A. G. LE CHATELIER.

BLOWPIPE.

APPLICATION FILED FEB. 15, 1907.

899,453.

Patented Sept. 22, 1908.

Fig:4

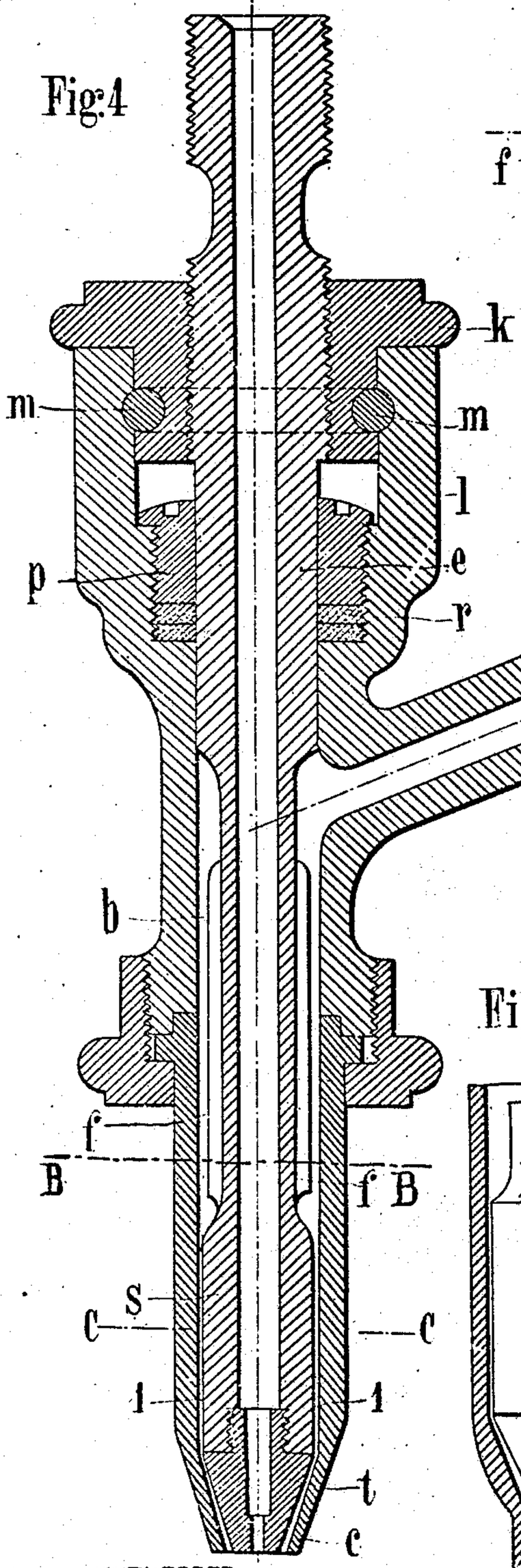


Fig:5

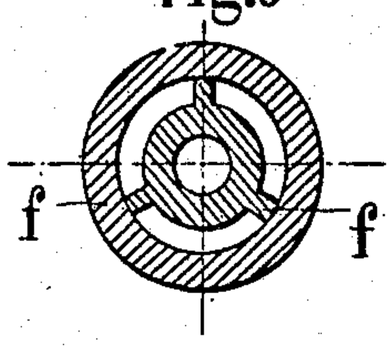


Fig:6

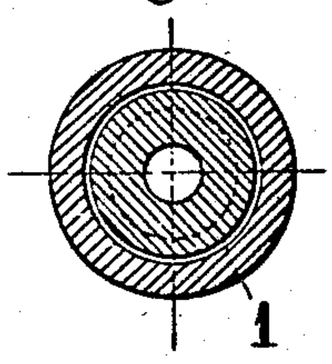


Fig:2

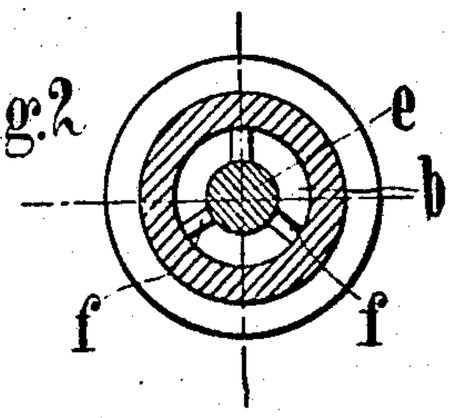


Fig:1

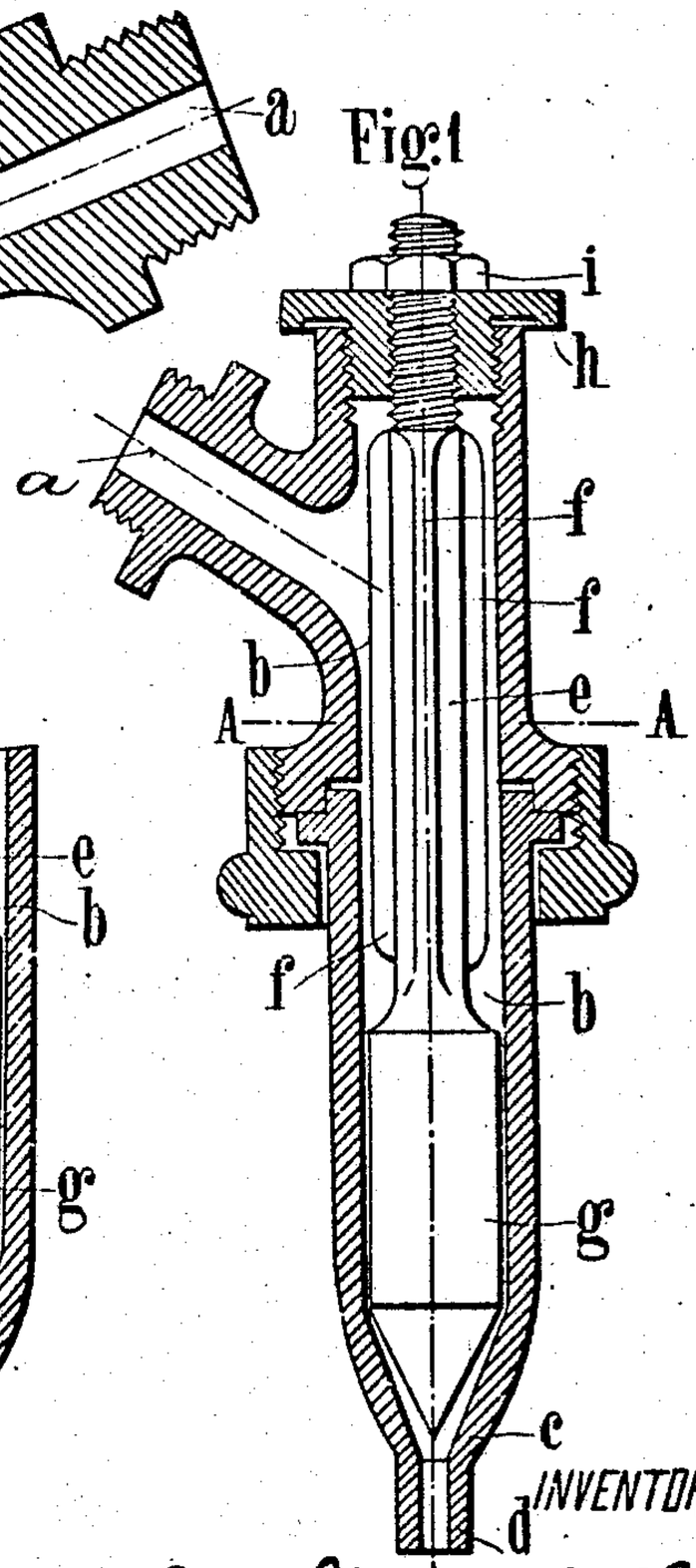
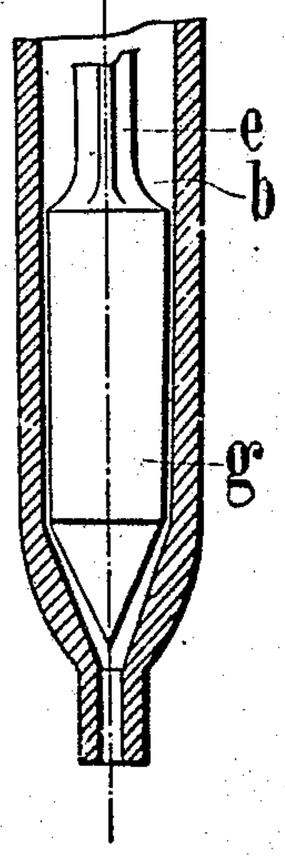


Fig:3



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BLOWPIPE.

No. 899,453. Specification of Letters Patent. Patented Sept. 22, 1908.

Application filed February 15, 1907. Serial No. 357,564.

To all whom it may concern:

Be it known that I, ANDRÉ GABRIEL LE CHATELIER, a citizen of the Republic of France, and resident of Marseille, France, have invented new and useful Improvements in Blowpipes, which improvements are fully set forth in the following specification.

