No. 746,546. PATENTED DEC. 8, 1903.

W. G. MIDGLEY.

REGULATOR FOR GAS BURNERS.

APPLICATION FILED FEB. 20, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

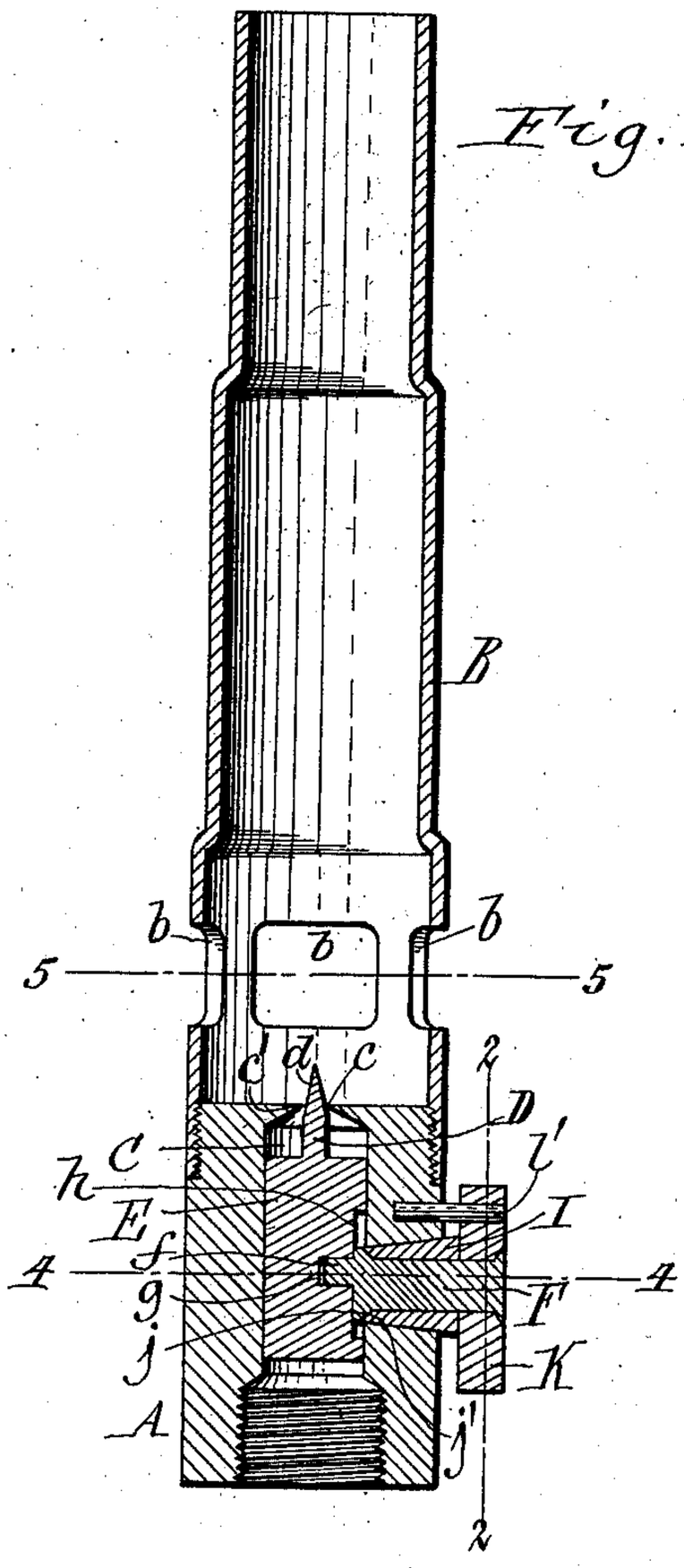


Fig. 2.

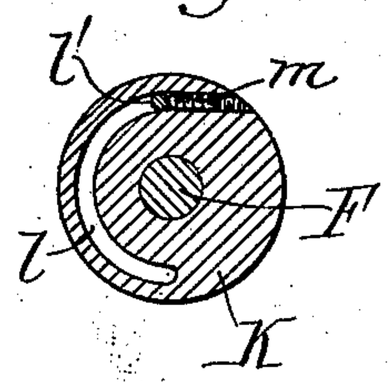


Fig. 3.

