No. 672,888. Patented Apr. 30, 1901.

G. H. BURROWS & G. L. WEAVER.

INCANDESCENT GAS LIGHT APPARATUS.

(Application filed Dec. 13, 1900.)

(No Model.)

Fig. 1.

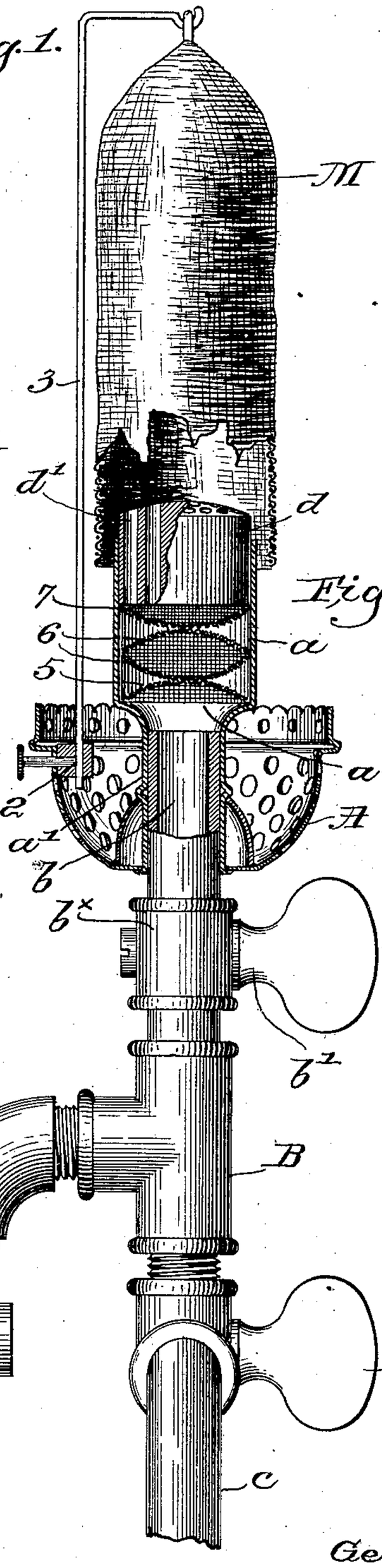


Fig. 2.

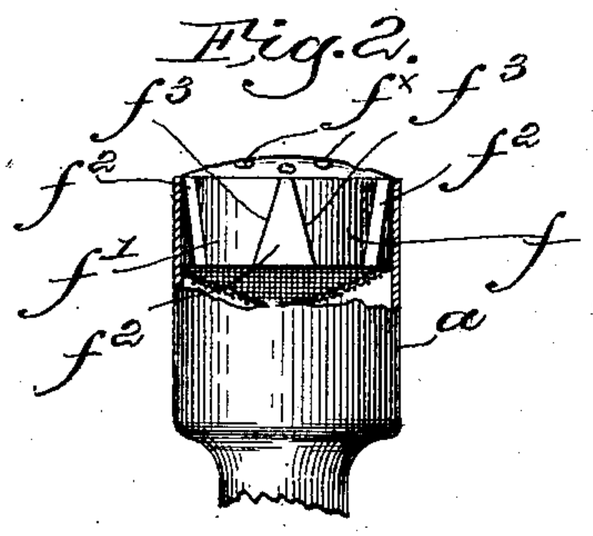


Fig. 3.

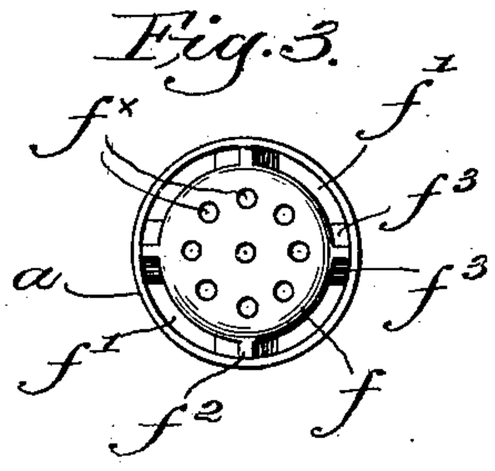


Fig. 4.