Blowpipes in which oxygen is utilized as the burning element are generally based upon the principle which consists in imparting to the gaseous mixture, on its leaving the blowpipe, a velocity greater than that with which the flames is propagated in the same gaseous mixture considered in the state of repose, which velocity attains 200 meters per second for the oxy-acetylenic mixture.

Experience demonstrates that the velocity of the gaseous mixture on leaving the blowpipe may experience momentary reductions of a certain importance, as a result of various accidental causes, such as introduction of foreign bodies in the nozzle or body of the blowpipe, deficient operation of the expanders or other devices supplying the gases utilized, accidental compression of the india rubber tubes conducting the gases from these devices to the blowpipe etc.; these momentary reductions in the velocity of the gaseous mixture nullify the principle upon which the operation of the blowpipe is based and for this reason in particular in oxy-acetylenic blowpipes, the flame frequently lights back, which fouls the apparatus and may even damage its essential members, unless care be taken to close the gas supply cocks immediately.

The present invention has for its object the view to obviating these defects by utilizing the retarding action exerted upon the propagation of the flame by the cooling influence of the walls of conduits provided with a sufficiently small aperture.

It is an established fact that the propagation of the ignition of a combustible gaseous mixture contained in a tube of small diameter and in a condition of repose progressively decreases with the diameter, and that this result is attributable to the cooling action exerted upon the flame by the walls of the tube; this propagation velocity may even become *nil* with a sufficiently small diameter; in this case the flame is unable to propagate itself and becomes extinguished.

If the gaseous mixture instead of being in a condition of repose, has a velocity of its own in the inverse direction to that of the propagation of the flame; this velocity proper to itself will reduce that of the flame by a corresponding amount, even if it is only of small value, it will be sufficient to cause the extinction of the flame provided the diameter of the tube sufficiently approximates the diameter with which the flame becomes extinguished with a gaseous mixture in the condition of repose. To sum up, therefore, in order to prevent the propagation of the flame, two elements of essentially different natures are provided in a tube of small diameter. 1. The cooling influence of the walls, which increases as the diameter of the tube decreases; 2. The velocity proper to the gaseous mixture. Obviously it is advantageous to utilize the first of these two elements to the largest possible extent for blowpipes because the method of its action depends only upon the construction adopted, and cannot be rendered defective by accidental circumstances during the operation, contrary to what is the case, as already explained, with regard to the velocity of the gaseous mixture.

The propagation velocity of the flame of mixtures containing oxygen, is generally very great, and the capillary tubes, that is to say tubes the diameter of which does not exceed some tenths of a mm., are the only tubes which exert a really efficient retarding action; if tubes of this nature were employed in the construction of blowpipes, owing to the discharges which must necessarily be provided for, it will be essential either to multiply their number in order to obtain an adequate total section, or to cause them to be traversed by the gaseous mixture at velocities amounting to several thousand meters per second, either of which cases results in great constructional difficulties; the same object may be attained in a simple and practical manner by substituting for capillary tubes annular passages of very small aperture, that is to say passages delimited by surfaces very close together, and which passages by analogy will hereinafter be termed annular capillary passages. Their apertures may be sufficiently small to insure that they shall have, as regards the propagation of the flame, a retarding action analogous to that of capillary tubes, and, on the other hand, by appropriately increasing

their diameter it is possible to obtain a section for the passage of the mixture which is adequate for the blowpipe.

The foregoing considerations will sufficiently explain the principle of the present invention, which consists broadly in interposing on the path of the gaseous mixture, in blowpipes in which oxygen is employed, an annular capillary passage, which has for its object to prevent lighting back efficiently owing to the cooling action of its walls; this passage may be located very close to the orifice of the blowpipe; it may be of any desired form, but cylindrical and conical shapes are those most readily obtained. The aperture of this passage could be made sufficiently small to insure that this alone will be sufficient to stop the flame, but in practice it is not necessary to reach this extreme limit; the only important point is that its action should be sufficiently efficacious and preponderant to stop the flame when the velocity of the gaseous mixture experiences momentary reductions which may present themselves in the course of the operation of the blowpipe.

In order that my invention may be more readily understood reference will be had to the accompanying drawings in which

Figures 1 and 4 are views in longitudinal section showing my improvement applied to a blow pipe. Fig. 2 is a cross sectional view on the line A—A of Fig. 1. Fig. 3 is a longitudinal sectional view showing a variation of the application of my improvement. Figs. 5 and 6 are cross-sectional views taken on lines B—B and C—C of Fig. 4.