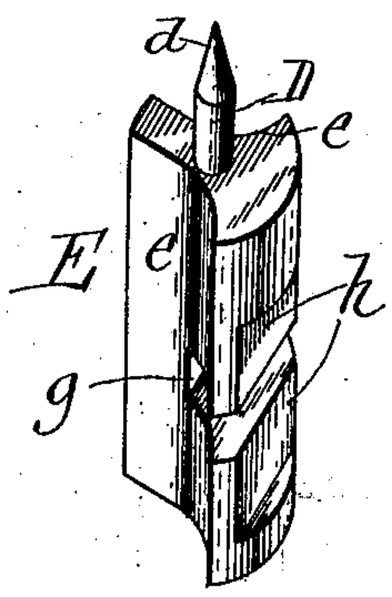


Fig. 4.

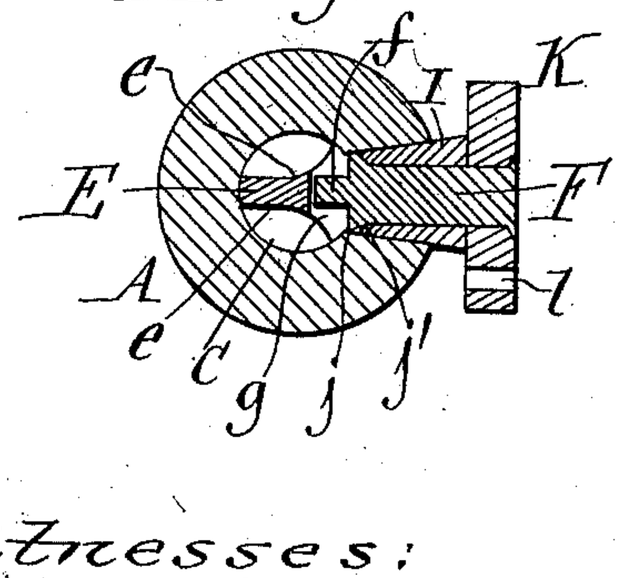
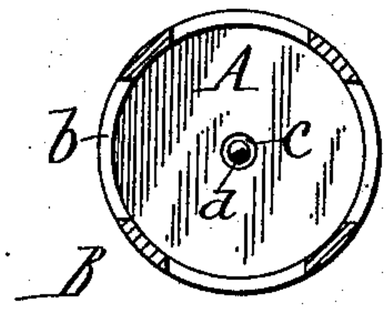


Fig. 5.



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REGULATOR FOR GAS BURNERS.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 6.

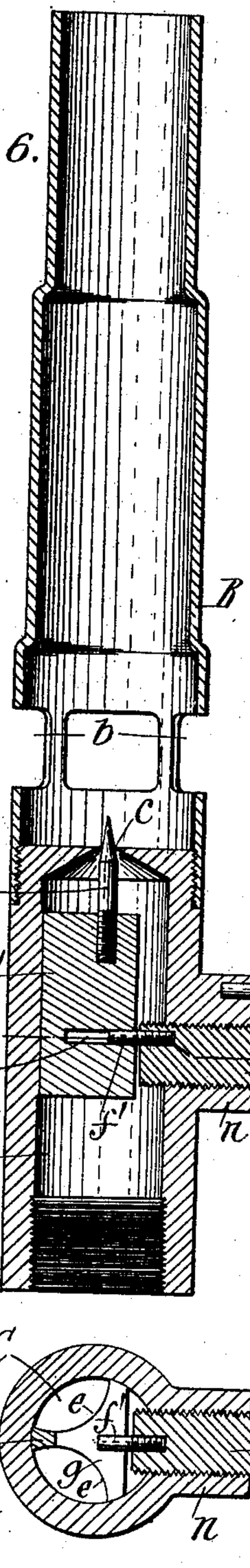


Fig. 10.

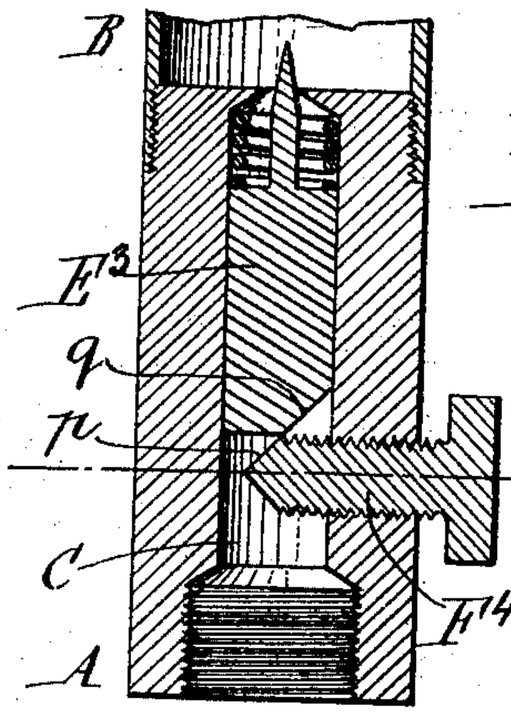


Fig. 11.

