(No Model.) 2 Sheets—Sheet 1.

C. CLAMOND.

SAFETY GAS BURNER.

No. 532,638. Patented Jan. 15, 1895.

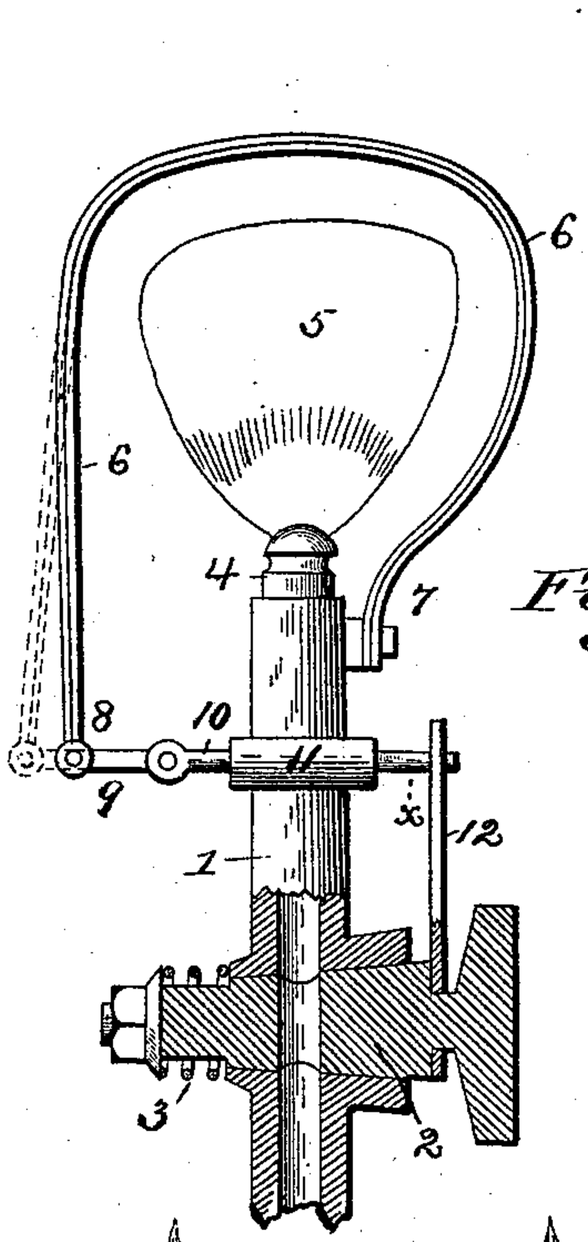


Fig. 1.

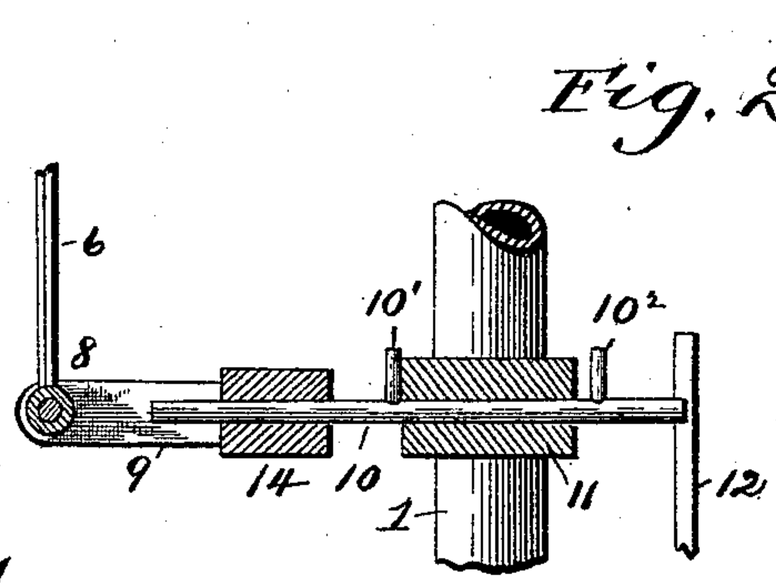


Fig. 2.

