No. 681,052. Patented Aug. 20, 1901.

J. HARRIS.

GAS BURNER.

(Application filed June 22, 1900.)

(No Model.)

FIG. I.

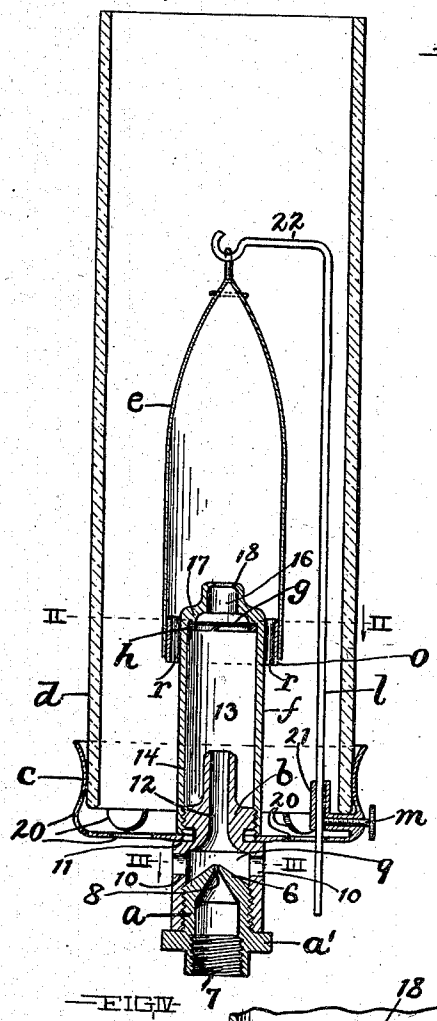


FIG. II.

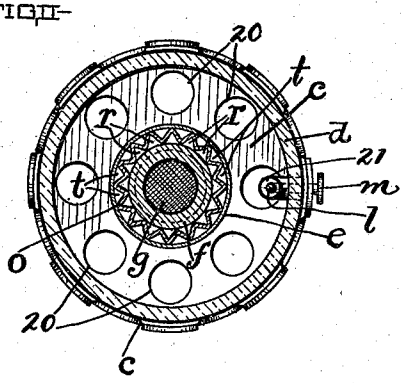


FIG. III.

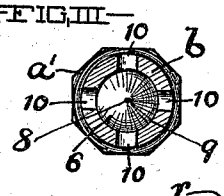


FIG. IV.

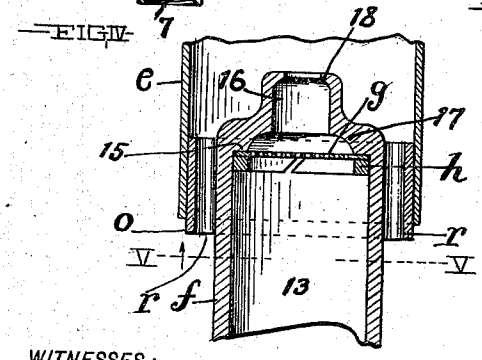
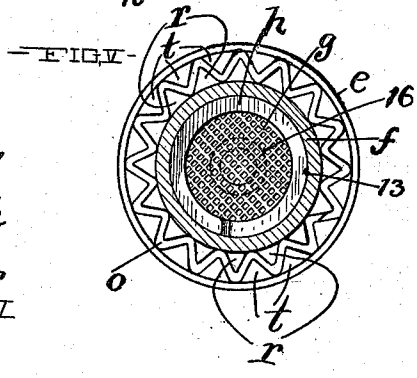


FIG. V.



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GAS-BURNER.

SPECIFICATION forming part of Letters Patent No. 681,052, dated August 20, 1901.

Application filed June 22, 1900. Serial No. 21,138. (No model.)

To all whom it may concern:

Be it known that I, JOHN HARRIS, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Gas-Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in gas-burners designed more especially for use in burning acetylene gas and other rich gases.