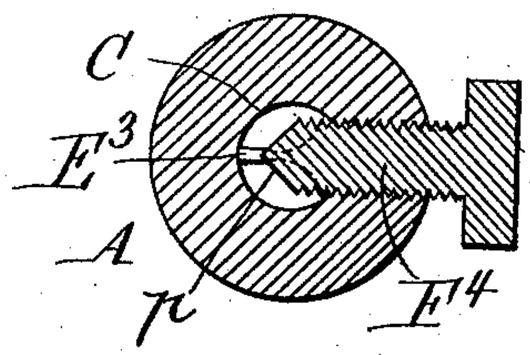


Fig. 8.

Fig. 7.

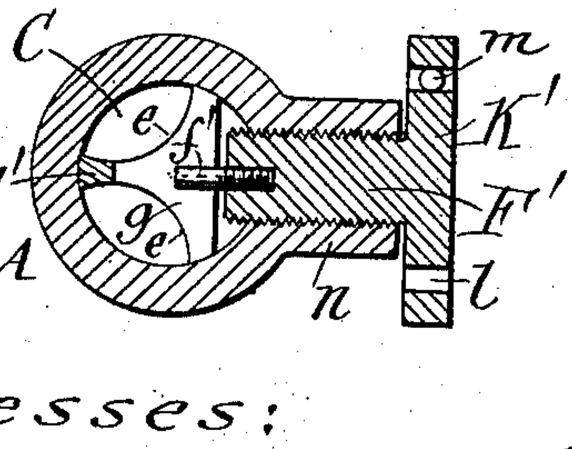
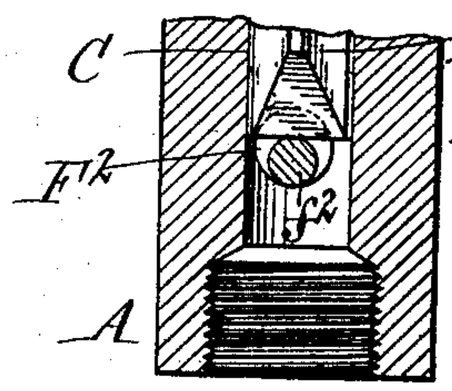


Fig. 9



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No. 746,546. Patented December 8, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM G. MIDGLEY, OF BUFFALO, NEW YORK.

REGULATOR FOR GAS-BURNERS.

SPECIFICATION forming part of Letters Patent No. 746,546, dated December 8, 1903.

Application filed February 20, 1903. Serial No. 144,215. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. MIDGLEY, a subject of the King of Great Britain, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Regulators for Gas-Burners, of which the following is a specification.

This invention relates to that class of gas-burners in which a needle-valve is employed for regulating the supply of gas. While a needle-valve permits of producing a fine regulation of the gas, its use in burners as heretofore constructed is undesirable on account of the liability of increasing the size of the gas-passage to an objectionable extent by forcing the conical end of the needle into the gas-outlet opening. It is well known that the gas-outlet opening should be as small as possible consistent with the amount of gas required in order to obtain the highest efficiency of the gas as it mixes with the air. By increasing the size of the gas-outlet to an objectionable extent the gas spreads a greater extent and its efficiency is correspondingly reduced.

The object of this invention is to provide means for adjusting the needle-valve of gas-burners which renders it impossible to force the needle into the gas-outlet opening and produce an abnormal enlargement of the same.

