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T. G. PALMER & H. B. COX.

BUNSEN BURNER.

APPLICATION FILED MAY 25, 1904.

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FIG. 1.

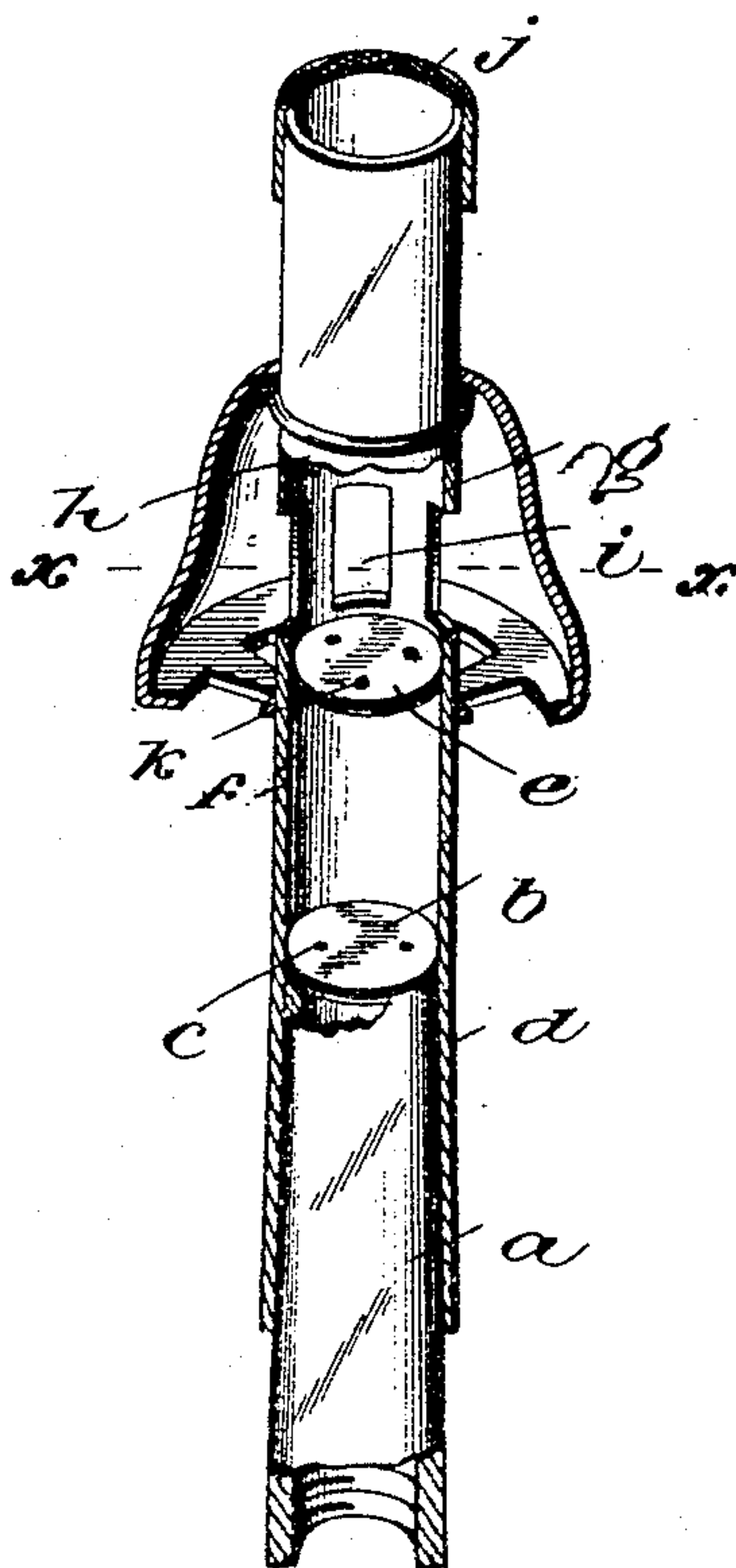
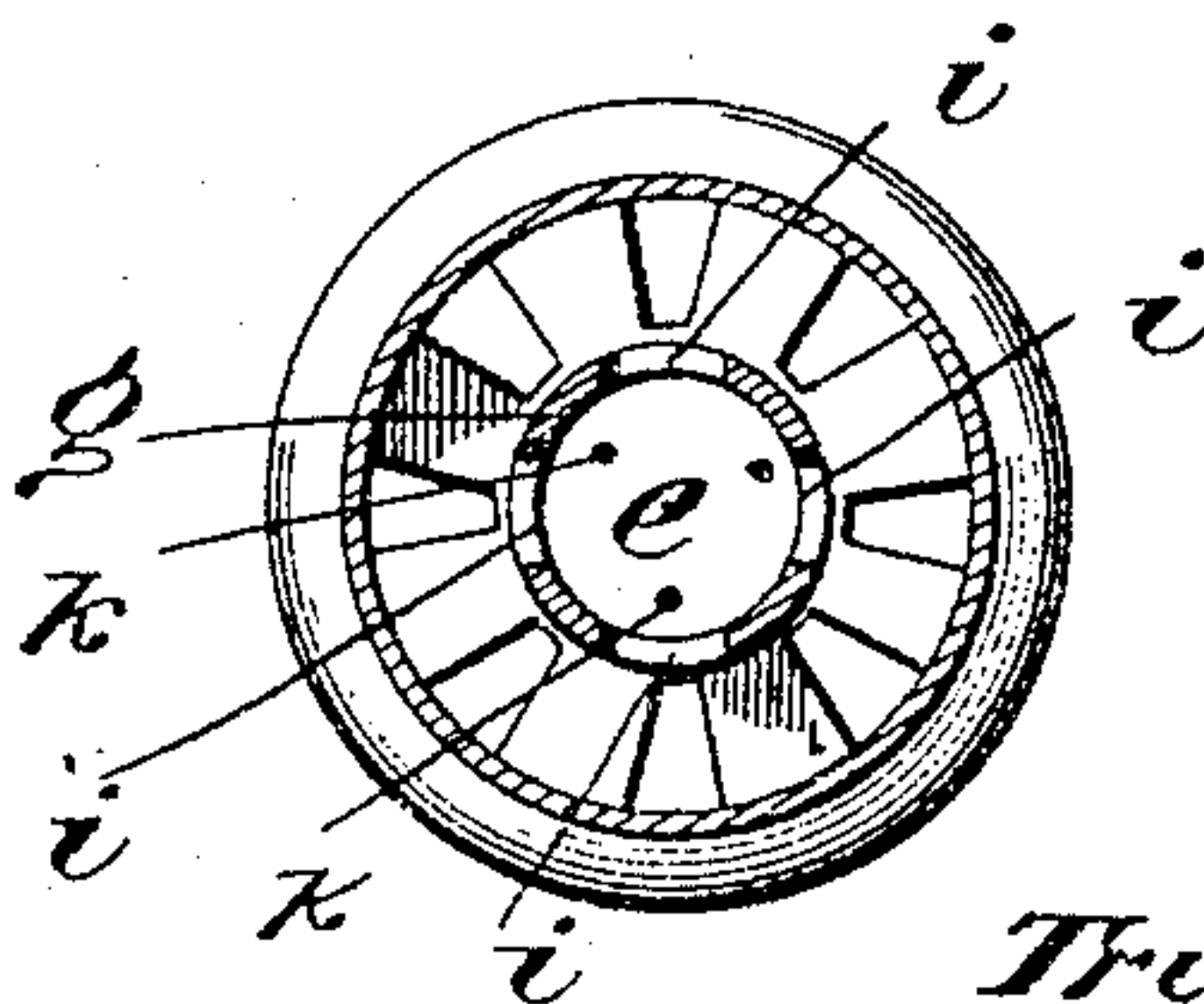


FIG. 2.



