No. 681,842. Patented Sept. 3, 1901.

# E. F. BANFIELD.

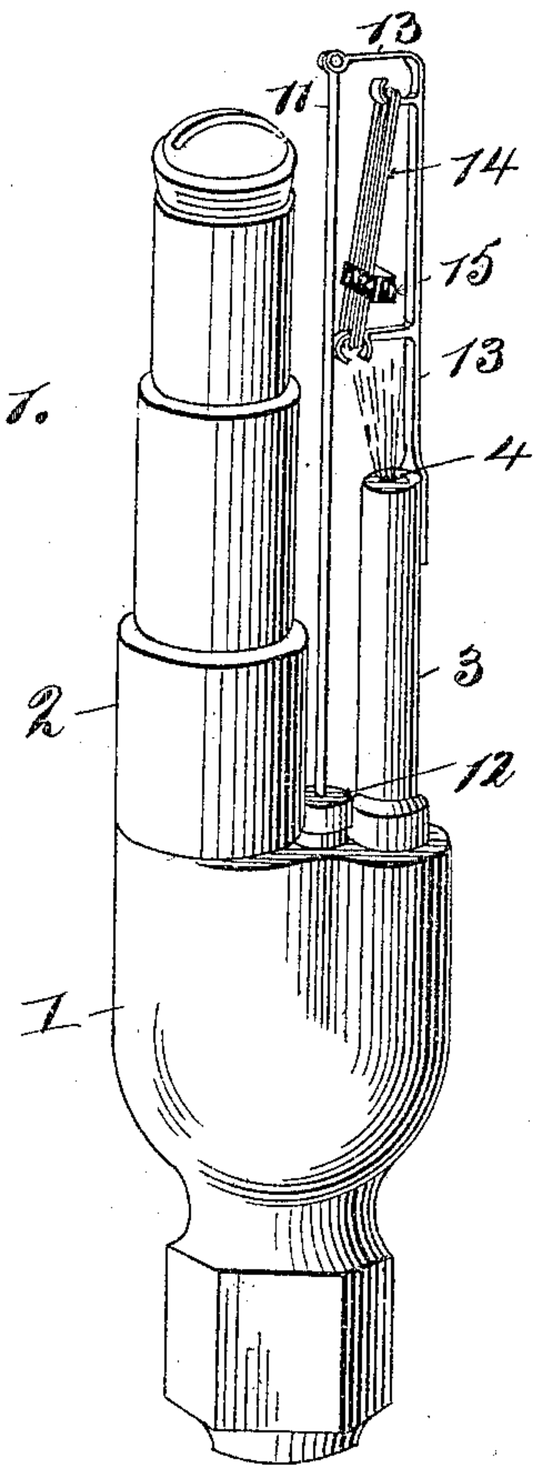
## LIGHTING DEVICE FOR GAS BURNERS.