In the accompanying drawings, consisting of two sheets, Figure 1 is a vertical section of a gas-burner containing my improvements. Fig. 2 is a vertical section in line 2 2, Fig. 1. Fig. 3 is a perspective view of the needle-valve and its carrier. Figs. 4 and 5 are horizontal sections in the correspondingly-numbered lines in Fig. 1. Fig. 6 is a vertical section of a gas-burner, showing a modification of my improvements. Fig. 7 is a horizontal section in line 7 7, Fig. 6. Fig. 8 is a vertical section showing another modified form of my improvement. Fig. 9 is a fragmentary vertical section of the same in line 9 9, Fig. 8. Fig. 10 is a further-modified construction embodying my invention. Fig. 11 is a horizontal section of the same in line 11 11, Fig. 10.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the valve body or casing, which is preferably of cylindrical form, and B represents the mixing-tube, which is connected at its lower end with the top of the casing by a screw-joint. This tube is provided adjacent to the casing with an annular series of air-inlet openings *b*. The mixed air and gas is burned at the upper end of the mixing-tube, this end of the tube being furnished with a tip, mantle, or other contrivance of well-known construction. Formed lengthwise and centrally in the casing is a cylindrical valve-chamber C, which is connected at its lower end by a screw-joint or otherwise with a gas-supply pipe. The top of the valve-chamber is provided with a central gas-outlet opening *c*, and the under side of this top is conical and tapers upwardly from the cylindrical bore of the chamber to the upper side of the top, thereby bounding said outlet-opening by a thin or knife edge, as shown at *c'*, Fig. 1.

D represents a needle-valve having its upwardly-tapering or conical point *d* movable vertically and axially in the gas-outlet opening, so as to leave an annular passage between the point of the needle and the edge of the outlet-opening, through which the gas passes from the valve-chamber into the mixing-tube, where the same commingles with the air entering through the openings *b* preparatory to being consumed at the upper end of the tube. By moving the needle-valve up or down the area of the gas-exit may be decreased or increased for varying the supply of gas to the mixing-chamber as may be necessary to produce the desired gaseous mixture. The angle of the tapering needle is greater than the tapering under side of the top of the valve-chamber, whereby the two sides of the annular passage between the needle-valve and the valve-chamber converge upwardly to the gas-outlet opening, as shown in Fig. 1. This relative formation of the opposing sides of the valve and valve-chamber provides a passage for the gas of maximum area up to the extreme outlet-point, where the regulation takes place, thereby permitting the gas to flow with the greatest possible freedom and with the least amount of frictional resistance. When the gas before issuing from the outlet-opening is obliged to pass to some extent through a passage which is of no larger area than the outlet-opening, the friction of the gas against the walls of the

passage is excessive, thereby retarding the flow of gas and interfering with the proper regulation and combustion of the same. The needle-valve is mounted on the upper end of a vertically-movable carrier or slide E, which is arranged in the valve-chamber. This carrier is guided on the wall of the valve-chamber and provided on opposite sides with longitudinal grooves *e*, which form conduits or passages through which the gas passes from the lower to the upper part of the valve-chamber.

In order to prevent the needle-valve from being raised so high that it is forced into the gas-outlet opening and enlarges the same, the vertical adjustment of the valve is effected by a shifting device which is capable of moving the needle-valve up or down only a limited extent, the range of the adjustment being so determined that when the needle is in its highest position the same just engages or nearly engages the edge of the gas-outlet opening. The preferred means for effecting this adjustment of the needle-valve consists of an adjusting spindle or shaft F, extending transversely through the wall of the valve chamber or casing and provided at its inner end with a crank or eccentric pin *f*, which engages with a horizontal or transverse groove *g* in the adjacent side of the valve-carrier. The throw of the crank is such that when the same is in its highest position it raises the carrier and the needle-valve thereon, so that the latter just closes or nearly closes the gas-outlet opening, but does not forcibly engage the same. Upon turning the spindle so that the crank is lowered more or less the needle-valve is moved downwardly, so that a narrow part of the needle-valve is arranged in said opening, thereby increasing the area of this opening and the supply of gas proportionately. When the crank is in its lowest position, the needle-valve opens the gas-outlet opening its fullest extent and admits the maximum supply of gas. For retaining the valve-carrier in proper engagement with the crank-pin the carrier is prevented from turning and held in its proper position relatively to the crank by means of a flat vertical face *h*, formed on the carrier adjacent to its groove and engaging with the flat inner end of the crank-spindle, as shown in Figs. 1 and 4, thereby dispensing with separate devices for this purpose. The crank-spindle is journaled in a bushing or bearing I, which engages with an opening in the wall of the casing. The outer surface of the bushing is preferably conical or tapering inwardly and secured in the correspondingly-shaped opening of the casing with a driving fit, thereby securing these parts in place in a simple and inexpensive manner and producing a neat and finished appearance. The crank-spindle is prevented from moving outwardly in the bushing or bearing by forming an outwardly-facing annular shoulder *j* thereon, which engages with a similar inwardly-facing shoulder *j'* on the bushing. These shoulders are preferably cone-shaped or tapered outwardly, so that a tight joint is produced between these parts at this point, which prevents the escape of gas. Upon the outer end of the crank-spindle is mounted an adjusting disk or finger-piece K, which is preferably secured in place by riveting or upsetting the outer end of the spindle against the outer side of the disk, so as to draw the latter and the spindle-shoulder against opposite ends of the bushing with sufficient firmness to prevent leakage between these parts, but permit the crank-spindle to be turned by the disk.