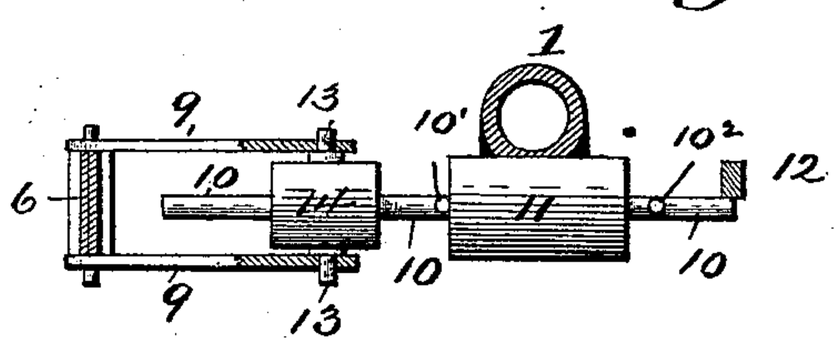


Fig. 3.

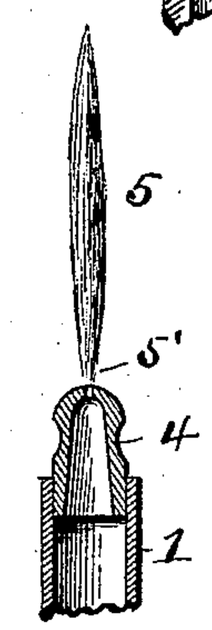


Fig. 4

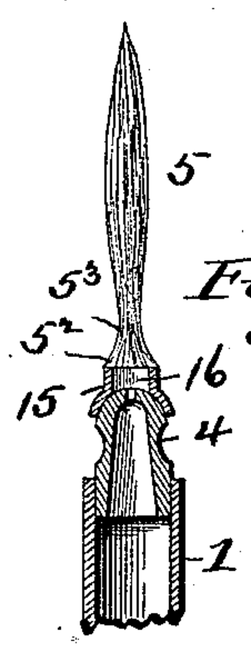


Fig. 5.

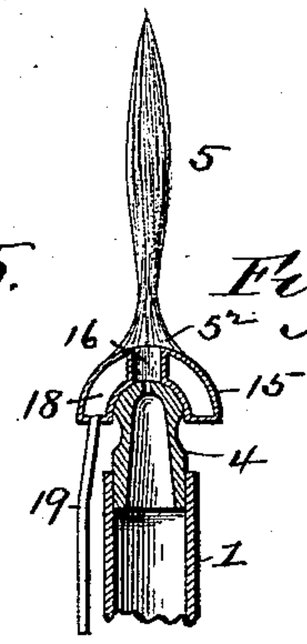


Fig. 6.

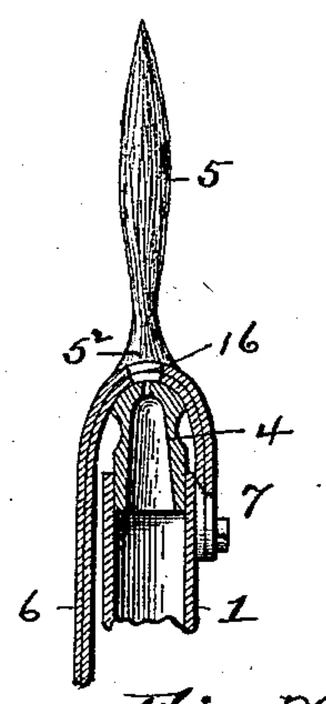


Fig. 7.

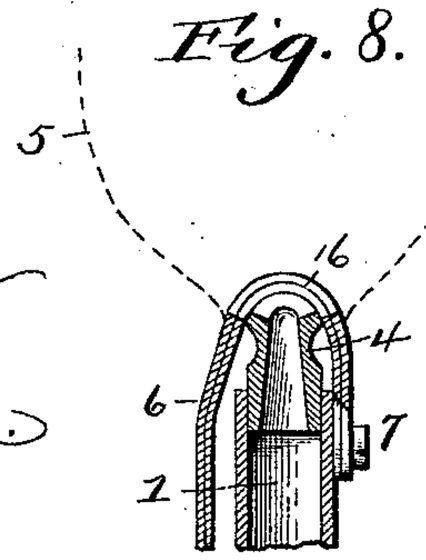


Fig. 8.