(Application filed Oct. 11, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



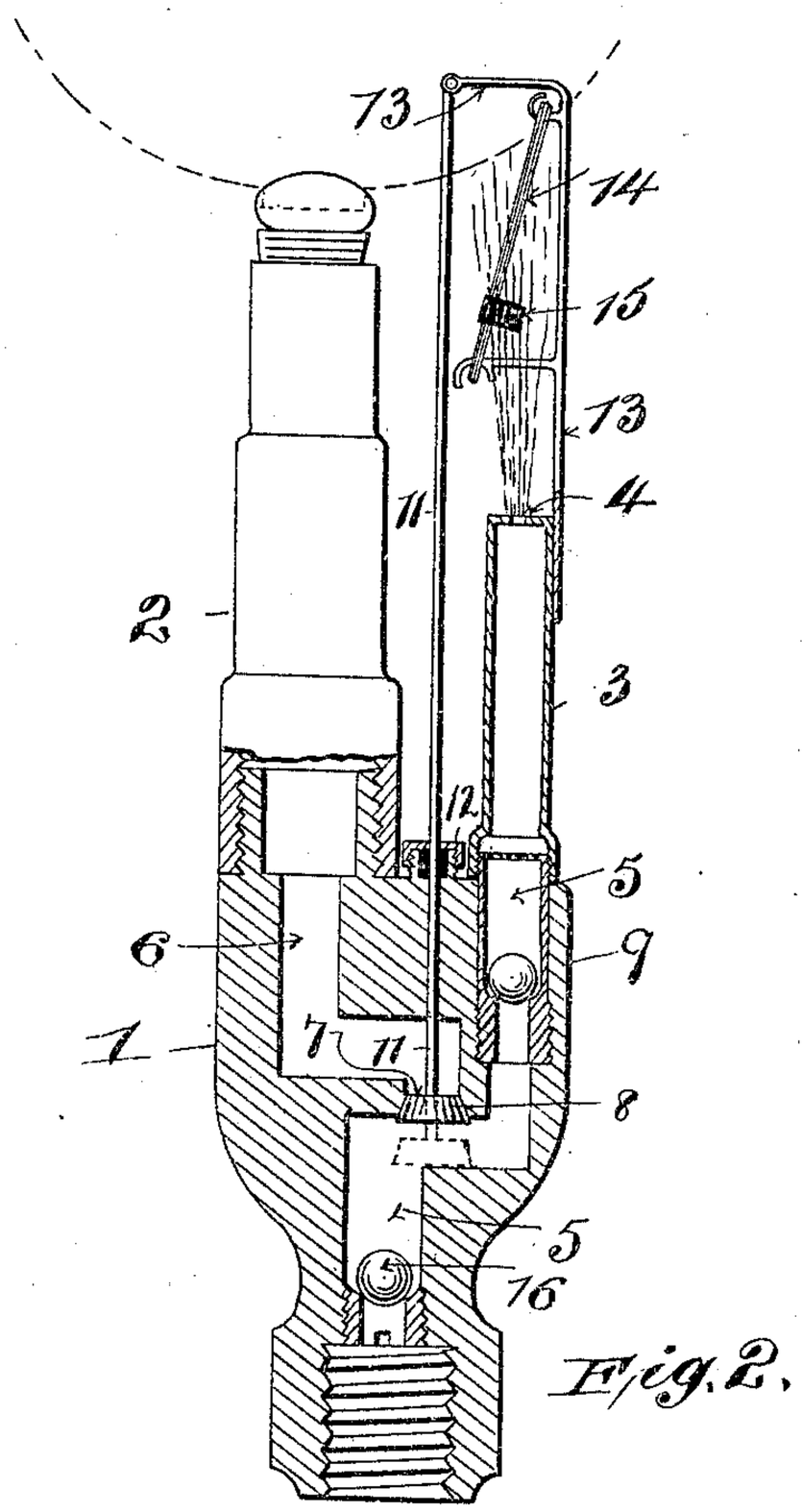
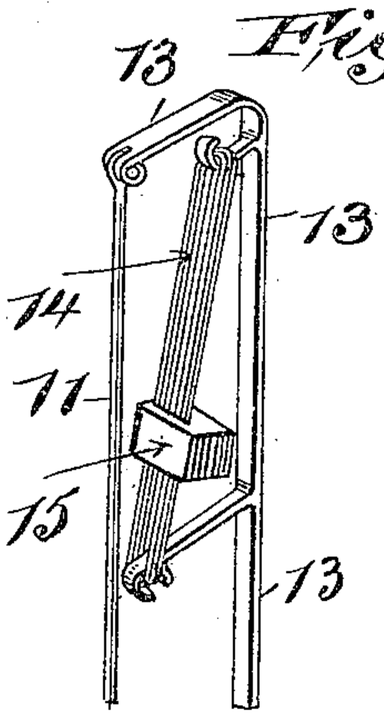




Fig. 2.

Fig. 3.



