

Burners,  
Liquid fuel, Retort.

EXAMINED

No. 653,166.

H. B. CARY.

Patented July 3, 1900.

OPEN BUNSEN BURNER.

(Application filed May 1, 1899.)

(No Model.)

2 Sheets—Sheet 1.

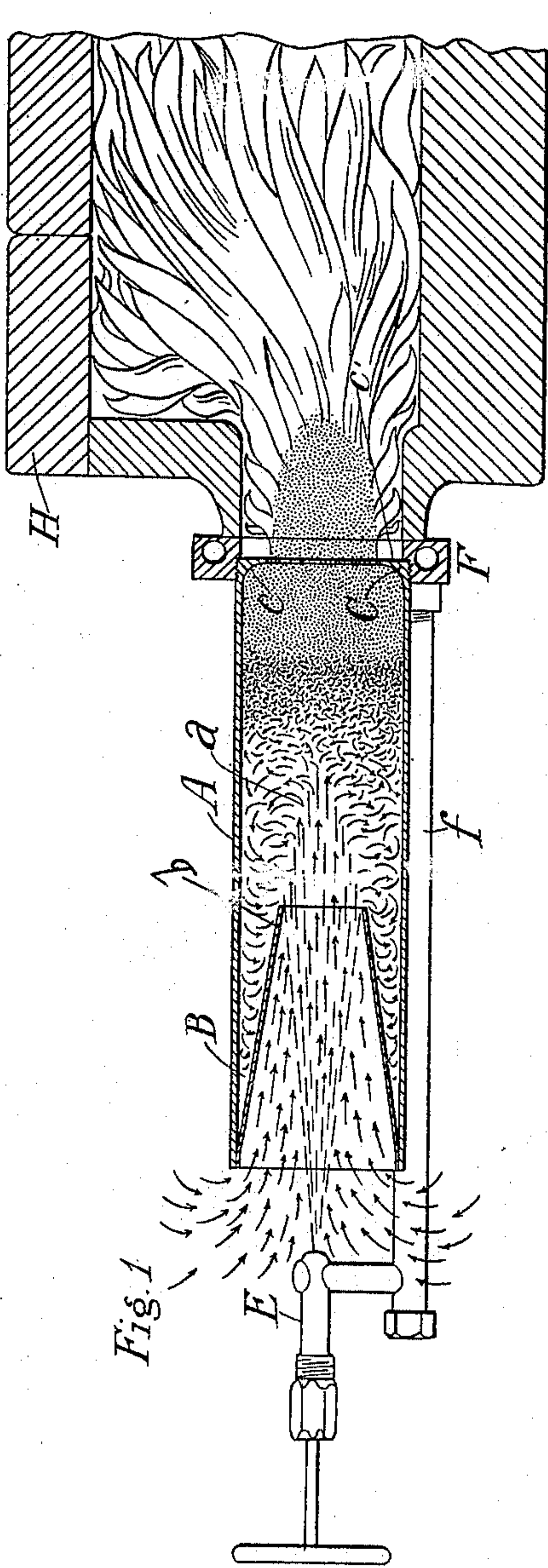


Fig. 1

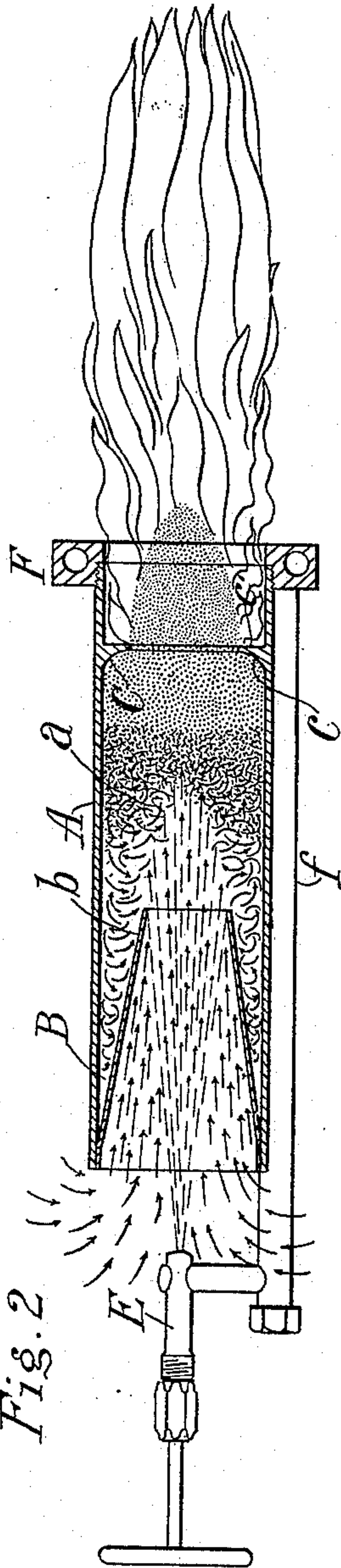


Fig. 2

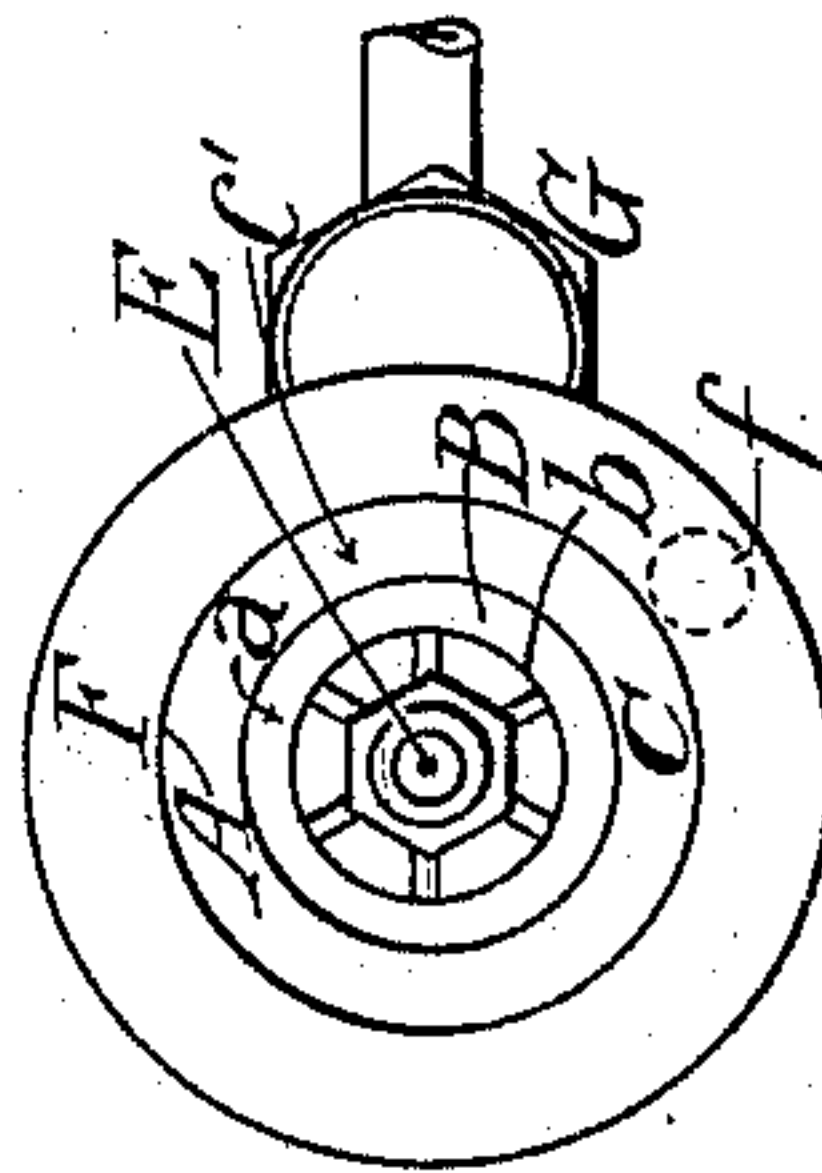


Fig. 3

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2 Sheets—Sheet 2.