One object of this invention is to provide a burner of the character indicated that has an exceedingly large heating or illuminating capacity.

Another object of the invention is to provide a burner suitable for successfully burning acetylene gas with a mantle or other body capable of being rendered incandescent by its exposure to the flame issuing from the burner.

Another object of the invention is to avoid objectionable noise during the operation of the burner and to prevent the ingress or backing up of the flame into the burner.

Another object of the invention is to provide a construction whereby the quantity of air or oxygen supplied to the burner is materially increased.

Another object of the invention is to provide a construction whereby a large quantity of air or oxygen is conducted into the lower end of the mantle or body that is to be rendered incandescent.

With these objects in view and to the end of realizing other advantages hereinafter appearing the invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a central vertical section of a burner embodying my invention, and the burner illustrated in this figure is provided with a chimney and with a mantle that is to be rendered incandescent. Fig. II is a top plan in transverse section on line II II, Fig. I. Fig. III is a transverse section on line III III, Fig. I, looking downwardly. Fig. IV is an enlarged side elevation, in section, of the upper portion of the burner. Fig. V is a transverse section on line V V, Fig. IV, looking upwardly.

My improved burner comprises an upright gas-receiving tube *a*, that forms the lower end of the device. The tube *a* has its lower end screw-threaded internally to render it capable of being screwed onto a gas-supply pipe. (Not shown.) The tube *a* has its upper end screw-threaded externally and screwed into the correspondingly internally screw-threaded lower end of an upright air-receiving tube *b*. The tube *a* is provided with an external flange *a'*, that abuts the lower end of the tube *b*. The flange *a'* is polygonal externally to accommodate the application of a wrench thereto. The tube *a* has its upper end terminating in a cone 6, and the gas-conducting or gas-supply passage-way 7, that is formed within the tube *a*, is gradually reduced in width or transverse area toward the upper extremity or apex of the cone 6, where the said passage-way terminates in a discharge-orifice 8, that is formed centrally of the said apex.

The cone 6 forms the bottom of an air-receiving chamber 9, formed within the tube *b*, next above the tube *a*. The surrounding wall of the chamber 9 is provided with a series of lateral perforations or air-inlets 10, that are arranged at the same, or approximately the same, horizontal plane at suitable intervals around the tube *b*. The tube *b* illustrated has four uniform air-inlets 10, arranged equidistant apart, and the arrangement of the parts is preferably such that the said air-inlets 10 shall be arranged directly opposite the gas-discharge orifice 8 of the tube *a*, so as to conduct air from the external atmosphere directly to and in advance of the said orifice, and preferably the said perforations 10 are large enough to render them capable of directly conducting air against the aforesaid cone 6, and the cone is instrumental in directing the air toward the aforesaid orifice.

The tube *b*, a short distance above the air-inlets 10, is provided with an annular shoulder 11, that forms a seat for the dish-shaped holder *c*, that is instrumental in supporting the chimney, globe, or glass *d*, that surrounds

the burner in the usual manner. The holder *c* performs also the function of supporting the device employed in suspending or holding the mantle *e* or other body that is to be rendered incandescent over the upper and flame-discharging end of the burner.

A vertically-arranged port or passage-way 12 is formed in and centrally of the top wall of the air-receiving chamber 9 and has its lower end gradually enlarged downwardly—that is, the surrounding wall of the lower end of the port or passage-way 12 flares downwardly, and thereby facilitates conducting or directing the gas and air entering the chamber 9 during the operation of the burner upwardly into the said port or passage-way, and the gas and the air are brought into closer communication within the said port or passage-way.