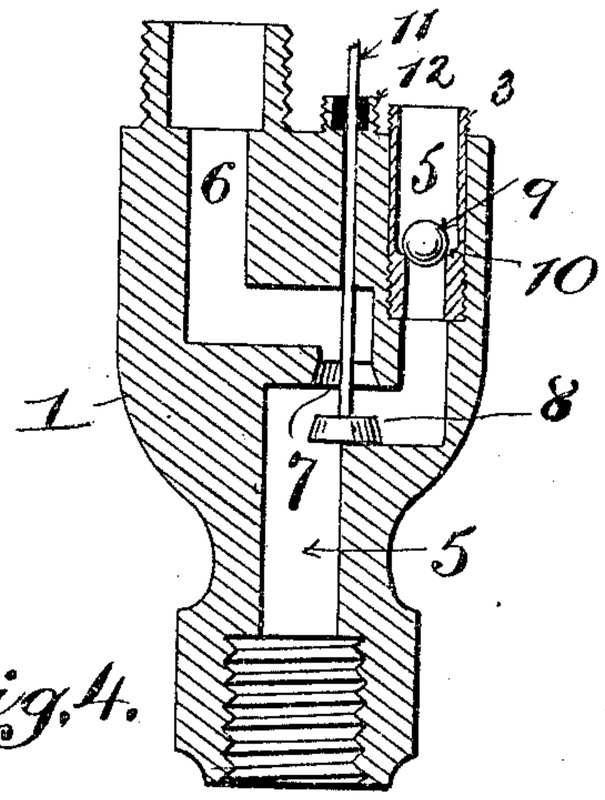




Fig. 4.

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## LIGHTING DEVICE FOR GAS BURNERS.

(Application filed Oct. 11, 1900.)

(No Model.) 2 Sheets—Sheet 2.

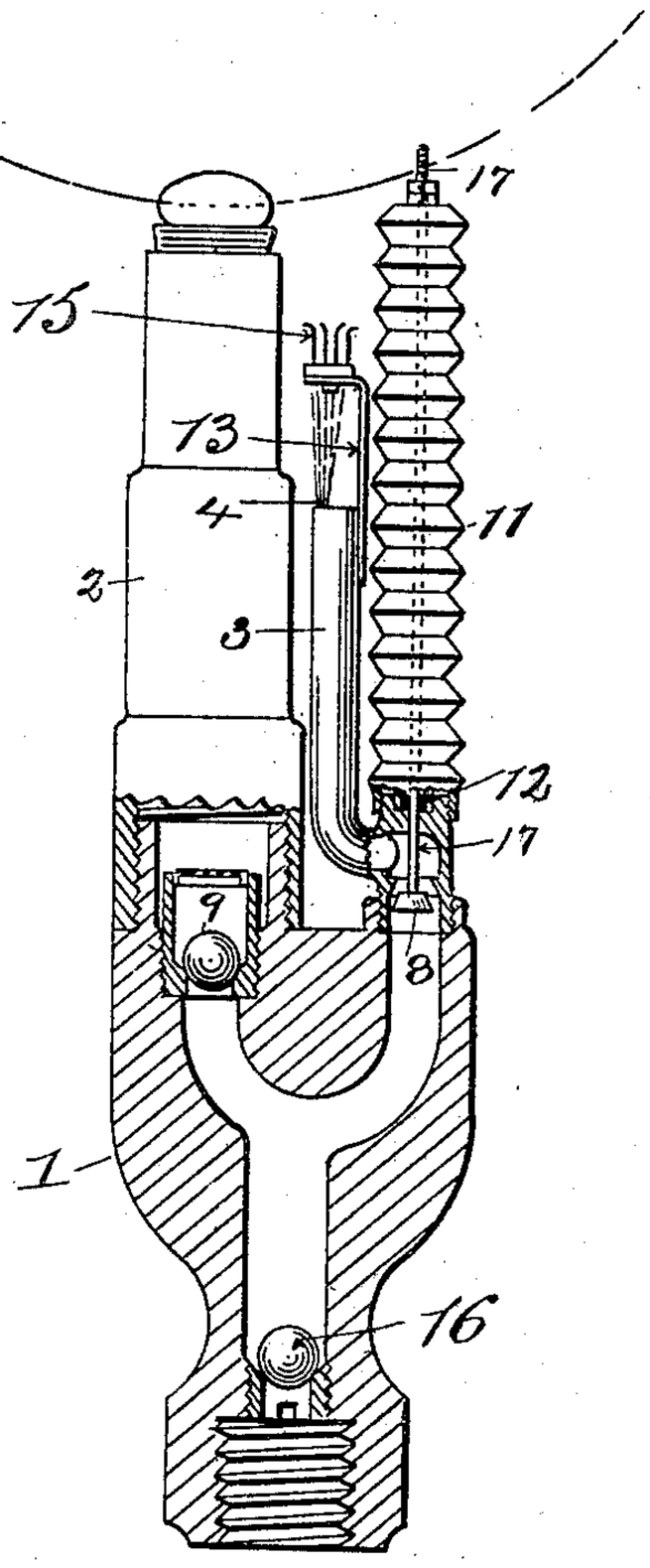


Fig. 5.