Fig. 4.

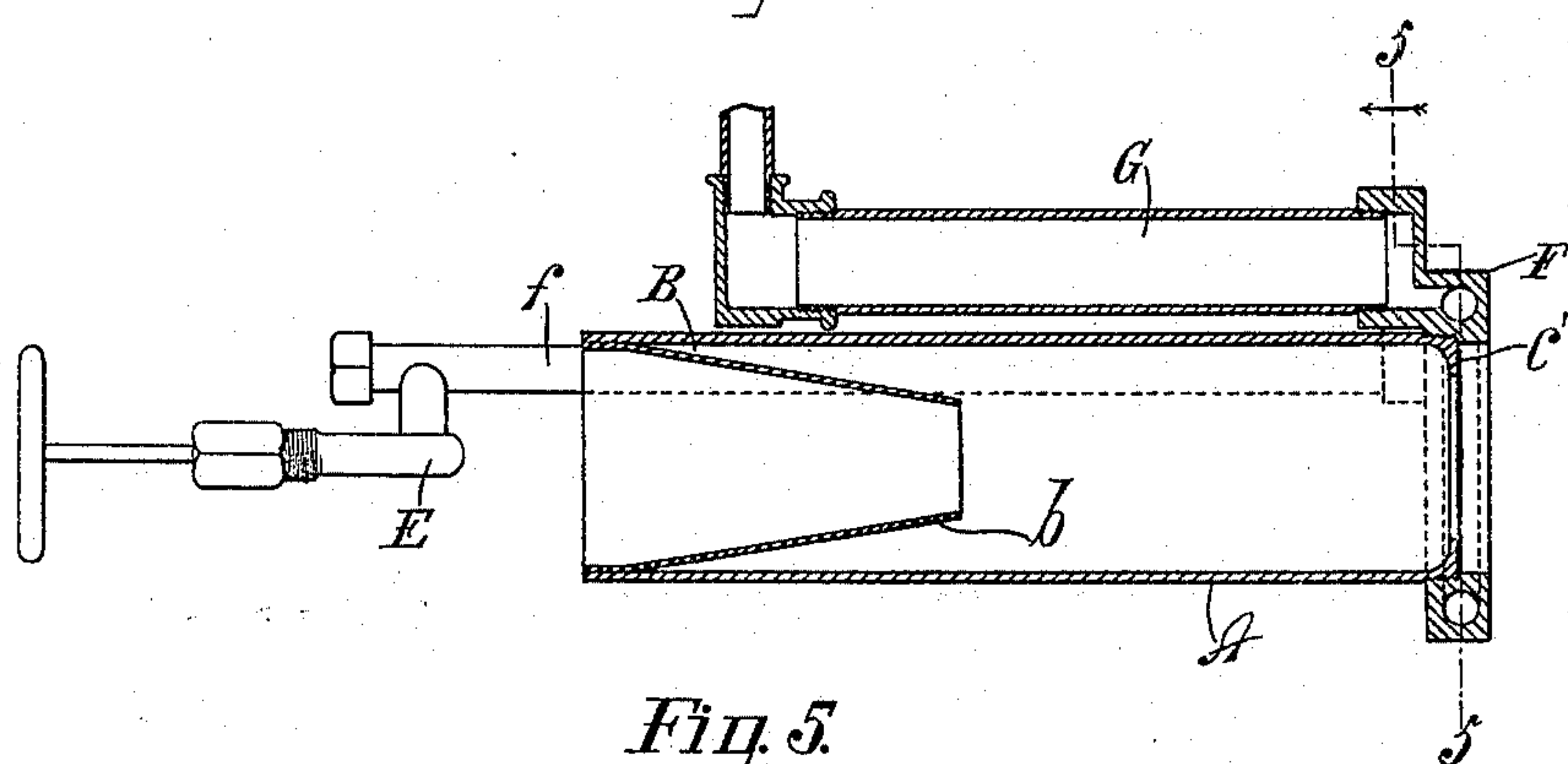