The port or passage-way 12 has its upper end discharging into a chamber 13, formed within a tube *f*, that has its lower end screw-threaded internally and screwed onto corresponding threads formed upon and externally of the tube *b*, next above the bottom of the holder *c*. The tube *f* is screwed onto the tube *b* far enough to cause the tube *f* to clamp the holder *c* against the seat-forming shoulder 11 of the tube *b*. The tube *b* has its upper end preferably considerably smaller in cross-section than the surrounding tube *f*, so as to form an annular space 14 externally of the upper end of the tube *b*, between the external surface of the tube *b* and the internal surface of the tube *f*. The said space 14 forms a downward extension of the chamber 13. The gas and air that are brought into close communication with each other within the port 12, as already indicated, are thoroughly mixed within the chamber 13, and the downward extension of the said chamber around the upper end portion of the tube *b* forms a pocket, from which the mixture cannot escape except upwardly to the upper or gas-burning end of the burner. The tube *f* is provided internally at the upper end of the mixing-chamber 13 with a screen *g*, that is arranged horizontally and transversely of the tube and held in place upwardly against an annular shoulder 15, formed internally of the tube *f*, by any suitable means—such, for instance, as a split spring-forming ring *h*, introduced into and against the under side of the screen.

The tube *f* has its upper end, above the mixing-chamber and above the screen *g*, reduced in cross-section to form a vertically-arranged port or outlet 16 centrally of the upper end of the tube *f* above the screen. The port 16 has its lower end gradually enlarged toward the screen *g*, so that the surrounding wall 17 of the lower end of the port 16 flares toward and overhangs the screen. The port 16 is reduced in size at its upper or outer extremity, so as to form an annular downwardly or inwardly facing flange 18 internally of and upon the surrounding wall of the outer and discharging end of the said port, which flange preferably has its under or inner side flaring downwardly or inwardly. The enlargement of the port 16 next above the screen accommodates the passage of a larger volume of the inflammable mixture through the said screen than would be the case in the absence of the said enlargement of the said port. The reduction or contraction of the port 16 at its outer or discharging extremity is instrumental in preventing the flame from entering the burner during the operation of the burner.

The gas is of course introduced into the passage-way 7 under more or less pressure, and the air introduced at the air-inlets 10 is of course under the ordinary atmospheric pressure. Obviously the flame issuing from the burner forms a vacuum or a partial vacuum at the discharging end of the burner and results in the creation of suction in the direction of the said end from within the burner, and hence the air is drawn in at the air-inlets 10 into the chamber 9 in advance of the orifice 8, at which gas is drawn or forced into the said chamber. The passage of the air and gas into the port or passage-way 12 brings the gas and the air into close communication with each other. The presence of the screen *g* checks the upward passage of the inflammable mixture and is instrumental, therefore, in causing the air and the gas to thoroughly commingle within the chamber 13. As the aggregate area of the meshes of the screen is less than the transverse area of the mixing-chamber 13, obviously the mixture is somewhat compressed in its passage through the said screen. The reduction of the burner in cross-section above the screen and the enlargement of the port 16 next above the screen participate also in a compression of the mixture passing through the screen. For instance, the enlargement of the port 16 next above the screen accommodates the passage of a larger volume through the screen than would the central portion of the said port next above its said enlargement. Hence as the transverse area of the said central portion of the port 16 is less than the aggregate area of the meshes of the screen obviously the mixture will be somewhat compressed within the said port. Of vast importance, however, is the reduction of the port 16 at its outer extremity, because this reduction results in a further compression of the mixture immediately preparatory to the combustion of the same. The construction involving the mixing-chamber 13, the screen *g* at the upper end of the mixing-chamber, the discharge-port 16 above the screen with its lower end enlarged in the direction of the screen and with its outer end restricted, is most important in preventing objectionable noise during the operation of the burner, in producing perfect combustion, and in pre-

venting the flame from backing into or entering and thereby destroying or mutilating the burner.