Witnesses:
J. B. McGirr.
F. T. Chapman.

Inventor;
Charles Clamond,
By Joseph Lyons,
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

C. CLAMOND.

SAFETY GAS BURNER.

No. 532,638. Patented Jan. 15, 1895.

Fig. 9.

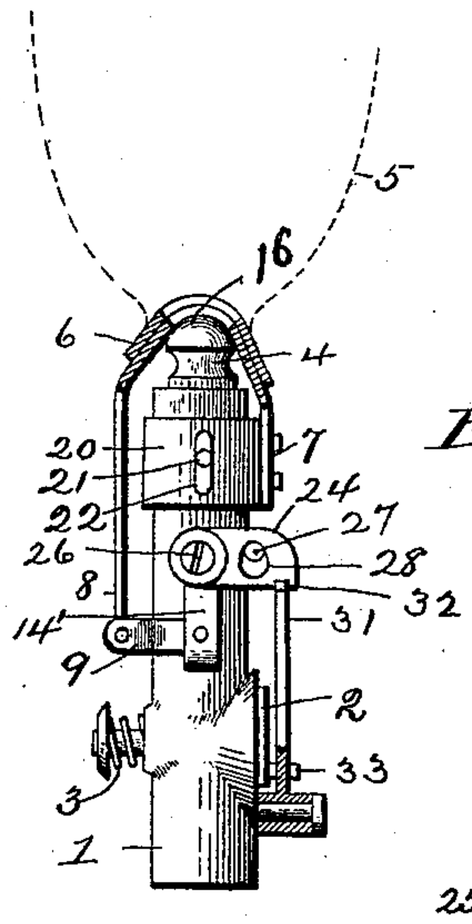


Fig. 11.

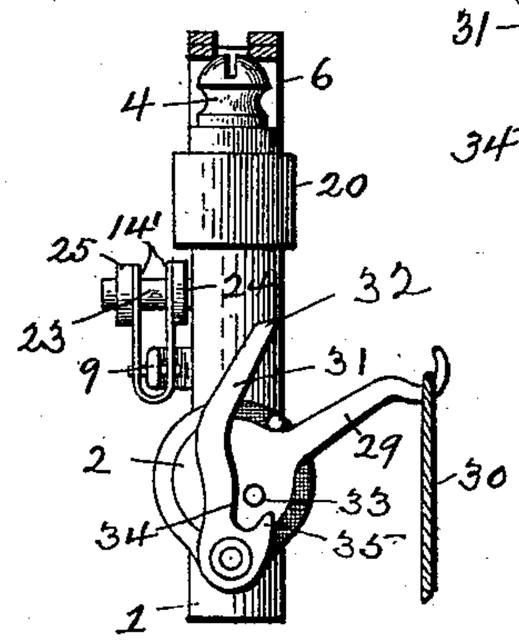


Fig. 10.

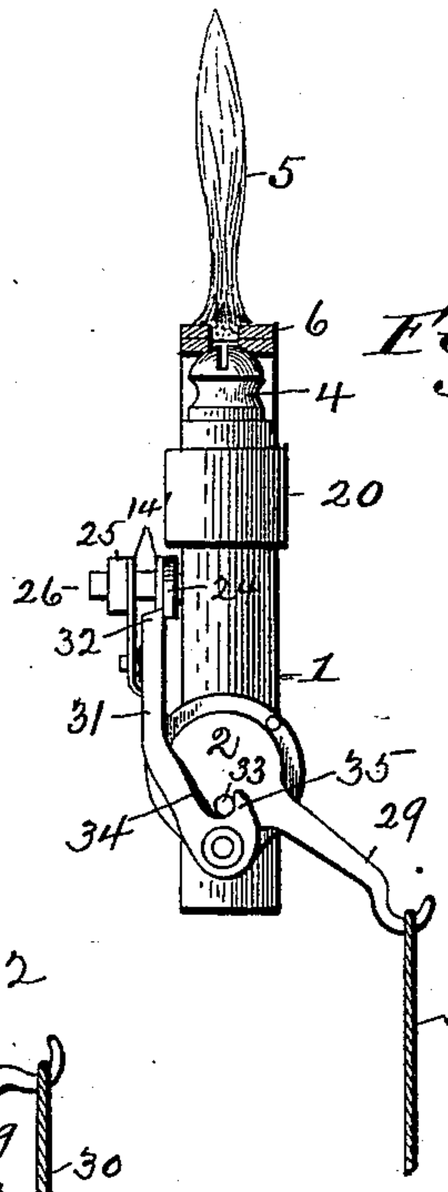


Fig. 12.