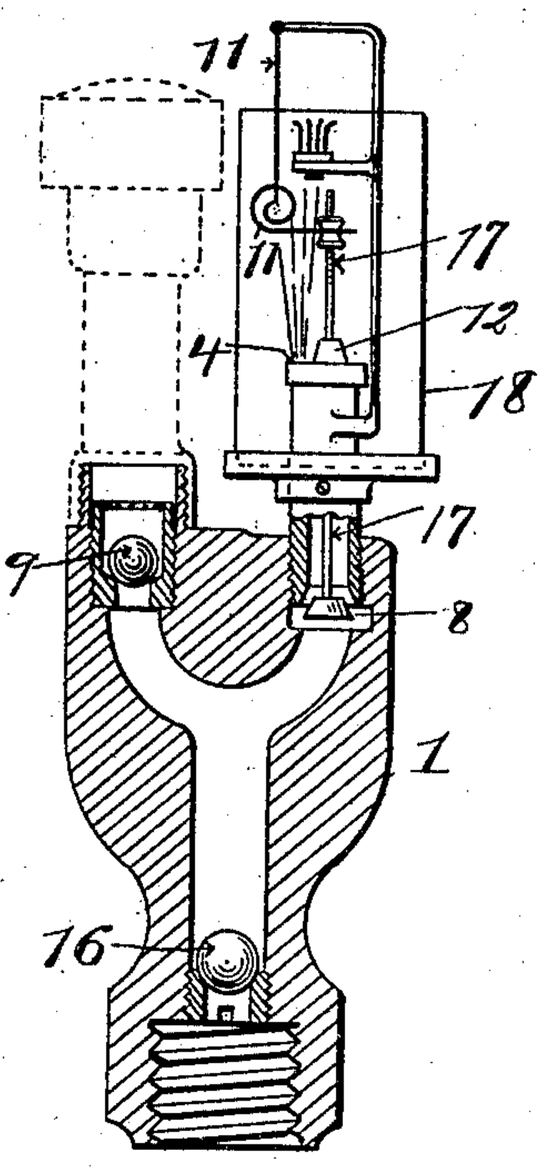


Fig. 6.

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# UNITED STATES PATENT OFFICE.

EDWIN F. BANFIELD, OF NEW YORK, N. Y.

## LIGHTING DEVICE FOR GAS-BURNERS.

SPECIFICATION forming part of Letters Patent No. 681,842, dated September 3, 1901.

Application filed October 11, 1900. Serial No. 32,663. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN F. BANFIELD, a citizen of the United States of America, and a resident of the borough of Manhattan, city of New York, State of New York, have invented certain new and useful Improvements in Lighting Devices for Gas-Burners, of which the following is a specification.

This improvement relates to that class of gas-lighting devices in which the gas is ignited by contact with an igniting material and which have a separate igniting-burner; and the object of the invention is to produce a lighting device applicable to all gas-burners for illuminating or heating purposes, which will be simple in construction and efficient in operation and in which the gas will be lighted instantly as soon as the gas-cock is opened and if blown out or accidentally extinguished will be immediately relighted without permitting the escape of gas into the room, and, further, in which if the gas is turned down or reduced below its igniting-pressure it will be automatically and effectively shut off and its escape prevented; and the improvement consists in the constructions and combinations set forth in the claims herewith.

In the accompanying drawings, forming part of this application, Figure 1 is a view of a complete gas-burner with my improved lighting device. Fig. 2 is a vertical sectional view of the construction shown in Fig. 1. Fig. 3 is a detail showing the igniting material. Fig. 4 is the same as Fig. 2, showing the valve open and the safety-valve omitted. Fig. 5 is a vertical section of a burner, illustrating a modified construction of the lighting mechanism; and Fig. 6 is a view showing a modification and the application of the lighting mechanism to an incandescent burner.

The drawings illustrate the construction of my invention which I deem preferable; but I do not wish to limit myself to the exact form and arrangement of the mechanism shown, as the construction and arrangement of the parts may be varied without departing from the spirit of my invention.