In order to arrest the rotary movement of the spindle when its crank has moved the needle into its highest or lowest position, means are provided which limit the rotary movement of the spindle at either extremity of the throw of its crank. As shown in Figs. 1 and 2, this is preferably accomplished by means of a segmental or semicircular slot *l*, formed concentrically in the adjusting-disk, and a stop pin or projection *l'*, mounted on the valve-casing and extending into the slot. Upon turning the adjusting-disk half-way around in either direction it is arrested by the adjacent end of the slot striking the stop-pin. For the purpose of enabling the valve to be quickly and definitely shifted into a position in which it stops short of its complete closing movement and leaves a small passage in the gas-outlet opening for maintaining a small flame or pilot-light an adjusting device is provided, consisting, preferably, of a screw *m*. The latter works in the adjusting-disk and is adjustable lengthwise of that end of the slot *l* which moves toward the stop-pin during the closing movement of the valve. Upon adjusting this screw backward or forward in the disk the area of the gas-outlet opening which is unobstructed when the closing movement of the disk is arrested may be varied for varying the size of the pilot-light, as may be desired.

While the construction shown in Figs. 1 to 5 represents the best embodiment of my improved gas-burner, the same can obviously be varied in many respects and still retain the essence of my invention. For instance, as shown in Figs. 6 and 7, the spindle F' screws into a threaded opening in a boss *n* on the side of the valve-casing, and the adjusting-disk K' is made integrally with the spindle. Although fewer parts are required by making the spindle and disk in one piece and journaling the spindle directly in the valve-casing, as shown in Figs. 6 and 7, it is more practical to employ the construction shown in Figs. 1 to 5, because the latter construction can be manufactured cheaper, is assembled easier, and is not liable to leak. Furthermore, the construction shown in Figs. 1 to 5 permits of making the valve-body out of bar-brass, which is kept in stock and can be obtained at a low price, while the valve-casing shown in Figs. 6 and 7 having the boss

for obtaining the necessary length of screw-thread to support the screw-spindle makes it necessary to cast this valve-casing, consequently increasing the cost of the same.

If the needle-valve and its carrier are made of the same material, these parts may be formed integrally, and for the same reason the adjusting-spindle and its crank may be made in one piece, as shown in Figs. 1 and 4. If, however, it is desired to make the needle-valve and crank of material different from that of the carrier and spindle, the valve D′ and the crank f' may be connected with the carrier E′ and spindle F′ by screw-joints, as shown in Figs. 6 and 7. Although the screw connection between the needle-valve and the carrier has the additional advantage of permitting these parts to be adjusted relatively to each other, the cost of the same is greater than when these parts are made out of a single piece.

Instead of arranging a crank at one end of the adjusting-spindle for raising the needle-valve the same effect may be produced by arranging a cam or crank f^2 between the ends thereof, such a construction being shown in Figs. 8 and 9. In this construction the spindle F^2 is journaled at its ends by screw-joints in opposite sides of the valve-casing, and the crank or cam f^2, arranged on the spindle between the ends thereof, engages with the lower end of the slide E^2, which carries the needle-valve. Upon turning this spindle so as to move the cam upwardly the valve is closed more or less, while upon moving the cam downwardly the valve-carrier is permitted to descend. This descent may be effected by gravity alone, but is preferably rendered more certain by the aid of a spring o, interposed between the upper end of the valve-carrier and the top of the valve-chamber. When the cam f^2 is turned into its highest position, the valve can be closed no farther, the parts being so constructed that the valve is not forced against the edge of the outlet-opening when it reaches the end of its closing movement.