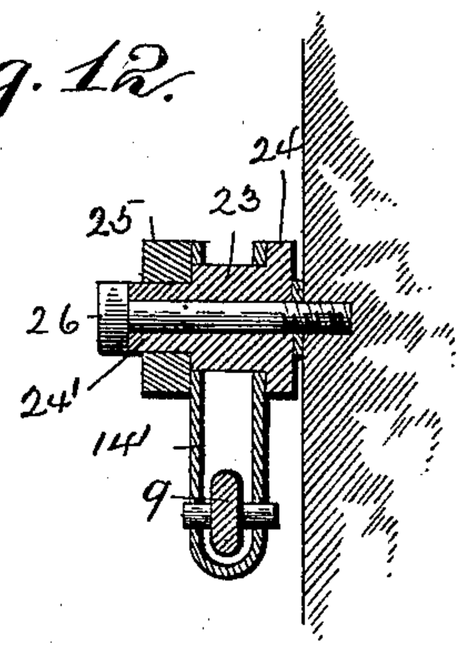
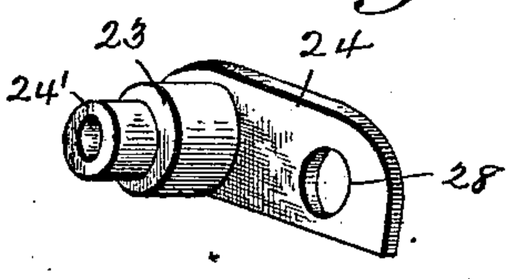


Fig. 13.



Witnesses:

J. B. McGirr.

F. T. Chapman.

Inventor,

Charles Clamond,

By Joseph Lyon.

attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES CLAMOND, OF PARIS, FRANCE.

SAFETY GAS-BURNER.

SPECIFICATION forming part of Letters Patent No. 532,638, dated January 15, 1895.

Application filed September 13, 1894. Serial No. 522,915. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CLAMOND, a citizen of the Republic of France, residing at Paris, in the Republic of France, have invented certain new and useful Improvements in Safety Gas-Burners, of which the following is a specification.

This invention has reference to a safety gas burner, so constructed that when the cock or valve is opened it will be held open by the action of the flame of the gas when the same is ignited, but will be automatically closed when the gas is not ignited, or when, after ignition, the flame dies out for any reason, thus preventing the escape of gas and all the injurious influences resulting therefrom.

It is well known that a great many safety gas burners have been constructed aiming to secure this object, but of all them have certain defects which I shall presently point out and which my invention is designed to overcome.

In the following detail description reference will be had to the accompanying drawings, in which—

Figure 1, is a side elevation partly in section of a common type of safety gas burners upon which my invention aims to improve. Fig. 2, is an elevation partly in section of a safety gas burner embodying one of the principles of my invention, and Fig. 3, is a plan view partly in section of the same. Fig. 4, is a vertical section of an ordinary pin-hole gas burner illustrating the shape of the flame produced thereby. Figs. 5, 6 and 7 illustrate vertical sections of pin-hole gas burners embodying another principle of my invention as adapted to safety gas burners, and Fig. 8, is a vertical section of a bat-wing gas burner embodying the same improvement. Fig. 9, is a side elevation partly in section of a safety gas burner embodying my invention as adapted for commercial use, and Figs. 10 and 11, are end elevations of the same, showing the mechanism in the open and closed positions, respectively. Fig. 12, is a vertical section of the latch mechanism of my commercial form of burner, and Fig. 13, is a perspective view of the latch.

Like numerals and letters of reference indicate like parts.