In the construction shown in Figs. 1 to 4, 1 is a base which connects with the gas-pipe in the usual manner and to which any form of gas-burner 2 is attached. From the top of the base alongside of the main burner 2 extends a small igniter-burner 3, having a hole 4 in its upper end where the gas is lighted by the igniting material. In the base 1 are channels 5 and 6 connecting, respectively, with the igniter-burner and with the main burner. These two channels communicate with each other within the base through an opening 7 controlled by a valve 8. The arrangement and operation of this valve 8 are such that when the valve is closed the communication between the channels is shut off and the gas is confined to the channel 5 and passes through this channel to the igniter-burner, and when the valve is opened the communication is established between the channels and the gas passes from the channel 5 into the channel 6 and so to the main burner 2. In the channel 5 is a second valve 9, which controls the passage of gas to the igniter-burner. As shown, this valve consists of a metallic ball which rests by its own weight on its valve-seat. As the gas passes through the channel 5 its pressure raises the valve 9 from its seat, permitting the free passage of the gas, but the moment the pressure of the gas on the bottom of the ball decreases the ball drops by its own weight into its seat and closes the passage. The valve 9 therefore acts automatically by gravity to shut off the flow of the gas through the channel. The valve 8 between the channels 5 and 6 is opened and closed by thermostatic mechanism or mechanism operated by the heat of the igniter-flame and of the main flame. Connected to the valve 8 is a rod 11, which passes through the base 1 and through a stuffing-box 12 on top of the latter and is attached at its upper end to a support 13, fastened to the igniter-tube 3. This rod 11 is situated so as to receive the heat from both the igniting-flame and the main flame, and is composed of a material readily responsive to the action of heat and cold. When the rod is heated, its expansion causes it to elongate, and, as will be seen from Fig. 2, as it is fastened at its upper end its lower end must move downward, and hence the elongation of the rod pushes the valve 8 down away from its seat, thus opening the aperture 7 between the channels. As the rod cools after the flames have been extinguished it contracts

and draws up the valve 8 against its seat, closing the opening. Attached to the support 13 is the igniting material, in position to be acted upon by the flow of gas from the orifice 4 in the igniter-burner 3. As shown enlarged in Fig. 3, the igniting mechanism consists of a series of fine platinum wires 14, held on suitable supports at an angle with the igniter-burner, so that a portion of the wires will always be in the zone of the gas, and thus insure the lighting of the latter. The lighting material 15 is attached to the wires at the proper distance above the gas-orifice 4 and in line with the latter, so that the action of the gas on the material will cause ignition.

The operation of the apparatus is as follows: Before the gas-cock is opened and the burners are lighted the valve 8, by reason of the contraction of the rod 11, is drawn up against its seat and the gravity-valve 9 rests on its seat in the channel 5. It will thus be seen that both the valves controlling the passage to the main burner and to the igniter-burner are closed. When the gas-cock is opened, the flow of gas restricted to the channel 5 raises the valve 9, and passing through the igniter-burner and out through the orifice 4 acts on the igniting material 15 and causes the igniting of the igniter-flame in the usual manner. The heat of this flame at once acts on the rod 11, causing it to elongate and move the valve 8 slightly from its seat. A small stream of gas now passes from the channel 5 to the channel 6 and out through the main burner, where it is lighted by the igniter-flame. As the igniter-flame is a small one its action on the rod 11 is at first slight and the movement of the latter gradual, the valve 8 therefore at first opening just sufficient to allow enough gas to pass through the main burner to be ignited. The continued action of the heat on the rod 11 causes the rod to elongate to its full extent and moves the valve 8 entirely from its seat. The flow of gas, following its usual law, now seeks and follows the unrestricted passage through the opening 7 to the channel 6 and main burner instead of the passage through the opening 10, restricted by the weight of the valve 9, and the latter valve, relieved of the pressure of the gas under it, drops down on its seat, shutting off the passage of gas through the channel 5 and extinguishing the igniter-flame. As long as the main flame continues burning its heat acting on the rod 11 holds the valve 8 open, permitting the free passage of gas to the burner and insuring the valve 9 remaining on its seat. In case the main flame is accidentally extinguished—as, for instance, if it is blown out—the rod 11, no longer acted upon by the heat, at once contracts, closing the valve 8. The gas, now restricted to the channel 5, raises the valve 9 and, passing through the igniter-burner, is ignited and, as before described, opens the valve 8 and relights the gas in the main burner. The gas is thus at once relighted as often as extinguished while the gas-cock is open. When the gas-cock is closed and the gas extinguished, it will be seen that the channel 5 is closed by both valves to the outer air and the air therefore prevented from entering the channel, thereby insuring a more quick passage of the gas when the cock is open.