Witnesses

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## UNITED STATES PATENT OFFICE.

TRUMAN G. PALMER, OF CHICAGO, ILLINOIS, AND HARRY BARRINGER COX, OF WASHINGTON, DISTRICT OF COLUMBIA; SAID COX ASSIGNOR TO SAID PALMER.

## BUNSEN BURNER.

SPECIFICATION forming part of Letters Patent No. 781,454, dated January 31, 1905.

Application filed May 25, 1904. Serial No. 209,792.

*To all whom it may concern:*

Be it known that we, TRUMAN G. PALMER, residing at the city of Chicago, county of Cook, State of Illinois, and HARRY BARRINGER COX, residing at Washington city, District of Columbia, citizens of the United States, have invented certain new and useful Improvements in Bunsen Burners; and we 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 appertains to make and use the same.

This invention relates to certain improvements in Bunsen burners; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanation of the construction shown in the accompanying drawings, merely as an example for purposes of illustration and description, from among other constructions and arrangements within the spirit and scope of the invention.

The object of the invention is to provide means in a Bunsen burner for attaining increased efficiency at a reduced gas consumption by liberating, expanding, and fixing the gas from the service-pipe, thereby producing a gas of the peculiar proper condition preparatory to and for mixing with the air in the air and gas mixing chamber to form a combustible mixture of the high efficiency desired.

The invention consists in certain novel arrangements and combinations of parts, as more fully and particularly described and pointed out hereinafter.

In the accompanying drawings, Figure 1 is a sectional perspective, showing a form of Bunsen burner arranged in accordance with our invention. Fig. 2 is a cross-section on the line *x x*, Fig. 1.

In the drawings, *a* is a nipple, tube, or tip in direct connection with the gas service-pipe and receiving the gas under service-pressure. The outlet from this pipe is approximately closed by any suitable means to provide one or more jet-openings or spray-orifices. For instance, the outlet end of the pipe is shown spanned by diaphragm *b*, having one or more

fine small jet-openings *c*, so that the gas under service-pressure is against the diaphragm.

*d* is a tube removably slipped over or otherwise forming a tight joint with tube *a* and projecting above the same and carrying or forming a part of the Bunsen burner. This tube *d* is of greater diameter than the tube *a* and at a proper or suitable distance above the diaphragm *b* is spanned by a diaphragm *e*, thereby forming the expansion or liberating chamber *f* between said two diaphragms. The Bunsen-burner tube *g* continues upwardly from diaphragm *e* to form the air and gas mixing chamber *h*, at its lower end having the air-inlet openings *i* above the diaphragm *e*. The tube *g* terminates at its upper end at the combustion-point or discharges through the reticulated diaphragm *j* to the combustion-point above the same, according to the type of Bunsen burner employed.

The gas under service-pressure is forcibly injected into chamber *f* in the form of spray or jets and is suddenly liberated and expanded therein, creating eddies and currents and causing a partial mechanical separation and thorough commingling and mixing of the molecules and a consequent peculiar preparation of the gas, reducing the same to a condition which causes the gas thus prepared to most efficiently mix with the air in the chamber *h* under the peculiar requirements of a Bunsen burner. The expanded prepared gas flows at a comparatively slow rate through the jet openings or orifices *k* of the upper diaphragm *e* and is thereby slowly sprayed or injected into the air and gas mixing chamber *h*, whereby the gas and air are therein more thoroughly mixed and commingled to produce a combustible mixture of a high efficiency for the purpose desired. By thus preparing the gas before it is admitted to the air and gas mixing chamber the proper proportions of air and gas can be more accurately maintained than has heretofore been possible and the objectionable excess of gas in the combustible mixture is avoided, and, furthermore, the gas is so prepared that when introduced into said air and gas mixing chamber a combustible mi-



ture of higher efficiency than heretofore is produced.

