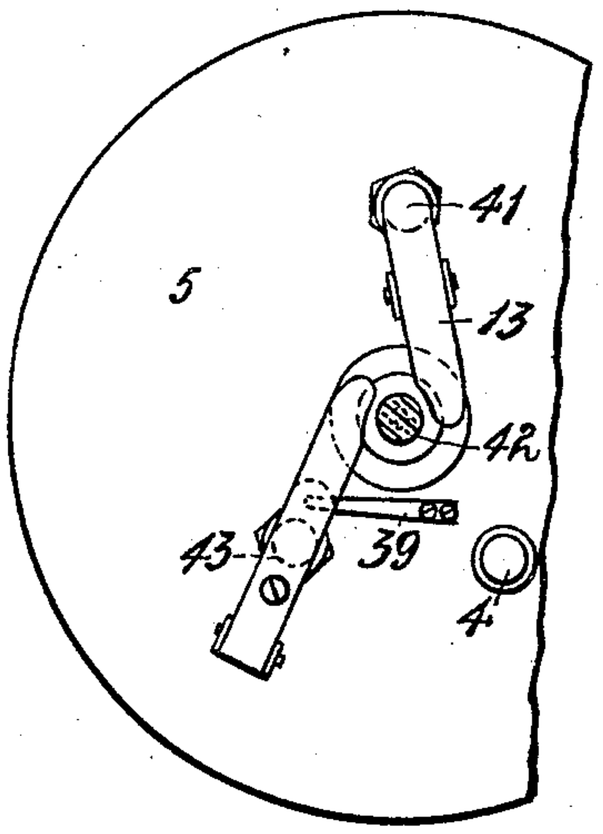
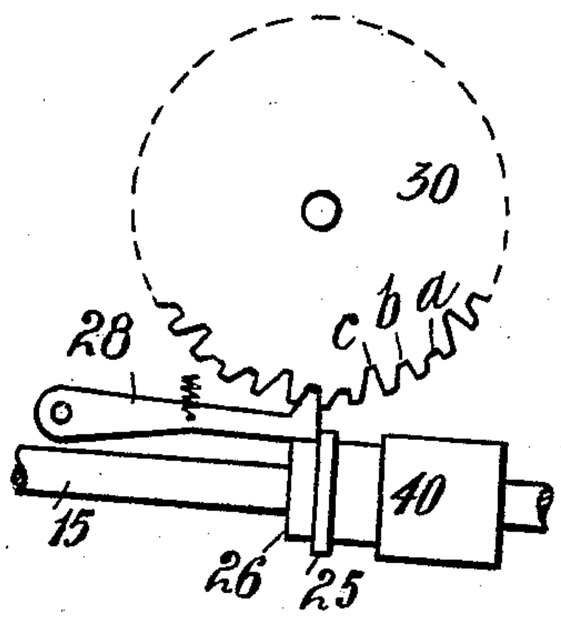



Fig. 10.

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4 SHEETS—SHEET 4.

Fig. 11.