In the modified construction shown in Fig. 5 the position of the valves 8 and 9 is reversed. The automatic gravity-valve 9 controls the passage of the gas to the main burner, and the thermostatic-operated valve 8 controls that to the igniter-burner. The latter valve 8 is raised by the heat of the igniting-flame acting on the heat-operating mechanism, thereby closing the passage of the gas to the igniter-burner and causing the flow of gas to be directed against the gravity-valve 9 and raise the latter. In the form of the apparatus shown in Fig. 5 the mechanism 11, operated by the heat of the two flames, is in the form of a corrugated or bellows-formed column of suitable metal fastened at the bottom and free to elongate upward when heated. Attached to the top of this expanding column 11 and extending down through it is the valve-stem 17, connected to the valve 8. As will be seen, as the column expands under the influence of the heat of the flame the valve is raised by the valve-stem and drawn up against its seat. The stem 17 is attached to the top of the column in such a manner that the movement of the valve 8 may be adjusted and the passage of gas to the igniter-burner suitably controlled with respect to the movement of the valve 9. The operation of this construction is as follows: Before the gas-cock is opened the several parts of the apparatus are in position, as shown in Fig. 5, the gravity-valve 9 is on its seat, shutting off the passage of gas to the main burner, and the valve 8 is down away from its seat and the passage to the igniter-valve open. When the cock is open, the gas flows by the valve 8 and into the igniter-tube 3 and is lighted in the manner before described. The heat of the igniter-flame now acts on the metal column 11, causing it to elongate and raise the valve by the valve-stem. As the valve 8 is slightly raised the flow of gas into the igniter-tube is checked and its energy transferred to the valve 9, which is raised from its seat to allow enough gas to pass into the main burner to be lighted by the igniter-flame. The column continuing to expand or elongate, the valve 8 is drawn up against its seat and closed and the passage of gas to the igniter-burner shut off. At the same time the flow of gas has raised the valve 9 from its seat and has opened the full passage into the main burner. In case the gas-flame is accidentally extinguished while the gas-cock is opened the column 11 at once cools and pushes the valve 8 down from its seat, thereby opening the passage to the igniter-burner. The gas at once seeks and follows the unrestricted passage thus opened by

the valve 8 to the igniter-burner, and is lighted and relights the main burner, as before.