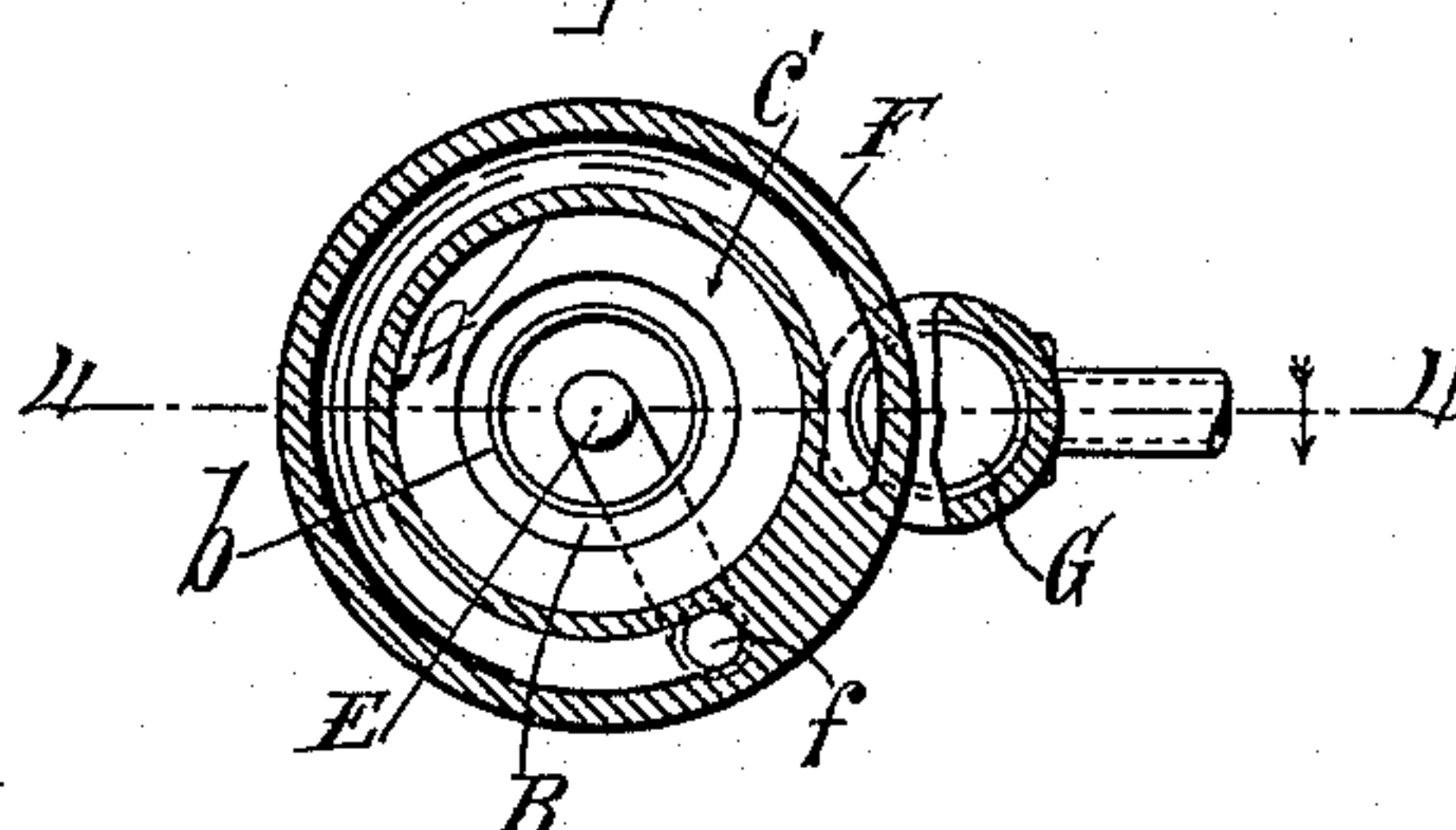