In order that a clear understanding of my improvement may be obtained, it is necessary to contemplate the general principles upon which safety gas burners have heretofore been made, and in order to facilitate this, a typical but otherwise fictitious gas burner of that kind has been illustrated in Fig. 1. In this figure of the drawings, 1 represents the gas pipe having a cock or valve 2, which, by a spring 3, is normally held in the closed condition. This gas pipe has at its upper end a burner tip 4, which in the present instance is supposed to be a bat-wing tip, giving a flame of the kind indicated at 5. A thermostatic plate 6, composed of two strips of unequally expansible metals is brought within the heating influence of the flame and is, at one end 7, fixed to the burner pipe 1, while its free end 8, is pivoted to a link 9, which in turn is pivotally connected with a sliding rod 10, which passes through a guide 11, into the path of an arm 12, fixed to the valve stem so as to rotate with it. When, in a device of this kind, the gas is not lighted the thermostatic plate is supposed to have the the form indicated in dotted lines, in which case the free end of the sliding rod 10, will be a little distance to the left beyond the left hand side of the arm 12, so that the latter may be moved with the valve to pass the line of movement of the rod 10, when the valve is being opened. In the device as shown in the drawings, the valve is in the open position and the gas ignited. Consequently, in an apparatus of this kind, supposing that the more expansible metal of the thermostatic plate is on the outside, the latter has become more convex, until the free arm 8 is moved to the position shown in solid lines, and consequently the sliding rod 10, has projected beyond the plane of movement of the arm 12, which latter is thereby prevented from turning under the influence of the spring 3. The valve or cock is therefore held open by the action of the heat of the flame upon the thermostatic plate. The defects of a device of this kind are very apparent.

Supposing that the free end of the rod 10, is normally a considerable distance from the plane of movement of the arm 10, say for instance, in a position marked by the letter *x*, and the cock is opened and the gas ignited. It will then be seen that the cock must be

held open by hand until the thermostatic plate has become heated enough to curve sufficiently to bring the free end of the rod 10, beyond the edge of the arm 12. This takes as much as a minute or more, which is a great inconvenience. If the valve is released before the rod 10, has advanced into the path of the arm 12, it will not remain open but will be instantly closed by the spring 3. In order to avoid this difficulty the construction is ordinarily made so that the free end of the rod 10, is very close to, but still on the left side of the path of the arm 12, so that only a short time, say a few seconds, is required to bring the free end of rod 10, into the path of the arm 12; but when this is done another and much more serious difficulty arises, which consists in the continued heating, the continued curving and the continued inward movement of the free end of the plate 6, whereby the rod 10, is projected an unreasonably long distance across the path of the arm 12. This condition is shown in the drawings. It results from this that if now from any reason the flame should go out, the valve cannot be closed by the spring 3, until after the plate 6, has cooled down to its normal temperature and the rod 10 thereby withdrawn from the path of the arm 12. This sometimes takes as much as two minutes of time, and during this time the gas is permitted to escape freely. In addition thereto, by the repeated heating and cooling of the plate 6, the elasticity of the latter and its normal shape are varied in either of two ways: first, it may happen that the normal shape of the thermostatic plate becomes such as to bring the free end of the rod 10 a considerable distance away from the plane of movement of the arm 12, so that it now requires a still longer time, after lighting the gas, before the valve will be kept automatically open; and second, it may happen that the changed normal condition of the plate 6, will bring the free end of rod 10, into the path of the arm 12, in which case the valve cannot be kept open at all. These are the main, but by no means all the defects, inherent in the ordinary safety gas burners heretofore made, and I shall now explain the manner in which I overcome these defects by my improvement.

