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P. VON WOUWERMANS.

BUNSEN BURNER.

APPLICATION FILED DEC. 4, 1906.

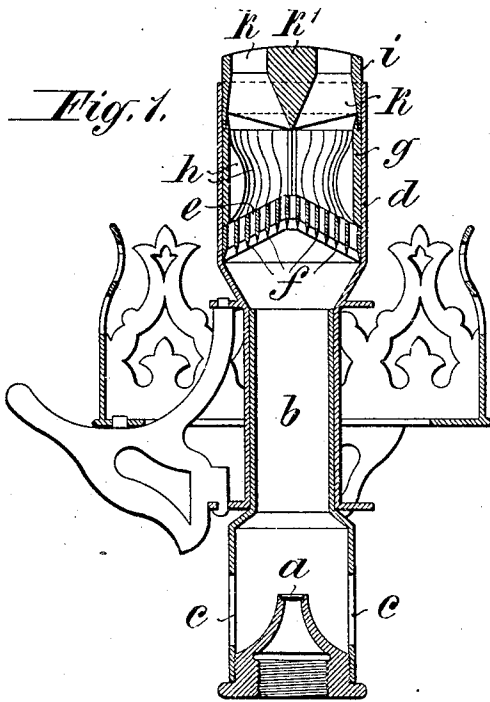
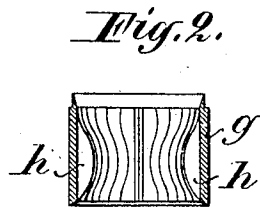


Fig. 3.

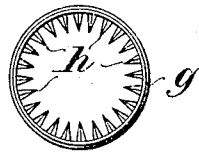


Fig. 5.

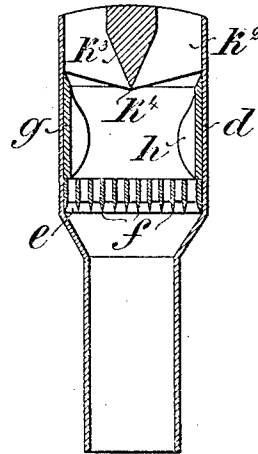


Fig. 7.

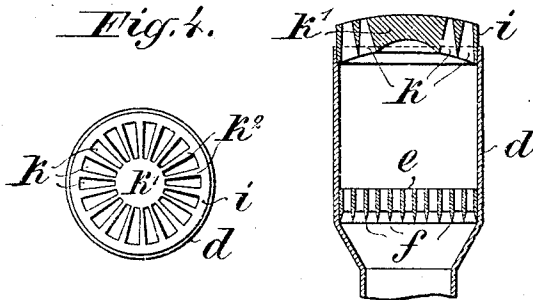


Fig. 9.



Fig. 11.

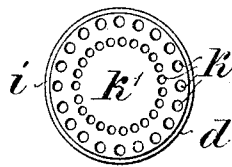
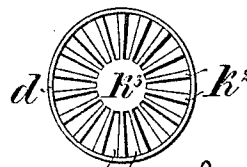


Fig. 13.



Witness:
G. L. Lee
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In Witness:
Philip von Wouwermans
By *[Signature]* Attorney.

UNITED STATES PATENT OFFICE.

PHILIPP VON WOUWERMANS, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR TO GASSPAR-
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BUNSEN BURNER.

No. 882,545.

Specification of Letters Patent.

Patented March 17, 1908

Application filed December 4, 1906. Serial No. 346,322.

To all whom it may concern:

Be it known that I, PHILIPP VON WOUWERMANS, of Vienna, Austria-Hungary, a subject of the Emperor of Austria-Hungary, and whose post-office address is No. 33 Alserbachstrasse, Vienna, Austria-Hungary, have invented a new and useful Bunsen Burner, of which the following is a specification.

This invention relates to Bunsen burners for illuminating and heating purposes and its object is to heat the gas and air mixture to a high degree by means of heat taken from the upper part of the burner, for the purpose of increasing the efficiency of the latter as much as possible.

To this end the invention consists essentially in so constructing the upper part of the burner comprising the cap or head-piece of the burner and the upper portion of the mixing tube, that a large number of internal folds or corrugations are formed to constitute a large contact and radiating surface and flashing back of the flame is prevented.

According to the invention the cap or "head-piece" as it is termed hereinafter and in the annexed claims of the burner is made of a good heat conducting metal, such as copper and the like, and of such thickness that the walls of the outlet openings offer a large heating surface; the outlet openings themselves are nozzle shaped, that is, their cross sections decreasing gradually upwards. The lower edges of the walls of the partitions separating the outlet openings are beveled to form cutting edges. By this construction of the head-piece the outflow velocity of the gas mixture is increased, and on the other hand friction and checks to the gas and air mixture when entering the openings are prevented, the sharp lower edges cutting smoothly through the current. By the coöperation of both means the flashing back of the flame is so effectively prevented that the mixture may be heated to a very high degree. The upper part of the mixing tube which latter is made of a metal which is of less heat conductivity such as iron, is according to this invention provided with a heater which consists in a tubular piece closely fitting in the mixing tube and provided on its inner surface with a number of thin ribs or fold-like projections, radially extending into the path of the mixture of gas and air and the cross section of which gradually decreases from both sides to form a sharp edge. The heater is constructed

with copper or another metal or alloy having a good heat conductivity.