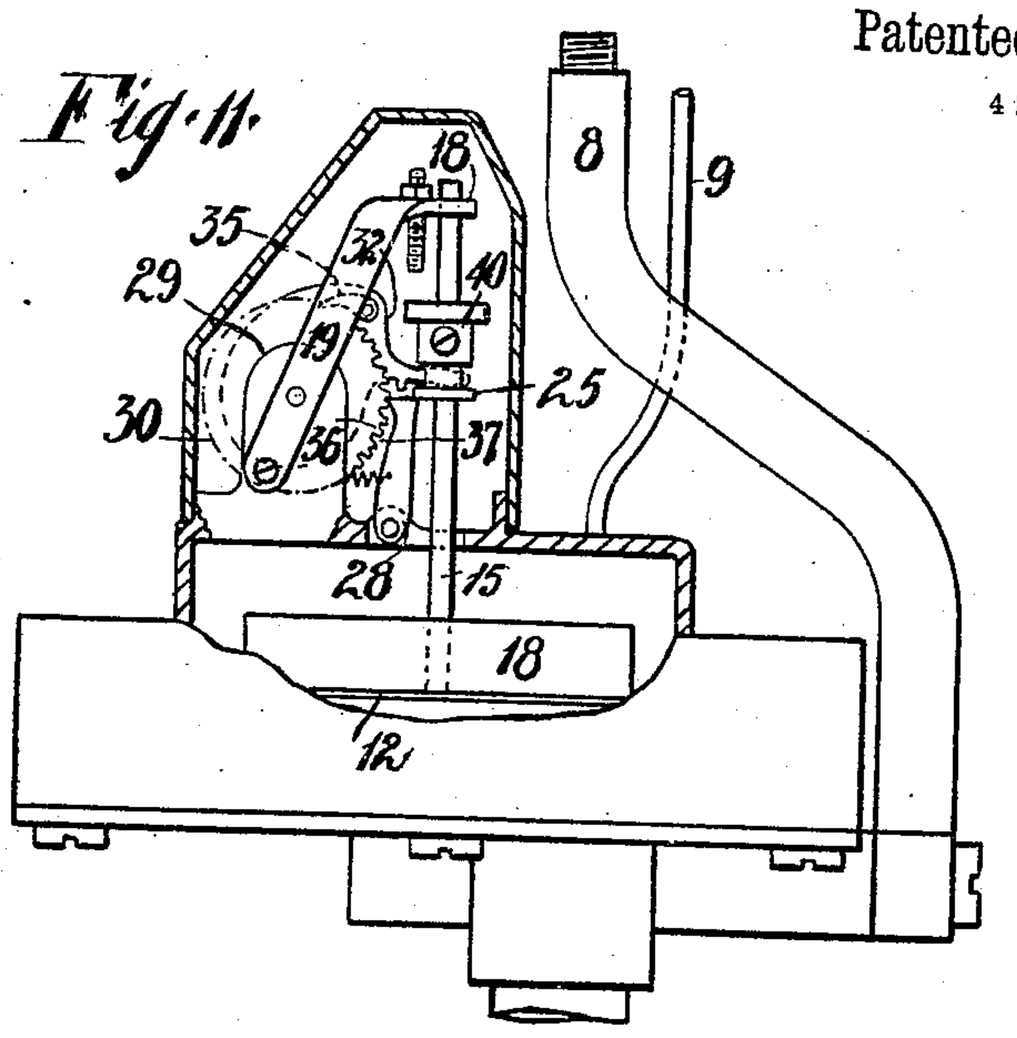
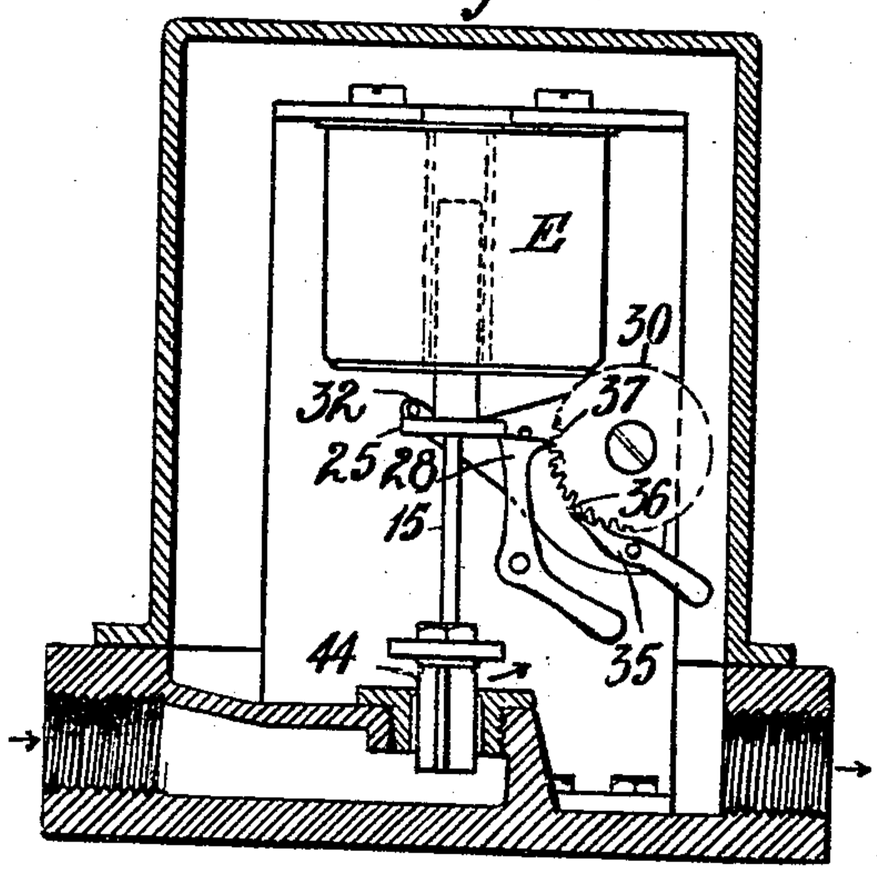



Fig. 12.