Referring to Figs. 2 and 3, it will be seen that the free end of the thermostatic plate 6, is pivoted to two parallel links 9, 9, to which in turn is pivoted, by the trunnions 13, the block 14, which hereinafter will be referred to as the "friction block." This friction block has a central bore through which the sliding rod 10, passes, and is held therein by gentle friction. The friction may be secured in any suitable and well known manner, as for instance, by a close fit or by a spring, or by making either the block or the rod 10, a permanent magnet while the other part is made of soft iron. The sliding rod 10, also passes through the guide block 11, with no appreciable friction, and it has fixed to it very near the points where it emerges from the guide block, the stop-pins $10'$ and 10^2, respectively, so that the distance between the two stop-pins is only a very little greater than the length of the guide block 11. The normal position of the sliding rod 10, is such that the stop pin 10^2, abuts against the guide block, and then the right hand end of the rod 10, just clears the plane of movement of the arm 12, so that the cock or valve can be opened. If now the valve is opened, the gas ignited and the thermostatic plate 6, is heated by the flame, its free end 8, will move toward the right thus impelling the links 9, the friction block 14, and the sliding rod 10, which is held therein frictionally, toward the right, since the rod 10, moves without perceptible friction through the guide block. This movement will continue until the stop-pin $10'$, comes in contact with the left hand end of the guide block, and by this time the free end of the rod 10, will have passed beyond the plane of the adjacent surface of the arm 12, so that the cock or valve will now be held open and prevented from closing by the action of the spring 3. For this purpose only an exceedingly small movement of the rod 10, is required, a movement which, by the heating action of the flame upon the thermostatic plate, is produced in a very few seconds. A continued heating and consequent curving of the thermostatic plate has no effect upon the sliding rod 10, since the same is stopped from further movement toward the right; but the friction block 14, now moves over the rod 10, until the thermostatic plate 6, has reached its highest temperature. If now, for any reason, the flame should become extinguished, the thermostatic plate 6, would at once begin to cool and its free end 8, would move toward the left, taking with it the links 9, the friction block 14, and the sliding rod 10, which would thus pass out of the path of the arm 12, until the stop-pin 10^2, comes in contact with the right hand end of the guide block 11. This movement is effected in a very few seconds so that no appreciable amount of gas can escape, since the very instant when the rod 10, has passed the plane of the left hand face of the arm 12, the cock or valve is shut by the spring 3. The continued cooling of the plate 6, has no effect upon the sliding rod 10, as will now be readily understood. All that happens is that the link with the friction block 14, is drawn farther toward the left. It is thus clear that by the interposition of the friction coupling between the rod 10, and the thermostatic plate the movement of the rod 10, (which here assumes the function of a latch,) is limited in both directions by the stop-pins $10'$, and 10^2. This movement may be made as small as desired, so that any appreciable heating or cooling of the thermostatic plate will produce the maximum movement of the latch, thus locking or releasing the cock or valve instantaneously. This is one of the important characteristics of my invention and the same is applicable to numer-

ous other devices than safety gas burners, and in fact everywhere where by changes of temperature a certain definite movement, neither more or less, is required.

If this invention is applied to safety gas burners, the thermostatic plate must be placed under the influence of such part of the flame which remains particularly constant whatever the size of the flame may be. This will be readily understood if it is considered that if the plate 6, were arranged with reference to the flame in the manner shown in Fig. 1, any reduction of the flame such as may be caused by a momentary decrease of gas pressure, would cool the plate 6, sufficiently to cause a movement of its free end 8, and the gas would instantly and untimely be cut off in the manner hereinbefore described. On the other hand, if the gas pressure should momentarily increase above the normal and then again drop down to normal, the cooling of the thermostatic plate at the drop of pressure would again instantly cut off the gas. It is thus impracticable to place the thermostatic plate with reference to the flame in such position that the heating of the same is dependent upon the size of the flame. To work well the thermostatic plate, when connected to the latch by a friction coupling, must be heated equally whether the flame is large or small and this result is secured by the second part of my invention, which I shall presently describe.

In Fig. 4, is represented an ordinary pin-hole gas burner giving a flame shaped similar to that of an ordinary candle, that is to say, the portion of the flame nearest to the opening is contracted as shown at $5'$.

In Fig. 5, the burner tip 4, is shown as provided with a cap 15, forming a small expansion chamber 16, which when the cock is opened is filled with gas and prevents the access of air; the gas therefore comes to combustion at the upper edge of the cap 15, so that the flame spreads over and covers the upper edge of the cap as indicated at 5^2. Immediately above this point the flame is contracted, as indicated at 5^3, and then again swells out and finally terminates in a point, the same as the flame in the ordinary pin-hole burner. The portion 5^2 of the flame, which will hereinafter be called the expanded base of the flame, remains practically constant whatever the gas pressure may be and constitutes a heating agent which is independent of the fluctuations in the size of the flame proper. It will now be understood that if the thermostatic element used in connection with a safety gas burner is exposed to the heating influence of the expanded base of the flame produced by the expansion chamber 16, it will act promptly when the gas is lighted no matter how small the flame may be, and will remain indifferent to variations in the size of the flame.