In all gas-lighting devices employing an igniting material which when acted upon by the flow of gas produces ignition a certain definite pressure of gas on the material is necessary to cause the ignition of the gas. This I term the "igniting-pressure." If the pressure of gas is below this igniting-pressure, no ignition takes place, although the gas continues to flow through the igniter-burner. It frequently occurs that the pressure of gas from the burner varies and sometimes may be reduced below the igniting-pressure, particularly if the flame of the main burner is turned down by the stop-cock. In such cases if the gas-flame of the main burner is extinguished, as if accidentally blown out, as the pressure of gas is below the igniting-pressure necessary to produce ignition on the igniting material, the gas will not be relighted, but will continue to pass and escape from the igniter-burner. In the construction of the improvement herein shown in Figs. 1 to 4 this escape of the gas when below the igniting-pressure is rendered impossible by reason of the valve 9 which controls the passage to the igniter-burner being normally closed when the gas-flame is extinguished and from the fact that the pressure of gas necessary to raise this valve must be greater than the igniting-pressure. Hence with this construction if the pressure of gas is reduced below the igniting-pressure and the gas-flame accidentally extinguished, as the valve 8 to the main burner is closed by the thermostatic device and the valve 9 to the igniter-burner is closed and held on its seat by its own weight, the gas will be prevented from escaping through either burner, although the stop-cock remains open. In the modification of this improvement shown in Fig. 5, in which the valve to the igniter-burner is operated by the thermostatic device and in which, therefore, the valve is normally open when the gas-flame is extinguished, I prevent this escape of gas when below the igniting-pressure by means of an additional or safety valve 16 in the lower part of the channel 5. This valve in the form shown consists of a ball of suitable metal resting by gravity on its valve-seat and raised by the passage of gas through the channel. The weight of this ball or valve 16 should be graduated according to the igniting-pressure or the degree of pressure of gas necessary to produce ignition, so that the pressure of gas which will cause ignition by contact with the igniting material will be sufficient to raise the valve 16, and the latter will remain closed on its seat by any pressure below such igniting-pressure. Hence if the pressure of gas passing through the gas-pipe is less than that required to produce ignition the passage of the gas will be at once shut off by the valve 16, and if the gas-flame in the main burner is turned down below the necessary igniting-pressure the valve 16 at once closes the passage and prevents the escape of any gas. This safety-valve 16 thus insures under all circumstances that the gas passing through the gas-cock is sufficient to cause ignition and to light the burner. It will be readily understood that this safety-valve may be applied to all gas-lighting burners, no matter what their construction and operation or whether having a separate igniter-burner or not, that use an igniting material. Fig. 6 illustrates the application of this improvement to an incandescent burner and also shows the employment of a common form of thermostatic device for operating the valve. As there shown, the end of the thermostatic coil 11 raises under the influence of the heat of the flames and draws up the valve by the valve-stem. The figure shows the valve controlling the passage to the igniter-tube as operated by this thermostatic coil; but it is evident that the thermostatic device shown in Fig. 6 may be applied to either valve. If desired, the corrugated or bellows-formed column shown in Fig. 5 may be applied in the form of construction shown in Figs. 1 and 2 to operate the heat-controlled valve 8. In this case it is evident the valve would be raised to open the passage in place of being lowered. In Fig. 6 is shown a small mica chimney 18, which surrounds the igniting material and protects it from drafts and from injury. In this improvement, as will be understood from the foregoing, only one of the valves controlling the passage of the gas to the burners is operated by mechanism affected by the heat of the flame, the other valve being automatic and operated entirely by the flow of the gas itself and by gravity, and, furthermore, in the construction shown in Figs. 1 and 2 both of the valves controlling the passage of gas to the igniter-burner and to the main burner are normally closed while the burner is inactive. By reason of this construction and operation this gas-lighting device is particularly adapted to use with gas-burners for heating or burners in gas stoves and ranges, and the use of the safety-valve, which prevents the passage of gas through the burner below the pressure necessary to effect lighting with the igniting material, prevents all escape or leaking of the gas when the gas-cock is open.

What I claim is—

1. In a gas-lighting device, in combination, a main burner; an igniter-burner; a gravity-valve; a heat-controlled valve; and means operated by the heat of the flame whereby the heat-controlled valve is opened and closed, substantially as described.

2. In a gas-lighting device, in combination, a main burner; an igniter-burner; a valve, normally closed, controlling the passage to the igniter-burner; a second valve, normally closed, controlling the passage to the main burner; and means operated by the heat of the flame whereby the valve to the main

burner is opened when the igniter-flame is lighted, substantially as described.

3. In a gas-lighting device, in combination, a main burner; an igniter-burner; a gravity-valve controlling the passage to the igniter-burner; a heat-controlled valve, controlling the passage to the main burner; and means operated by the heat of the flame whereby the heat-controlled valve is opened and closed, substantially as described.

4. In a gas-lighting device, in combination, a main burner; an igniter-burner; a gravity-valve; a heat-controlled valve; means operated by the heat of the flame whereby the heat-controlled valve is opened and closed, and a valve arranged and adapted to shut off the flow of gas through the burner when below the pressure necessary to produce ignition on the igniting material, substantially as described.

5. In a gas-lighting device having an igniting material, the combination with the burner through which the gas passes to be lighted by the igniting material, and the valve controlling the same, of a second valve arranged and adapted to shut off the passage of gas through the burner when below the pressure necessary to produce ignition on the igniting material, substantially as described.

Signed by me at the city of New York this 9th day of October, 1900.

EDWIN F. BANFIELD.

Witnesses:
FRANCIS J. BYRNE,
DAVID M. WOLFF.