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# UNITED STATES PATENT OFFICE.

NORMAN SINCLAIR McNAB, OF CAULFIELD, AND JOSEPH SELBY LINK, OF MELBOURNE, VICTORIA, AUSTRALIA.

## AUTOMATIC APPARATUS FOR LIGHTING AND EXTINGUISHING GAS-LAMPS.

969,182. Specification of Letters Patent. **Patented Sept. 6, 1910.**

Application filed September 27, 1909. Serial No. 519,885.

*To all whom it may concern:*

Be it known that we, NORMAN SINCLAIR McNAB, a subject of the King of Great Britain, residing at Waiora Road, Caulfield, in the State of Victoria, Australia, electrical and mechanical engineer, and JOSEPH SELBY LINK, a subject of the King of Great Britain, residing at Collins street, Melbourne, Victoria aforesaid, consulting engineer, have invented Improvements in Automatic Apparatus for Lighting and Extinguishing Gas-Lamps, of which the following is a specification.

This invention relates to mechanism for operating valves from a distance and is particularly intended for use in lighting and extinguishing gas lamps.

The mechanism is operated electrically or by a temporary increase of fluid pressure or fluid pulsations and is adapted to open and close one or more valves.

In its application to gas lamps, the mechanism is adapted to extinguish or light simultaneously a series of lamps, or a cluster of burners, or to extinguish series of lamps or series of burners of a cluster before others of such series.

The invention is illustrated in the accompanying drawings whereof;

Figure 1 is a vertical sectional view, with parts in elevation, of one form of the mechanism, and Fig. 2 is an end elevation with the casing of the mechanism removed. Fig. 3 is a front elevation of the valve plate, and Fig. 4 is a vertical section (broken) through same. Fig. 5 is a section showing a reverse arrangement from that of Fig. 3. Figs. 6 and 7 are enlarged side elevations of portions of the ratchet wheel formed with differently arranged retaining and releasing notches, as used for instance in extinguishing two series of lamps at different times. Fig. 8 a front elevation, and Fig. 9 is a side elevation (broken) showing the invention as adapted to extinguish certain burners of a cluster and leave the remainder alight until the next pulsation, while Fig. 10 is an enlarged detail showing part of the releasing mechanism. Fig. 11 is a sectional elevation of the mechanism wherein a horizontal diaphragm is employed. Fig. 12 is a vertical section of the electrically controlled valve.

According to this invention gas is supplied through a pipe 1 provided with an ordinary cock or a three way cock 2 as shown, which admits the gas when opened into a chamber 3 through an opening 4 in the valve plate 5 of said chamber. Upon said valve plate are two outlet ports 6, 7, the port 6 leading to the burner by way of tube 8 and the other port 7 by tube 9 to the pilot light, said ports being controlled by valves 10, 11.

In accordance with the construction shown in Fig. 1, the valves 10, 11, are controlled by a gas tight sensitive diaphragm 12, bellows or like device located in the chamber 3, through the medium of pulsations or varying pressures of the gas introduced into said chamber.

In the simplest form of construction for extinguishing or lighting all the burners at the same time, one valve is mounted on a pivoted lever 13 and kept normally closed by a spring 14, while the other is formed on an operating rod 15 attached to and operated by the diaphragm 12.

In the form shown in Figs. 1 and 4, the valve 10 on the lever 13 controls the supply of gas to the burner, but in Fig. 5 the pilot valve 11 is on said lever and this latter form is preferable when operating on different series of gas supply to burners where certain ones are to be extinguished before the others.

In either arrangement of the valves, the one on the pivoted lever is kept closed by the spring 14 bearing against said pivoted lever 13, while the latter is depressed and the valve opened by a shoulder 16 on the rod 15 of the diaphragm 12 engaging the end of said lever. The other valve is closed by the direct action of the rod, and the valve-carrying end of the latter is guided by a sleeve 17, perforated to admit gas to one outlet valve. The other end of the rod slides in a guide 18 on the end of an arm 19.