My invention, therefore, comprises among other things, a safety gas burner, the thermostatic element of which is exposed to the heating influence of a practically invariable expanded base of the flame. This part of my invention is useful whether it is coupled with the mechanism for limiting the movement of the latch, described with reference to Figs. 2 and 3, or whether it is used in connection with any other safety gas burner mechanism. It is immaterial in this connection whether the thermostatic element consists of metal or any other material. Thus for instance in Fig. 6, I have shown an embodiment of this part of my invention in which the thermostatic element is a fluid. In this case the cap 15, has a closed receptacle 18, which may contain either a gas or liquid, and in addition thereto it is formed with the expansion chamber 16, upon the upper edge of which the permanent base 5^2 of the flame is formed, and which, heating the fluid within the receptacle 18, expands the same and causes it to act upon the latch for locking or releasing the spring actuated valve or cock. For this purpose a small pipe or tube 19, is led from the receptacle 18 to the latch controlling mechanism.

In Fig. 7, the thermostatic element is represented as composed of two unequally expansible metallic plates 6, one end 7, of which is fast on the gas pipe 1, and is then curved over and in contact with the burner tip and has an expansion chamber 16 coincident with the pin-hole opening in the tip. In this case the permanent base 5^2 of the flame heats the metallic strips composing the thermostatic element, the free end of which, it will now be understood, is connected with links 9, 9, substantially in the manner shown in Figs. 2 and 3, or with any other mechanism which embodies the same fundamental principle.

In Fig. 8, the burner tip 4 has a slot instead of a pin-hole, and thus furnishes a bat-wing flame. Consequently the expansion chamber 16, formed in the thermostatic plate 6, is in this case shaped to conform to the slot, that is to say, to surround the burner slot. In all other respects the construction is the same as that shown in Fig. 7.

For the practical embodiment of my invention I have devised a structure which is illustrated with reference to Figs. 9 to 13, inclusive.

In the construction shown in these figures the thermostatic portion of plate 6 is reduced in length, as shown, since it is unnecessary to extend it much beyond the portion directly heated by the flame. The expansion chamber 16 is formed in the middle of the thermostatic portion of plate 6, and the end 7 of this plate is secured to a collar 20, which freely slides on the burner pipe, but is secured against accidental displacement on the same by a pin 21, projecting from the burner pipe into a slot 22, formed in the collar. The thermostatic plate thus rests by gravity upon the burner tip and any longitudinal movement of the side terminating in the end 7 will

be taken up by the movement of the collar and consequently there will always be a tight fit between the thermostatic plate and the burner tip so that no air can enter the expansion chamber from below. The other end 8 of the thermostatic plate is connected by a link 9, to the lower end of a U-shaped spring 14′, which as will presently be seen performs the function of the friction block 14 of the structure shown in Figs. 2 and 3. The upper ends of the two arms constituting the U-shaped spring are perforated and receive a hub 23 projecting laterally from one end of a latch 24, which latter, as will presently be seen, performs the function of the sliding rod 10. The hub 23, has a reduced axial extension 24′, on which is secured in any suitable manner, a washer 25, confining the two arms of the spring 14′ between it and the latch, which latter is secured to the burner by a screw 26 passing centrally through the hub. The spring 14′ is so constructed that the two arms tend to move outwardly when confined between the latch and the washer 25, so that they bear with more or less friction against the same, but if the latch be held against movement a spring may be moved around the hub as a center. The latch has its movement around the screw 26, limited by a pin 27, rising from the burner and entering a slot 28 formed in the latch.

The cock or valve 2 is provided with a laterally extending arm 29, to which is attached a cord 30, or other means for turning the valve from the closed position indicated in Fig. 11 to the open position shown in Fig. 10, against the action of the spring 3. Extending across the face of the valve is an arm 31, pivoted to the burner below the valve and of such length that its upper end 32, when the arm is moved on its pivot, will strike the lower edge of the latch 24. This upper end of the arm is beveled so that it will raise the latch and ride under it when moved in the proper direction. The movement of the arm from the position shown in Fig. 11, toward that shown in Fig. 10, is effected by the movement of the valve toward the open position. On the face of the valve is a pin 33, placed eccentrically, and as the valve is turned toward the open position this pin engages a shoulder 34, on the arm 31 and thereby moves the latter around its pivot until its upper end 32 has passed under the latch. It will be understood that the latch being held with some friction by the spring 14′ will remain in the raised position and as the gas will now be turned on it is only necessary to light the gas in order that the thermostatic plate will, by means of the link 9 and spring 14′, lower the latch into the path of the upper end 32 of the arm 31 and thereby prevent the latter from returning to its first position. On the arm 31 opposite the shoulder 34 is a tooth 35, separated from the shoulder by a slight recess into which the pin 33 passes when the valve is turned to the open position, and this tooth 35 prevents the return of the valve to the closed position, under the action of the spring 3, by engaging the pin 33.