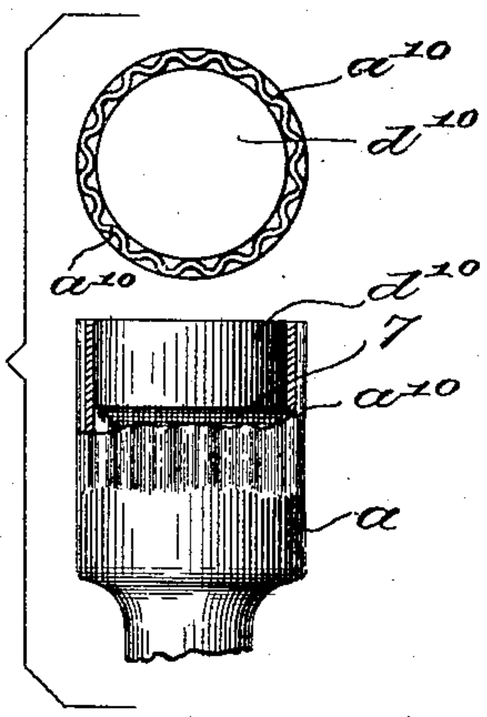
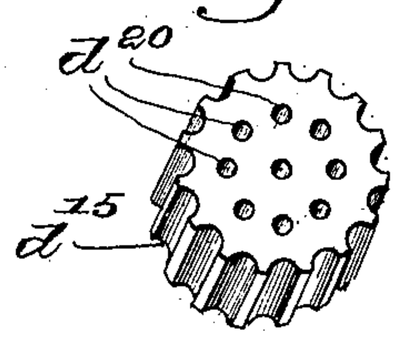


Fig. 5.



Witnesses.
Thomas A. Drummond,
Adolph L. Kaiser.

Inventors
George H. Burrows,
George L. Weaver,
by Crosby Gregory Attys.

UNITED STATES PATENT OFFICE.

GEORGE H. BURROWS, OF SOMERVILLE, AND GEORGE L. WEAVER, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO THE INCANDESCENT GAS LIGHT COMPANY, OF BOSTON, MASSACHUSETTS.

INCANDESCENT-GAS-LIGHT APPARATUS.

SPECIFICATION forming part of Letters Patent No. 672,888, dated April 30, 1901.

Application filed December 13, 1900. Serial No. 39,662. (No model.)

To all whom it may concern:

Be it known that we, GEORGE H. BURROWS, a resident of Somerville, and GEORGE L. WEAVER, a resident of Boston, in the county of Suffolk and State of Massachusetts, citizens of the United States, have invented an Improvement in Incandescent-Gas-Light Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

In United States Patent No. 665,311, granted January 1, 1901, to one of the applicants herein named, novel apparatus for incandescent gas-lighting is shown and described, wherein a very thorough mixing of gas and air under pressure is effected in a mixing-chamber before the mixture is permitted to pass to the burner, the latter in the said patent being formed by a cap or cover, preferably of fine wire-netting, mounted on the outlet end of the mixing-chamber. The heat generated at the burner in such apparatus is sometimes very great, particularly if two or more of the devices are arranged in close proximity, as is not infrequently the case, and in practice we have experienced some trouble by the rapid burning out of the burner. Our present invention relates to the same general type of apparatus as forms the subject-matter of the said patent; but we have herein embodied a burner which will not burn out and which also by its form and construction prevents "burning back," as it is termed, so that the mixer herein is protected from such action.

Various other novel features of our invention will be hereinafter described, and particularly pointed out in the following claims.

Figure 1 is a view, partly in elevation and partly in vertical section, of an incandescent-gas-lighting apparatus embodying our present invention with one form of burner illustrated. Fig. 2 is a view, partly broken out, of the mixing-chamber and another form of burner seated therein, the other parts being omitted. Fig. 3 is a top or plan view of the chamber and the burner therein. Fig. 4 represents in plan and side elevation, the latter partly broken out, still another form of burner coöperating with the mixing-chamber; and Fig. 5 is a perspective view of yet another modification of the burner detached.

Referring to Fig. 1, the mixer being shown as adapted for use with a burner, a tubular chamber a is formed at the upper end of or constitutes an enlarged continuation of a tube a', a shade-holder A, secured to the tube, having a socket 2 to receive the supporting-standard 3 of an incandescing mantle M of any suitable or well-known construction, such as the "Welsbach" mantle, its lower end surrounding the burner, to be referred to. The tubular outlet b of a valve-case $b^{\times}$ extends into the lower end of and supports the tube a' and connected parts, a controlling-valve b' being mounted in the case $b^{\times}$, which latter is secured to a T-coupling B, communicating by conduits g and c with suitable supplies of gas and air under pressure. (Not shown.) As in the patent referred to, we prefer to use air under slightly greater than the gas pressure. The conduits are provided, respectively, with controlling-valves $g^{\times}$ and $c^{\times}$, by which the proportions of gas and air are regulated to the proper mixture for combustion at the burner.