The diaphragm 12 is under constant pressure by means of a weight 20, which, in the case of a vertical diaphragm, is slidably and adjustably secured to the end of a hinged lever 21, said lever having preferably an arm 22 bearing against a block 23 secured to the rod 15 outside the chamber 3 and within the casing 24 of the mechanism. When a horizontal diaphragm is employed it is provided on top with a weight to control its movement as in Fig. 11. The rod is provided with an adjustable trip collar 40 near its outer end which collar has either a single flange 25 or double flanges 25, 26, (Fig. 10) according to the effect desired, while the

arm 19 is provided with a stop 27 to limit the outward movement of said collar and the rod. Adjacent to said trip collar is a spring pawl 28 pivoted on a rigid frame 29 and adapted to engage with a ratchet toothed wheel 30 provided with notches of different depths and loosely mounted on a spindle 31. The ratchet wheel is adapted to be turned or partially rotated in one direction only by means of a pawl lever operated by the inward movement of the flanged trip collar. Said pawl lever comprises a curved arm 32 loosely mounted on the spindle 31 and provided with a tension spring 33 and a stop 34, while upon said arm is pivoted a spring pawl 35 adapted to engage the teeth or notches of said ratchet wheel. This tension spring 33 is unnecessary where the diaphragm is horizontal, (Fig. 11), because the pawl lever returns to its normal position by its own weight. The notches 36, 37, between the teeth of the ratchet wheel vary according as to whether the mechanism is adapted to operate a single lamp or groups of lamps, such as street lamps at different times, or a series of lamps provided with a cluster of burners.

The ratchet wheel shown in Fig. 1 is adapted to operate a series of lamps each having a single burner, all of which lamps are to be extinguished at the same time, and so one series of notches 37 is deeper than the other series 36. These two series alternate and might be termed, respectively, the "releasing" and "retaining" notches. Thus when the pawl 28 is in engagement with a shallow or retaining notch 36 of the ratchet wheel it projects sufficiently to engage the flange 25 of the trip collar 40 on the rod thereby preventing the inward movement of the diaphragm controlling the valves 10 and 11; but when the pawl engages a deep or releasing notch 37 it is out of the path of said flange 25 and therefore permits the weighted lever 21 to operate and force the diaphragm inward.

As an example of operation, and assuming the valve 10 on the lever 13 to be adapted to close the burner port 6, and the valve 11 on the rod 15, to close the pilot port 7, and assuming also that the burner is extinguished but the pilot alight,—the pressure of gas being normal the pawl will be in engagement with a shallow notch 36 and will retain the rod and diaphragm by projecting in the path of the flange 25 of the trip collar 40, thus preventing the weight operating on the diaphragm. By now momentarily increasing the gas pressure, the flange 25 will first move outwardly and operate against the arm 32 of the pawl lever, thus rotating the ratchet wheel 30 to the extent of one tooth, so that the pawl 28 springs into a deep or releasing notch 37 and allows the flange 25, which immediately returns, to pass and the weight to operate on the rod and force the diaphragm 12 inward. The effect of this is that the shoulder 16 on the rod depresses the pivoted valve lever 13 against the pressure of its spring 14 and opens the burner valve 10, and approximately at the same time the pilot light valve 11 is closed. The burner is extinguished by means of another pulsation or momentary increase of gas pressure, whereby the flange 25 of the trip collar again moves outwardly and operates the pawl lever, thus turning the ratchet wheel 30 so that the pawl 28 again engages a shallow notch 36 and prevents the return of the diaphragm. The pilot light valve 11 is thus held opened while the burner valve 10 is closed by the spring 14 of the pivoted lever 13 to which it is attached.

It will be obvious that when the positions of the pilot light valve and burner valve are reversed, as in Fig. 5, the same mechanism is applicable with the difference that the outward movement of the diaphragm and rod closes the pilot light valve and opens the burner valve. This latter arrangement of the valves is preferable when it is desired to extinguish one series of lamp burners before another series, as in a three pulsation movement used for lighting and extinguishing the lamps. For instance, assuming that it is desired to extinguish certain street lamps at midnight and the remainder at sunrise, the main or burner valve 10 would be on the rod 15 and the pilot light on the pivoted lever, and ratchet wheel 30 of the mechanism of the lamps to be extinguished first would have two consecutive deep or releasing notches 37 followed by a shallow or retaining notch 36, as in Fig. 7, while the ratchet wheel of the mechanism of the lamps to be last extinguished would have two consecutive shallow or retaining notches 36 followed by a deep or releasing notch 37, as in Fig. 6. The object of two of one kind of notches being alongside one another is to prevent the diaphragm of the lamps to be last extinguished from being released by the pawl 28 until the third pulsation is given, and to prevent the flange 25 of the mechanism of the lamps first extinguished from being retained by the pawl 28 at the third pulsation.