In Figs. 10 and 11 is shown a construction embodying my invention in which the limited closing movement of the valve-carrier E^3 is effected by a wedge or incline p engaging with the beveled lower end q of the carrier. This wedge is preferably conical and formed on the inner end of a rotary spindle F^4, which is screwed into the valve-casing. When the top of the incline or wedge engages the straight under side of the valve-carrier, the continued inward movement of the wedge does not raise the valve any farther, as the valve at this time has reached the end of its closing movement and is not forced against the edge of the outlet-opening.

It will be observed that in all of the constructions shown and described the valve-adjusting devices are incapable of moving the needle-valve toward the gas-outlet opening more than the predetermined distance, and it is therefore impossible to enlarge the outlet-opening and destroy the highest efficiency of the burner.

I claim as my invention—

1. In a gas-burner, the combination of a cylindrical valve-chamber provided in its upper end with an outlet-opening, a needle-valve cooperating with said opening, and a carrier for said valve having segmental faces which slide lengthwise in the bore of the cylinder and provided in its side with longitudinal grooves which form gas-passages, substantially as set forth.

2. In a gas-burner, the combination of a cylindrical valve-chamber having an outlet-opening in its top, a valve coöperating with said opening, a carrier for said valve having segmental faces sliding in said chamber and having a transverse groove and a flat face adjacent to said groove, and a rotary spindle extending through the wall of the chamber and provided at its inner end with a crank engaging said groove and with a flat face engaging the flat face of the carrier, substantially as set forth.

3. In a gas-burner, the combination of a casing provided with a valve-chamber and an outlet-opening, a valve arranged in said chamber and coöperating with said opening, a carrier for said valve, a bushing arranged in an opening in the casing, and a spindle journaled in said bushing and provided at its inner end with a crank for shifting said valve and a shoulder which engages with the inner end of the bushing, substantially as set forth.

4. In a gas-burner, the combination of a casing provided with a valve-chamber and an outlet-opening, a valve arranged in said chamber and coöperating with said opening, a carrier for said valve, a bushing arranged in an opening in the casing and provided at its inner end with a conical shoulder, and a spindle journaled in the bushing and provided at its inner end with a crank for shifting said valve and a conical shoulder which engages with said conical shoulder of the bushing, substantially as set forth.

5. In a gas-burner, the combination of a casing provided with a valve-chamber and an outlet-opening, a valve arranged in said chamber and coöperating with said opening, a carrier for said valve, a bushing having a tapering outer side which fits into a correspondingly-shaped opening in the casing, and a spindle journaled in said bushing and provided at its inner end with a crank for shifting said valve and with a shoulder engaging the inner end of the bushing, substantially as set forth.

6. In a gas-burner, the combination of a casing provided with a valve-chamber and with an outlet-opening, a needle-valve coöperating with said opening, a carrier for said valve guided in said chamber and provided with a transverse groove, a conical bushing seated in a correspondingly-shaped opening in the casing, a spindle journaled in the bushing and provided at its inner end with a

crank engaging said groove and with a shoulder engaging the inner end of the bushing, and a finger piece or disk secured to the outer end of the spindle and engaging with the outer end of the bushing, substantially as set forth.

7. In a gas-burner, the combination of a casing having a valve-chamber and an outlet-opening, a valve coöperating with said opening, a carrier for said valve, a spindle extending through the casing and provided at its inner end with a crank for shifting said valve, a disk arranged on the outer end of the spindle and provided with a segmental slot, and a stop arranged on the casing and extending into said slot, substantially as set forth.

8. In a gas-burner, the combination of a casing having a valve-chamber and an outlet-opening, a valve coöperating with said opening, a carrier for said valve, a spindle extending through the casing and provided at its inner end with a crank for shifting said valve, a disk arranged on the outer end of the spindle and provided with a segmental slot, a fixed stop arranged on the casing and extending into said slot, and an adjustable stop device arranged on the disk and projecting into one end of said slot, substantially as set forth.

9. In a gas-burner, the combination of a casing having a valve-chamber and an outlet-opening, a valve coöperating with said opening, a carrier for said valve, a spindle extending through the casing and provided at its inner end with a crank for shifting said valve, a disk arranged on the outer end of the spindle and provided with a segmental slot, a fixed stop arranged on the casing and extending into said slot, and an adjustable stop consisting of a screw working in said disk and projecting into one end of said slot, substantially as set forth.

Witness my hand this 17th day of February, 1903.

WILLIAM G. MIDGLEY.

Witnesses:
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EMMA M. GRAHAM.