It is necessary to thoroughly mix the gas and air before reaching the burner, and for this purpose we have located a permeable barrier in the chamber a, between the inlets for gas and air and the outlet of said chamber, such barrier being shown herein as a superposed series of arched foraminous diaphragms, preferably made of wire-netting of different degrees of fineness. The lowermost and coarsest diaphragm 5 is placed with its convex face up, its edges being supported by the annular bottom a^5 of the chamber. The next two diaphragms 6 are opposed to each other, with their annular edges together, forming a hollow convexo-convex compartment resting on the diaphragm 5, the opposed diaphragms being of successively finer mesh than the lowest one. A fourth diaphragm 7 rests on the top one of the pair 6 and is placed with its concave face uppermost, and it is of still finer mesh, its edges pressing against the wall of the chamber a. The entering gas and air must pass through the various openings in the diaphragms and are most thoroughly and intimately mixed before reaching the burner, the barrier retarding the flow of the gaseous mixture, and thereby giving sufficient time for effective and uniform mixing to take place.

As will be described, the compression of the diaphragms tends to flatten them and decrease their permeability, so that the action of the mixer may be varied according to circumstances.

In the patent referred to use is made of a packing of granular material in the mixer to further retard the flow and also to prevent the flame from burning back through the wire-gauze burner; but herein we are enabled by the novel form of burner to dispense with all danger of burning back and to also greatly increase the life of the burner, while producing equally fine results as to light, small consumption of gas, and complete combustion of the gaseous mixture. The burner in accordance with our present invention is made as an elongated plug of highly refractory material, cast-iron having proved very satisfactory and being very cheap and easy to manufacture. Referring to Fig. 1, the plug-like burner d, of suitable refractory material, is fitted snugly into the outlet end of the mixing-chamber, its lower end resting on the edge of the diaphragm 7, and communication is established between the mixer and the top of the burner by a series of long tube-like passages or holes d' in the burner and extended therethrough from end to end. When the burner is lighted, a series a small jets are formed, which rapidly heat the mantle M to incandescence. The length of the plug is sufficient to prevent any possibility of the flame burning back, and by pushing the burner more or less into the chamber the diaphragms are more or less flattened to vary their permeability. The top of the burner is slightly rounded or convexed, as shown in Fig. 1, to thereby direct the flame more directly toward the mantle, particularly from the outlets adjacent the periphery of the burner, the tendency of the elongated small passages being to deliver the gaseous mixture with considerable force, as from nozzles.

By longitudinally crimping or corrugating the upper end of the chamber a, as at a^{10}, Fig. 4, we can use a solid cylindrical plug-burner d^{10}, the burner-outlets at its periphery, formed by the corrugations, presenting a ring of small jets of flame, this construction being well adapted for short mantles. An equivalent result is obtained by providing longitudinal grooves or corrugations d^{15} in the burner-plug, as illustrated in Fig. 5, a smooth chamber being used therewith. With either construction if a long mantle is used we have found it advisable to provide the burner with internal apertures or passages, such as d^{20}, Fig. 5, as they act to carry the flame therefrom well up to the top of the mantle.

Yet another form of burner is shown in Figs. 2 and 3, the plug f, of refractory material, having segmental channels or grooves f' in its cylindrical surface, said grooves increasing in width from the bottom upward by making the dividing ribs or portions f^2 with upwardly-converging sides f^3. Comparatively large outlets are thus provided for the gaseous mixture adjacent the periphery of the burner, the lateral widening of the grooves further operating to lessen the velocity of efflux, and this form of burner is adapted for short mantles. If long mantles are used, we prefer to also provide the burner with a series of internal outlet passages or perforations $f^\times$ to carry a portion of the flame to the upper part of the mantle, the desired end thereby attained being, manifestly, to provide for as uniform and complete incandescence of the mantle as is possible.

The various forms of burner shown are adapted to also regulate the permeability of the barrier in the mixing-chamber, as has been described.

After the gas and air valves have been once adjusted the valve b', Fig. 1, is used for service purposes to turn on or shut off the light.

By our invention a thorough mixing of the air and gas is effected and the exit of the mixture is made noiseless, all singing, hissing, or roaring being prevented.

Various changes or modifications may be made by those skilled in the art without departing from the spirit and scope of our invention.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In apparatus of the class described, a mixing-chamber having air and gas supplies communicating therewith, a permeable barrier in said chamber to effect thorough mixing of air and gas and to prevent noisy escape of the mixture to the burner, an elongated burner of refractory material located in the outlet end of said chamber, and a plurality of long tubular outlet-passages establishing communication between the outer end of the burner and the interior of the chamber adjacent thereto.

2. In apparatus of the class described, a chamber, air and gas supplies communicating therewith, a permeable barrier in the chamber, to effect thorough mixing of air and gas, an elongated, plug-like burner of refractory material inserted in the outlet end of the chamber, and elongated tubular outlet-passages establishing communication between the outer end of the burner and the interior of the chamber, said burner being longitudinally adjustable in the chamber to vary the permeability of the barrier.