The outlet openings of the head-piece should be made as far as possible without any sharp edges and should be highly polished at their mouth.

For attaining the highest efficiency it is advisable to arrange the known distributing and mixing grating composed of vertical channels, below the heater, the walls of the gratings forming the channels being sharpened like a knife at their lower edge for the purpose of preventing any checks in the flow of the mixture and decreasing the inlet friction.

There results from the above means and their combination that by the coöperation of the continued and increasing heating of the gas and air mixture as it passes through the upper part of the burner, with the prevention of checks at the inlet into the channels of the distributing grating and at the inlet into the openings of the head-piece, and with the nozzle-like shape of the outlet openings of the head piece, the gas and air mixture flows out in a highly heated condition with very great velocity.

The invention allows to be embodied in various forms of which some are shown on the annexed sheet of drawings.

Figure 1 is a vertical section through a burner provided with a slotted head-piece and a heater having ribs of segmental shape. Fig. 2 is sectional elevation of the heater, and Fig. 3 the top view of the same. Figs. 4 and 5 are a top and a bottom view respectively of the slotted head-piece. Fig. 6 is a vertical section through a burner with a perforated head-piece, of which Fig. 7 is a plan. Fig. 8 is a vertical section of a burner with a modified slotted head-piece, shown in plan in Fig. 9.

In Figs. 1 to 5, *a*, is the gas inlet nozzle, *b*, the iron mixing tube with the air inlet openings *c*, and *d*, the expanded burner head, also of iron; in the bottom of the latter a cone shaped distributing and mixing grating *e*, is arranged, the cross sections of the channels of which are circular. The walls of the channels are beveled to form cutting edges, *f*, at the lower ends, so that they sharply cut the mixture and the latter enters the channels without any check. Above the grating, *e*, is arranged a heater, *g*. According to Figs. 2 and 3 this heater consists of a tubular body

preferably made of iron, and provided with radially projecting ribs, *h*, on its inner surface, the ribs, *h*, being made in the shape of segments of a circle with a good heat conducting and heat transmitting metal such as copper. The cross section of the ribs preferably decreases from both sides outward to form a cutting edge. This heater reaches up to the head-piece, *i*. The latter is made of a good heat conducting metal, such as copper, in the form of a comparatively thick disk perforated with slot-shaped openings, *k*, arranged radially around a solid middle part, *k'*, and increasing in width outwardly or towards the circumference. As shown in Fig. 1 and Fig. 5 the slots *k* broaden out downwardly, their partitions, *k²*, having a V-shaped vertical section, so that their lower ends form cutting edges whereby the mixture is enabled to enter the slots without any check.

As the mixture is sharply cut in entering the channels of the grating *e* by the cutting edges, *f*, it is distributed without any check in these channels which it passes through with a whirling movement, thereby more intimately mixing together the air and gas. It then flows into and through the heater *g* in the form of whirling currents which rapidly spread out and diffuse through each other, and it is heated partly by radiation from the ribs *h* and partly by direct contact with the same. The mixture, thus considerably more intimately mixed as well as highly heated and consequently accelerated in its velocity, enters the slots, *k*, of the highly heated head-piece, *i*, without any check. On passing through said slots it is still further mixed and further accelerated owing to the nozzle shape of the said openings and at the same time its temperature is further considerably increased by radiation from, and contact with, the surfaces of the slots. Owing to the nozzle shape of the outlet openings any flashing back of the flame is absolutely prevented.

In the burner shown in Figs. 6 and 7 with the heater omitted, a disk shaped shallow distributing grating *e*, is employed, and the head-piece, *i*, is provided with holes, *k*, of circular cross section expanding downwards and arranged, for example, in two concentric rows around a solid middle part, *k'*, the holes of the outer row being larger than those of the inner row.

In the burner shown in Figs. 8 and 9 the head-piece is constructed as a core, *k³*, provided with radial ribs, *k²*, which increase in breadth outwardly, and at a short distance from the upper edge are beveled from both sides so that their lower ends form cutting edges *k⁴*.

What I claim, and desire to secure by Letters Patent of the United States, is:

In a Bunsen burner the combination with the gas nozzle and the mixing tube provided with air inlets, of a thick head-piece made of a metal having great heat conductivity and provided with radial slits the width of which increases outward and downward, cutting edges formed on the lower ends of the partitions between said openings, a tubular body provided with ribs of segment like shape made of a metal having great heat conductivity extending radially inward into the path of the combustible mixture and provided with cutting edges, said tubular body being inserted below the said head piece and in contact therewith, and a distributing grate placed between said tubular body and the mouth of the mixing tube and being composed of a number of vertical channels, substantially as and for the purposes stated.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PHILIPP VON WOUWERMANS.

Witnesses:

ALVESTO S. HOGUE,
AUGUST FUGGER.