It is well known that perfect combustion in burning acetylene gas is obtained only when the air is mixed with the gas in the proportions of about thirteen parts of air to one part of gas. Obviously, therefore, the perforations or air-inlets 10 of the tube *b* should have a capacity that will render them capable of conducting the required supply of air to the gas issuing from the discharge-orifice 8 of the tube *a*. In other words, the capacity of the said air-inlets should be such that the quantity of air entering the burner shall be thirteen times as great as the quantity of gas issuing from the aforesaid orifice 8.

Of course the holder *c* is provided with any suitable number of apertures or air-inlets 20 to effect a proper supply of air to the flame issuing from the burner.

The mantle *e* is supported in any approved manner. For instance, the holder *c* is provided internally with a vertically-arranged ear 21, through which extends an upright stem or piece of wire *l*, secured in the desired vertical adjustment by a screw *m*, that extends into the said ear through a correspondingly-threaded lateral hole formed in the holder *c*. The wire or stem *l* terminates at its upper end in a laterally and inwardly extending arm 22, from which the mantle *e* or other body that is to be rendered incandescent is suspended. The mantle shown has its lower end embracing a fluted or corrugated sleeve or collar *o*, that is slipped onto and tightly embraces the upper end portion of the tube *f*, next below the upper reduced end of the said tube, and the corrugations of the said sleeve or collar are arranged vertically or longitudinally of the tube, so that two series of air passage-ways *r* and *t* are formed internally and externally, respectively, of the said collar, between the tube *f* and the lower end of the mantle, with the passage-ways of each series of passage-ways alternating with the passage-ways of the other series of passage-ways. The collar *o* consists, preferably, of a strip of sheet metal sinuously bent to form the passage-ways *r* and *t* and having its ends secured together in any approved manner. The fluted or corrugated collar *o* affords a lateral bearing for the lower end of the mantle and at the same time does not materially obstruct the passage of air upwardly into the mantle from below. It will be observed also that the reduction in cross-section of the upper end of the tube *f* reduces the metallic surface or material that is exposed to the heat of the flame issuing from the burner.

What I claim is—

1. A gas-burner having the following: a mixing-chamber; a discharge port or outlet; a screen arranged between the said outlet and the mixing-chamber; means for supplying air and gas to the said chamber, and the aforesaid port or outlet having its inner end gradually enlarged annularly toward the screen.

2. A gas-burner having the following: an upright mixing-chamber; a discharge port or outlet above and centrally of the mixing-chamber; a screen arranged between the said outlet and the mixing-chamber; means for supplying air and gas to the said chamber from below and centrally of the lower end of the chamber, and the aforesaid port or outlet having its inner end enlarged next over the screen.

3. A gas-burner having the following: a mixing-chamber; a discharge port or outlet at one end and centrally of the said chamber; a screen arranged between the said outlet and the mixing-chamber; means for supplying air and gas at and centrally of the opposite end of the said chamber, and the aforesaid port or outlet having its inner end enlarged next to the screen.

4. A gas-burner having the following: a mixing-chamber, a discharge port or outlet, a screen arranged between the said outlet and the mixing-chamber, means for supplying air and gas to the said chamber, and the aforesaid port or outlet having its inner end gradually enlarged toward the screen and being reduced in size at its outer or discharging extremity.

5. A gas-burner having the following: an upright mixing-chamber having an inlet in and centrally of its bottom, a screen arranged transversely of the upper end of the chamber, and an upright discharge port or outlet formed centrally of the said end of the mixing-chamber above the screen, which port is enlarged at its lower end next above the screen and is reduced in size at its upper end, substantially as and for the purpose set forth.

6. A gas-burner having the following: an upright mixing-chamber having an inlet in and centrally of its bottom and an annular downward extension around the inlet, a screen arranged transversely of the upper end of the chamber, and an upright discharge port or outlet formed centrally of the aforesaid chamber above the screen and reduced in size at its outer or discharging extremity.

7. A gas-burner having the following: an upright mixing-chamber, means for supplying air and gas to the said chamber, a screen arranged transversely of the upper end of the chamber, and an upright discharge port or outlet formed above the screen and provided at its outer and discharging extremity with an internal annular flange having its lower or inner side flaring inwardly, substantially as and for the purpose set forth.