Fig. 5.



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# UNITED STATES PATENT OFFICE.

HENRY BOUNDS CARY, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO  
FREDERICK W. BRAUN, OF SAME PLACE.

## OPEN BUNSEN BURNER.

SPECIFICATION forming part of Letters Patent No. 653,166, dated July 3, 1900.

Application filed May 1, 1899. Serial No. 715,237. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY BOUNDS CARY, residing at Los Angeles, in the county of Los Angeles and State of California, have invented  
5 a new and useful Improvement in Open Bunsen Burners, of which the following is a specification.

My invention relates to that class of gas-burners known as "Bunsen" burners and  
10 which have a mixing-tube open at both ends and arranged to receive a centrally-injected jet of gas or hydrocarbon vapor therein to mix with the entrained air drawn into the tube by the gas or vapor jet. Burners of this class  
15 are supplied with gas or vapor under pressure, and the jet of gas or hydrocarbon vapor centrally injected into the burner entrains and carries with it air to mix with the gas or hydrocarbon vapor to make a great heat-producing  
20 but non-luminous flame.

An object of my invention is to provide means in an open Bunsen burner to thoroughly and completely incorporate and mingle the gas or vapor and entrained air inside the  
25 chamber, so that no air or gas (or vapor) escapes therefrom unmixed, and to also provide a burner which will have no boring effect with its flame and which will burn with a soft flame as distinguished from a blast or blowpipe  
30 flame, but which will give a heat of the highest intensity which can be produced with hydrocarbon gas or vapor.

I propose by this invention to dilute with atmospheric air the hydrocarbon gas or vapor  
35 to such a degree that when ignited the carbon will be perfectly consumed, thereby eliminating from the resultant flame all luminous qualities and resolving all the energy of the combustible gases—i. e., hydrogen, carbon,  
40 and oxygen—into the form of sensible heat.

In carrying out this invention it is necessary to adjust the parts somewhat differently when the flame is to be used in the open air than when it is to be used in a closed furnace,  
45 for the reason that when the flame is used in the open the atmospheric air which has access to the mixture issuing from the mixer will increase the dilution of the hydrocarbon vapor or gas. It therefore becomes necessary  
50 to so arrange the burner which is to be used in the open that the mixture when it issues from the mixing-tube into the open atmos-

phere will not be so highly diluted as it should be in cases where the mixture issues from such tube into a closed furnace—such, for instance, 55 as an assayer's furnace. If the highly-diluted mixture which is required for the greatest efficiency in furnace use is allowed to issue into the open air, the further dilution of the mixture by the surrounding atmosphere will produce a mixture which will not ignite at the 60 temperatures attainable in the open air.

A further object of my invention is to provide an open Bunsen burner of great power which will supply thoroughly-mingled air and 65 gas which will burn with an even unvarying force, the combustion of the gases from the burner being carried on continuously and evenly.

My invention comprises an open Bunsen 70 burner provided with an expansion and mingling chamber having at one end an inwardly-tapering conical intake member or funnel arranged inside the mingling-chamber and fitting the outer end thereof and at the other 75 end of the chamber a contracted outlet from such chamber. The jet-piece is arranged to direct the jet of gas axially through the funnel into the mingling-chamber and is arranged at such a distance from the other parts of the 80 burner that the expanded jet at the smaller end of the funnel will be of a cross-section substantially the same as the cross-section of the smaller end of the funnel, and the further extension of the same inside the tube will 85 strike the walls of the tube between the inwardly-projecting ring and the end of the funnel.

The accompanying drawings illustrate my invention. 90

Figure 1 is a longitudinal mid-section of my newly-invented burner as applied to an assayer's furnace. Fig. 2 is a like cross-section showing the inwardly-projecting ring located at a point nearer the contracted intake member. Fig. 3 is an end view of the 95 burner viewed from the right of Fig. 2. Fig. 4 is a plan section on line 4 4, Fig. 5, of the form of burner shown in Fig. 1. Fig. 5 is an irregular section on line 5 5, Fig. 4. 100

A indicates the tube or body of the burner, within which is an expansion and mingling chamber *a*.

B indicates an inwardly-tapering injector-



funnel, the larger end of which fits and closes the outer end of the tube or tubular body A of the burner, and the tube A is provided at the other end with an inwardly-projecting ring C.