Should the gas light become extinguished the thermostatic plate on cooling will lift the latch from out the path of the arm 31 and the pin 33, which engages the tooth 35, will then throw the arm to the position shown in Fig. 11, and the valve will be free to return to the closed position under the stress of the spring 3.

In the commercial structure here described the movement of the latch is limited by the length of the slot 28, which may be very short while the thermostatic plate may move through a considerable distance since the spring 14′, will move on the hub 23 of the latch when the latter is stopped in either the raised or lowered position, as will now be readily understood.

It will be understood, that my invention may be embodied in structures widely differing in form from those herein described. I am therefore not limited to the particular mechanism shown, since the same can be freely varied and changed without departing from the fundamental principles upon which my invention is based.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. In a safety gas burner, the combination of a thermostatic element within the heating influence of the flame of the burner, with a latch for locking and unlocking a cock or valve of the burner, a friction coupling between the latch and the thermostatic element, and stops for limiting the movement of the latch, substantially as described.

2. In a safety gas burner, the combination of a self closing cock or valve and a latch for locking and unlocking the same; with a thermostatic element within the heating influence of the flame, a friction coupling between the latch and thermostatic element and stops for limiting the movement of the latch, substantially as described.

3. In a safety gas burner, the combination of a self closing cock or valve, and a latch capable of a limited movement in two directions for locking and unlocking the valve, respectively; with a thermostatic element within the heating influence of the flame and a friction coupling between the latch and the thermostatic element, substantially as described.

4. In a safety gas burner, the combination of a self closing cock or valve, a latch capable of a limited movement in two directions for locking and unlocking the valve, respectively, a thermostatic element within the heating influence of the flame and a coupling between the thermostatic element and latch composed of a plurality of friction joints capable of slipping past each other when the latch is estopped from following the impulse of the thermostatic element, whereby the latch

will be moved to an extreme position by the initial movements of the thermostatic element in either direction; substantially as described.

5. In a safety gas burner, the combination of a burner tip and a thermostatic element exposed to the heating influence of an invariable portion of the flame; with a latch for locking and unlocklng a cock or valve of the burner, a friction coupling between the latch and thermostatic element, and stops for limiting the movements of the latch, substantially as described.

6. In a safety gas burner, the combination of a burner tip and a thermostatic element producing a flame with an invariable expanded base in contact with the thermostatic element, substantially as described.

7. A gas-cut-off burner having its outlet surrounded by a thermostatic element forming an expansion chamber above which the gas burns with an invariable expanded base in contact with the top of the thermostatic element, substantially as described.

8. A safety gas burner having a thermostatic element formed with an expansion chamber surrounding the gas exit opening of the tip and thus heated by an invariable expanded base of the flame, in combination with a self closing cock or valve, a latch having limited movements in two directions for locking and unlocking the valve, and a friction coupling between the thermostatic element and the latch, substantially as described.

9. In a safety gas burner, the combination of a burner tip and a thermostatic element closely fitting to the top of the tip and formed with an expansion chamber surrounding the gas exit opening of the tip, whereby the flame is shaped with an invariable expanded base in contact with the thermostatic element, substantially as described.

10. In a safety gas burner, the combination with a burner tip and a thermostatic element producing a flame with an invariable expanded base in contact with the thermostatic element; of a self closing cock or valve, a latch having limited movements in two directions for locking and unlocking the valve, and a friction coupling between the thermostatic element and the latch constructed to slip when the latch has reached the limit of its movement in either direction, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES CLAMOND.

Witnesses:

O. KERR,

CLYDE SHROPSHIRE.