8. A gas-burner comprising the following: an upright tube wherein gas and air are commingled, which tube is reduced in cross-section at its upper end to form an outlet, a screen arranged within and transversely of the said tube below the aforesaid outlet, and means for conducting air and gas into the aforesaid

tube below the screen, substantially as and for the purpose set forth.

9. An upright gas-burner having the following: an upwardly-discharging outlet formed in the burner's upper end and reduced in size at its outer extremity, a mixing-chamber formed below and in open relation with the said outlet, an air-receiving chamber arranged below the mixing-chamber, a port or passage-way formed in the top wall of the air-receiving chamber and in the bottom of the mixing-chamber and establishing communication between the said chambers, air-supply holes or inlets in the surrounding wall or walls of the said air-receiving chamber, and a gas-supply passage-way terminating, at its upper end, in an orifice formed in the bottom of the aforesaid air-receiving chamber.

10. An upright gas-burner having the following: an upwardly-discharging outlet formed in the burner's upper end and reduced in size at its outer extremity, a mixing-chamber formed below and in open relation with the said outlet, an air-receiving chamber arranged below the mixing-chamber, a port formed within the top wall of the air-receiving chamber and in the bottom of the mixing-chamber and establishing communication between the said chambers and having its lower end flaring downwardly, and a gas-supply passage-way terminating, at its upper end, in an orifice formed in the bottom of the said air-receiving chamber centrally of and below the aforesaid port.

11. An upright gas-burner having the following: an upwardly-discharging outlet formed in the burner's upper end and reduced in size at its outer extremity, a mixing-chamber formed below and in open relation with the said outlet, an air-receiving chamber arranged below the mixing-chamber, a port or passage-way formed in the top wall of the air-receiving chamber and in the bottom of the mixing-chamber and establishing open relation between the said chambers, air-supply holes or inlets in the surrounding wall or walls of the said air-receiving chamber, a gas-supply passage-way arranged below the air-receiving chamber, and the bottom of the air-receiving chamber being conical and provided with a centrally-located orifice in open relation with the gas-supply passage-way, substantially as and for the purpose set forth.

12. An upright gas-burner having the following: an outlet at its upper end, a mixing-chamber formed below and in open relation with the said outlet, an air-receiving chamber arranged below the mixing-chamber and provided with a conical bottom, a port or passage-way formed in and centrally of the top wall of the air-receiving chamber and in the bottom of the mixing-chamber, which port or passage-way establishes open relation between the said chambers and has its lower end flaring downwardly, a plurality of lateral air-holes or air-inlets leading to the air-receiving chamber below the aforesaid port, which air-supply holes or inlets are arranged opposite to the apex of the aforesaid conical bottom, a gas-supply passage-way below the air-receiving chamber, and an orifice formed in and centrally of the conical bottom of the air-receiving chamber and in open relation with the gas-supply passage-way.

13. A gas-burner consisting of the following: the gas-supply tube *a* screw-threaded internally at its lower end, having the external flange *a'*, screw-threaded externally above the said flange, and having the conical upper end 6 provided with the centrally-located orifice 8; the air-receiving tube *b* screwed onto the gas-supply tube and having the chamber 9, lateral air-inlets 10, an upwardly-leading port or passage-way 12, the external shoulder 11 and external screw-threads above the said shoulder, and the tube *f* screwed onto the aforesaid air-receiving tube and having the mixing-chamber 13, the internal screen *g*, and the discharge port or outlet 16 enlarged at the inner end and reduced in size at the outer extremity, all arranged substantially as shown, for the purpose specified.

Signed by me at Cleveland, Ohio, this 18th day of June, 1900.

JOHN HARRIS.

Witnesses:
C. H. DORER,
A. H. PARRATT.