E indicates the gas-jet piece to discharge a jet into the injector-funnel. The jet-piece is set outside of the tube and funnel and at such a distance from the inner end *b* of the funnel that where the gas and the entrained air pass through the funnel it will have expanded to practically the same cross-section as the small end *b* of the funnel.

The inwardly-projecting ring is preferably concave, as shown at *c*, upon the inner side and is a plain surface, as at *c'*, upon the other side, being at right angles to the axis of the tube.

F indicates the ordinary heating-chamber or retort for the gas which is supplied to the jet-piece E through the pipe *f*.

In the drawings the straight lines leading from the jet-piece indicate the gas and the arrows indicate the entrained air.

In practice the ring retards the discharge of gas from the tube, so that when the gas and intrained air enter the chamber *a* their velocity is checked and they immediately expand and circulate, as indicated, substantially, by the lines and arrows in the mingling-chamber; but the force of the jet pushes the body of mingled air and gas forward toward the ring C finally in a thoroughly-mixed body, as indicated in the drawings by the dots. The concavity of the ring tends to direct the mixture inward toward the center, across the outlet through the ring, and thus retards the free passage of the gases from the mingling-chamber sufficiently to afford a back pressure or cushioning action to receive the impact of the jet, so that the discharge of gas from the tube is produced by the pressure within the tube, and when the mingled air and gas have passed the ring they are completely amalgamated into a gas which is ready for combustion without the addition of any more air and which will expand and burn immediately after passing the ring.

The burner shown is designed to be used with gasolene or gas, which is supplied to the retort F by pipe G.

H indicates a fragment of an assayer's furnace.

In practice I have discovered that such a mixture of air and gas as will form a highly-explosive gas can be produced by placing the retarding-ring C at the proper point in the chamber. By locating the ring C closer to the contracted opening *b*, as shown in Fig. 2, the amount of air mingled with the gas is reduced and the resultant mixture will burn in the open air; but by locating the ring farther away from the contracted mouth *b* the amount of air mingled with the gas is increased, and I have thereby produced a mixture so high in oxygen that it will not burn in the open air, but when projected into a closed furnace,

such as an assayer's furnace, the mixture will burn with an intense flame without smoke or odor, and I have been able to smelt cast-iron and steel readily and in a short time with a comparatively-small expenditure of fuel.

It is to be understood that the operation of this open Bunsen burner is to first project gases and entrained air into an expansion and mingling chamber, retard the escape therefrom, and ignite the gases immediately upon their escape from the chamber.

In Fig. 2 I have shown the inwardly-projecting ring located at a nearer point to the intake member than in Fig. 1. This shortening of the mingling-chamber lessens the amount of air taken in, and therefore the gas is richer in hydrocarbons and will burn in the open air, while the form shown in Fig. 1 takes in such a quantity of air that the mixture becomes so high in oxygen that it will not burn in the open air; but its combustion produces an intense heat when it is projected into a chamber, as indicated. It will be seen, therefore, that my invention provides an actual and positive control of the proportions of air and gas, so that a flame of any desired intensity of heat may be obtained.

After the mixture of gas and air has passed the ring or collar C it immediately expands and burns. No ignition occurs inside the mixing-chamber.

In the form shown in Fig. 2 the gases burn partly inside the tube—that is, as far back as the ring-face.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An open Bunsen burner comprising a tube provided at one end with an inwardly-tapering injector-funnel, and at the other end with an inwardly-projecting collar; an expanding and mingling chamber being formed in the tube between the inwardly-projecting funnel and the collar; and a gas-jet piece to discharge a jet into the injector-funnel.

2. An open Bunsen burner comprising a tube provided at one end with an inwardly-tapering injector-funnel and at the other end with an inwardly-projecting concave collar; and a gas-jet piece to discharge a jet into the injector-funnel.

3. An open Bunsen burner comprising the tube; a conical intake member arranged with its larger end closing one end of the tube and with its smaller end projecting into the tube; an inwardly-projecting ring having a concave face presented toward the intake member and a straight face presented toward the open discharge end of the burner, a mixing-chamber being provided between the intake member and the ring, and a gas-jet piece arranged to inject a jet axially into the tube through the conical intake member.

HENRY BOUNDS CARY.

Witnesses:

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