The location of the expansion or liberating chamber  $f$  between the gas-service pressure 5 and the point of air-inrush into the mixing-chamber maintains said chamber  $f$  comparatively cool and prevents superheating of the gas in the chamber.

To enable the chamber  $f$  to perform its peculiar function in causing the preparation of 10 the service-gas preparatory to the mixture thereof with air in the air and gas mixing chamber  $h$ , we jet the service-gas into chamber  $f$  through one or more inlets and then 15 permit the prepared gas to slowly pass from chamber  $f$  into the air and gas mixing chamber in the form of one or more jets. We find it desirable to maintain the gas in chamber  $f$  under a reduced pressure, so that it will pass 20 slowly into the air and gas mixing chamber, whereby we attain materially increased efficiency and a reduced gas consumption. The area or capacity of the service-gas inlet into chamber  $f$  is fixed whether such area be the 25 aggregate of several jet-openings or of only one opening. The area or capacity of the prepared-gas outlet from chamber  $f$  is also fixed and is greater or of larger capacity than that of said service-gas inlet whether said enlarged outlet area is that of one outlet-opening 30 or the aggregate area of several outlet-openings. The essential feature is that the pressure in the chamber  $f$  is reduced below that of the service-gas, so that the prepared 35 gas passes slowly through an outlet of fixed area into the air and gas mixing chamber, whereby a highly efficient combustible mixture is attained with a minimum consumption of gas. We find that this highly efficient 40 combustible mixture cannot be attained where the gas is discharged under high pressure or under the service-pressure into the air and gas mixing chamber even where regulating-valves or other devices are employed to vary 5 the quantity of gas admitted according to the service-pressure by varying the gas-passages. We prefer to employ gas inlets and outlets of fixed areas whatever the service-gas pressure, the areas of the inlet to and outlet from 5 our liberating-chamber being one greater than the other.

It is evident that various changes and modifications can be resorted to without departing from the spirit and scope of the invention

described. Hence it is not desired to limit 55 the invention to the exact construction shown.

What we claim is—

1. In a Bunsen burner, in combination, a pipe adapted to receive the gas under service-pressure and closed by a diaphragm having a 60 reduced service-gas outlet of fixed area, a tube removably slipped on said pipe and closed by a diaphragm having a prepared-gas outlet of a fixed area which is greater than 65 the area of said first-mentioned outlet, said tube forming an enlarged unobstructed gas-liberating chamber between said diaphragms, and a Bunsen-burner tube extended up from said first-mentioned tube and having an air- 70 inlet above said last-mentioned diaphragm and forming the Bunsen-burner air and gas mixing chamber above said liberating-chamber, as and for the purposes substantially as described.

2. A Bunsen burner having an air and gas 75 mixing chamber opening to the combustion-point, combined with a service-gas-liberating chamber having a restricted inlet of a fixed area for injecting service-gas at service-pressure into said liberating-chamber, and an 80 outlet of a fixed and greater area than said inlet for slowly discharging the prepared expanded gas at a reduced pressure into said air and gas mixing chamber, whereby an efficient mixture is attained in said air and gas mixing 85 chamber, substantially as described.

3. In a Bunsen burner, in combination, a gas and air mixing chamber at one end communicating with the point of combustion for the combustible mixture and at the opposite 90 portion having an air-inlet, and a service-gas liberating and preparing chamber having a restricted service-gas inlet and an outlet opening into the air-receiving end of said mixing-chamber and through which the prepared ex- 95 panded gas is injected at a reduced pressure into said mixing-chamber, whereby an efficient combustible mixture is attained, said inlet and outlet being of different capacities and fixed areas.

In testimony whereof we affix our signatures in presence of two witnesses. 100

TRUMAN G. PALMER.  
HARRY BARRINGER COX.

Witnesses:

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