3. In apparatus of the class described, a mixing-chamber having air and gas supplies communicating therewith, a permeable barrier in said chamber to effect thorough mixing of air and gas and to prevent noisy escape of the mixture to the burner, and an elongated burner of refractory material fitting in the outlet end of the chamber and provided with a plurality of long tube-like passages extended

from end to end of the burner to establish communication between the chamber and the outer end of the burner.

4. In apparatus of the class described, a chamber having air and gas supplies communicating therewith, a permeable barrier therein to effect thorough mixing of gas and air, a plug-like burner of refractory material inserted in the outlet end of the chamber, and elongated tube-like passages to convey the mixture of gas and air from the chamber to the outer end of the burner adjacent the periphery thereof.

5. In apparatus of the class described, a chamber having air and gas supplies communicating therewith, a permeable barrier therein to effect thorough mixing of gas and air, and a plug-like burner of refractory material inserted in the outlet end of the chamber and provided adjacent its periphery with a plurality of outlets extending the length of the burner, for the air and gas mixture, the burner being longitudinally adjustable in the chamber to vary the permeability of the barrier.

6. In apparatus of the class described, a burner composed of an elongated plug of highly refractory material, a chamber in the outlet of which the burner is seated, gas and air supplies communicating with the chamber, a barrier in the latter, consisting of a plurality of arched foraminous diaphragms, adjacent diaphragms being oppositely arched and a plurality of tube-like ducts or passages extending the length of the burner and establishing communication between the chamber and the outer end of the burner.

7. In apparatus of the class described, a mixing-chamber having air and gas supplies communicating therewith, a plurality of arched foraminous diaphragms in said chamber between its inner end and its outlet, and a plug of refractory material seated in the outlet end of the chamber and provided adjacent its periphery with a plurality of outlets for the mixture of air and gas extending through the plug from end to end, the plug constituting the burner and protecting the diaphragms from the heat of the flame.

8. In apparatus of the class described, a mixing-chamber having air and gas supplies communicating therewith, a plurality of arched foraminous diaphragms in said chamber between its inner end and its outlet, and a plug of refractory material seated in the outlet end of the chamber and provided with tube-like outlet-passages extending the length thereof for the mixture of air and gas, the plug, which constitutes the burner, being longitudinally adjustable in the chamber to vary the curvature of the diaphragms.

9. In apparatus of the class described, a burner provided with a mantle, the burner consisting of an elongated plug of refractory material provided with a plurality of tube-like passages extended therethrough, and a mixer in the outlet end of which the burner is seated, and having air and gas supplies in communication therewith, the burner being longitudinally adjustable to regulate the action of the mixer.

10. In apparatus of the class described, a tubular mixing-chamber having air and gas supplies communicating therewith, a plurality of arched foraminous diaphragms in the chamber between its outlet and the inner end, adjacent diaphragms being oppositely arched, and a plug of highly refractory material seated in the outlet end of the chamber and provided at its outer end adjacent its periphery with a plurality of outlets for the delivery of the mixture of air and gas, said plug constituting the burner, the inner end thereof pressing upon the adjacent diaphragm to force the edges of the several diaphragms against the wall of the chamber.

11. In apparatus of the class described, a burner consisting of an elongated plug of refractory material and having at its outer end the outlets of a series of passages extended through the plug, an incandescing mantle, a mixer in the outlet end of which the burner is seated, and air and gas supplies communicating with the burner-passages, by or through the mixer.

12. In apparatus of the class described, an elongated burner of refractory material provided with a plurality of long, tube-like passages, some of which are arranged adjacent its periphery, an incandescing mantle, and a mixer having air and gas supplies in communication therewith, said mixer communicating with the burner-passages, and comprising a chamber and a series of arched foraminous diaphragms therein.

13. In an apparatus of the class described, a mixing-chamber having air and gas supplies communicating therewith, a plurality of arched foraminous diaphragms in said chamber between said inlets and its outlet, and an elongated, plug-like burner located at the outlet of the chamber.

14. In apparatus of the class described, a chamber having air and gas supplies communicating therewith, a permeable barrier therein to effect thorough mixing of air and gas, and a plug-like burner at the outlet end of the chamber having a plurality of elongated passages with their openings adjacent the burner periphery.

15. In apparatus of the class described, a chamber having air and gas supplies communicating therewith, a burner at the outlet end of the chamber, and a permeable barrier in the latter between the burner and the inlets, the barrier being held in place by the burner.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGE H. BURROWS.
GEORGE L. WEAVER.

Witnesses:
JOHN C. EDWARDS,
MARGARET A. DUNN.