It will be obvious that the kind of notches of the ratchet wheels of the mechanism will be arranged in accordance with the effect desired and the number of pulsations used to ignite and extinguish the series of lamps at different times. In the case of extinguishing a certain series of burners of a cluster at one time and the remainder later, the valves controlling the burners are adapted to operate one after the other by separate pulsations (Figs. 8, 9 and 10). In this case one burner valve 42 is on the rod and sup-

plies the series of burners to be last extinguished, while the other burner valve 43, which supplies the series of burners to be first extinguished, is mounted on a spring ended or flexible lever 38 and is adapted to be kept normally open by the spring 39. The pilot light valve 41 is mounted on a spring controlled pivoted lever 13. In this case the mechanism is controlled by a ratchet wheel 30 provided with series of notches of three different depths, *a*, *b*, *c*, the latter being the deepest and final releasing one, while the trip collar 40 is provided with two flanges 25, 26, the former projecting beyond the latter a distance equal to the difference between the depths of the notches *a* and *b*. The distance between the flanges is sufficient to insure the central burner valve 42 being open after the other burner is closed. With this arrangement, at the first pulsation the pawl 28 engages the flange 26 and notch *a*, thus retaining the diaphragm and opening both burner valves 42, 43, and permitting the closure of the pilot light valve 41. At the second pulsation, the ratchet wheel is turned so that the pawl 28 engages notch *b* and the rod 15 moves inward until retained by flange 25. The shoulder 16 engages the lever 38, and closes the valve 43 controlling one series of burners. Upon the next pulsation being given, the pawl springs into notch *c* and so releases the flange 25, and the valve 42 on the rod controlling the other series of burners is thus closed and the pilot light valve 41 opened.

When the mechanism is employed for lighting cluster lights or large lamps of churches, theaters, and the like, the diaphragm may be dispensed with and the mechanism operated electrically (Fig. 12), in which case the main valve 44 is connected to the rod 15 which is employed as an armature of a solenoid E or like magnetic device energized by a current of electricity. This valve controls the supply to all the burners which may be ignited by a permanent pilot light or lights or it may be ignited from a spark gap or heated platinum wire placed in an electric circuit with the press button, or by an induced current.

With this mechanism, when the solenoid or electromagnet is momentarily energized, the armature 15 is drawn up thus raising the valve 44 from its seat. This movement of the valve causes the flange 25 on the rod to come in contact with and move the arm 32 of the pawl lever, which latter by engaging with the teeth of the ratchet wheel 30 through pawl 35 moves said wheel one tooth forward. The main pawl 28 thus enters a shallow or retaining notch 36 and engages the flange 25 and so the valve 44 is held open. On again momentarily energizing the solenoid or electromagnet the main pawl 28 engages a "releasing" notch 37, thus freeing the flange and allowing the rod to fall by gravity and close the valve 44. In this construction neither the pawls nor the pawl lever require springs as they are sufficiently counterweighted.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is;—

1. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a member operated by the second named movement of said rod; a toothed member operated by the actuation of the first named member; and a pawl arranged for engagement with said toothed member and with said rod, for controlling the first-named movement of the latter.

2. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a member operated by the second named movement of said rod; a member operated by the actuation of the first named member and provided with series of notches of different depths; and a pawl arranged for engagement in said notches and with said rod, for controlling the first-named movement of the latter.

3. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a collar carried by said rod; a member engaged with said collar and operated by the same during the second named movement of said rod; a toothed member operated by the actuation of the first named member; and a pawl arranged for engagement with said toothed member and with said collar, for controlling the first-named movement of the rod.

4. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a collar carried by said rod; a member engaged with said collar and operated by the same during the second named movement of said rod; a toothed member operated by the actuation of the first named member; and a pawl arranged for continuous engagement with said toothed member and for movement into and out of engagement with said collar consequent upon such continuous engagement, to control the first-named movement of said rod.

5. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a ratchet wheel ro-

tated by the second named movement of said rod; and a pawl engaged with said wheel, to retain and release said rod, for controlling the first-named movement of the same.

6. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a ratchet wheel rotated by the second named movement of said rod and formed with releasing and retaining notches of different depths; and a pawl engaged with said notches to retain and release said rod, for controlling the first-named movement of the same.

7. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a flanged member attached to said rod; a toothed member operated by the second named movement of said rod; and a pawl engaged with said toothed member, and arranged to engage and release said flanged member consequent upon such engagement, for controlling the first-named movement of the rod.

8. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a flanged member attached to said rod; a ratchet wheel operated by the second named movement of said rod, and provided with releasing and retaining notches of different depths; and a pawl arranged to engage said flanged member when engaged with a retaining notch, and to release said flanged member when engaged with a releasing notch, for controlling the first-named movement of the rod.

9. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a flanged member attached to said rod; a lever engaged with said flanged member and operated by the second named movement of said rod; a ratchet wheel; a pawl carried by said lever, and operatively engaged with said wheel; and a second pawl engaged with said wheel and arranged to move into and out of the path of said flanged member consequent upon such engagement, to control the first-named movement of the rod.

10. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a flanged member attached to said rod; a member arranged for movement into and out of engagement with said flanged member, to control the first-named movement of said rod; and mechanism for effecting such movements of the controlling member.

11. The combination, with a valve; of an operating rod therefor; means tending to move said rod in one direction; current-pulsation operated means for moving said rod in the other direction; a flanged member attached to said rod; a member arranged for movement into and out of engagement with said flanged member, to control the first-named movement of said rod; and mechanism operated by said rod consequent upon the second named movement of the same for effecting such movements of the controlling member.

12. The combination, with a valve; of a weight-controlled operating rod therefor; fluid-pulsation operated means for actuating said rod; a ratchet wheel operated by the actuation of said rod and provided with releasing and retaining notches; and a pawl engaging said notches and adapted to release and retain said rod consequent upon such engagement.

13. The combination, with a gas chamber having an inlet opening and a plurality of outlet openings; of a diaphragm arranged in said chamber; a weight-controlled operating rod to which the diaphragm is directly connected, said rod being actuated by the pulsations of the gas admitted into said chamber against said diaphragm; a valve attached to the inner end of said rod for closing one outlet opening; a lever pivoted within said chamber and provided with a valve for closing a second outlet opening; means engaged with said lever for normally holding the second valve closed; and means attached to said rod for rocking said lever when the rod is actuated, to open said second valve.

14. In an apparatus of the class specified, and in combination, a gas chamber; a diaphragm arranged therein; a spring-controlled lever pivoted in said chamber; an outlet valve carried by said lever; a guided operating rod connected to said diaphragm and provided with a shoulder adapted to engage said lever; an outlet valve on the inner end of said rod; a flanged trip collar on the outer end of the rod; and retaining and releasing means operating with said trip collar to alternately open and close said valves.

15. In an apparatus of the class specified, and in combination, a gas chamber; a pressure-operated diaphragm therein; gas outlet valves in said chamber; a rod connected to said diaphragm for operating said valves; a flanged trip collar on the rod; a pawl lever operatively engaged with said collar; a ratchet wheel operated by said lever and provided with notches of different depths; and a pawl engaged with the said notches

and arranged to retain and release said collar, for controlling the operation of said rod.

16. In an apparatus of the class specified, and in combination, a gas chamber; a pressure-operated diaphragm therein; a spring-controlled lever pivoted in said chamber; an outlet valve carried by said lever; a guided operating rod connected to said diaphragm and provided with a shoulder arranged to engage said lever; a gas outlet valve on the inner end of said rod; a flanged trip collar on the other end of said rod; a rotatable ratchet wheel having retaining and releasing notches; a spindle on which said wheel is mounted; a pawl engaging said notches; and a pawl lever for operating said wheel, said pawl lever consisting of an arm adapted to engage said flanged trip collar and loosely journaled on said spindle, and a pawl on said arm in engagement with said wheel.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

NORMAN SINCLAIR McNAB.
JOSEPH SELBY LINK.

Witnesses:
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EDWARD N. WATERS.