The invention may be carried into practice by various means. When it is to be applied to blowpipes provided with cylindrical discharge orifices, the arrangement represented in Fig. 1 of the accompanying drawing, and in Fig. 2, which represents a section on the line A—A of Fig. 1 may be adopted.

The mixture of oxygen and combustible gas passes through a passage *a* into a cylindrical chamber *b* which ends in a conical part *c* and the cylindrical orifice *d;* in this chamber a rod *e* provided with centering ribs *f f* is arranged, and comprises a cylindrical portion *g* terminating in a conical portion; this cylindrical part, together with the walls of the chamber *b*, delimit the capillary passage intended for preventing the flame from lighting back; the rod *e* is screw threaded where it passes through the bottom of the chamber *b* in order to admit of regulating the position of the cylinder *g* therein by means of a nut *h;* a counter nut *i* maintains this position when once the adjustment has been effected. In order to facilitate this mounting and to enable different outputs to be obtained with the same blowpipe, by changing the discharge orifice, the chamber *b* may be made in several parts, as shown in Fig. 1.

A second device is represented in Fig. 3; the chamber *b* and the enlargement *g* of the rod *e*, instead of being cylindrical are conical, their walls being still parallel; with this arrangement, by displacing the rod *e*, it is possible to adjust exactly to the desired extent the aperture of the annular capillary passage.

Any other arrangement may however be employed in order to establish in the path of the gaseous mixture and at a relatively small distance from the discharge orifice a capillary passage intended to prevent the lighting back of the flame.

For certain applications, it may be desirable to obtain a larger flame than that furnished by blowpipes with cylindrical orifices, while at the same time maintaining a moderate discharge of gas; the invention is particularly well adapted to attaining such an object; it is only necessary to prolong the annular capillary orifice in such a manner that it constitutes the actual discharge orifice of the blowpipe; in this manner an annular flame is obtained, to which any useful diameter may be given for a predetermined supply, by appropriately regulating the dimensions of the capillary passage. This passage being prolonged as far as the actual origin of the flame, is under the best possible conditions for preventing it from lighting back.

Very diverse arrangements may be employed; the capillary passage may be cylindrical as far as the discharge orifice; instead of being cylindrical, it may be conical; finally it may present a cylindrical part with conical end, this latter arrangement is that which gives the best results. The walls of the conical extremity may be parallel or slightly divergent.

Fig. 4 represents the nozzle of a blowpipe comprising an annular cylindrical passage with conical extremity, which form is advantageous for several applications; Fig. 5 represents a section on the line B—B and Fig. 6 a section on the line C—C.

The gaseous mixture passes through a passage *a* into a cylindrical chamber *b* ending in a frusto-conical part *c;* a rod *e* provided with centering ribs *f f f* enters the chamber *b* after passing through a stuffing box *r* arranged between a shoulder of the casing and screw cap *p;* at its extremity it carries a cylindrical enlargement *s* ending in a frusto-conical part *t*. The walls of the enlargement *s* and of its extremity *t*, together with the walls of the chamber *b* and of its extremity *c*, delimit the capillary passage; the chamber *b* may be made in two parts, as shown, and the extremity *t* may be fitted to the rod *e*. At its upper extremity the rod *e* is screwed into a knurl *k* connected with the part *l* carrying the stuffing box, by two pins *m* engaged in a semi-circular groove formed in the knurl *k*. Finally the rod *e* may be formed with a central passage ending in an orifice of small

cross-section, and intended for supplying a supplementary jet of oxygen when the blowpipe is utilized for dividing metals. This arrangement presents the following features: On leaving the conical annular conduit, the gases are mixed together, thereby insuring perfect combustion; by giving this passage an appropriate inclination, owing to the mutual reaction of the streams constituting the annular flame, a perfectly cylindrical flame is obtained without any lateral dispersion; the heat of the flame is thus utilized to the best advantage. When the blowpipe is employed for cutting off metals, the central oxygen jet passing through the middle of the annular flame, before it comes into contact with the part to be cut, experiences a heating which increases its action. By acting upon the knurl *k* the rod *e* may be displaced parallel with its axis; according to the direction in which this action takes place the aperture of the annular conical passage is increased or diminished and at the same time the discharge from the blowpipe is modified, so that it may be adapted to circumstances; in this case however, the aperture of the capillary passage 1—1 delimited by the walls of the enlargement *s* and of the part *b*, does not experience any change and its efficiency remains constant. Finally owing to the facility with which the conical extremity of the chamber *b* and the extremity *t* of the rod may be dismounted, it is possible by means of spare parts to modify the dimensions of the orifices for the discharge of the flame and of the central jet of oxygen according to requirements.

When it is not necessary to provide for the modification at will of the discharge from the blowpipe, in order to simplify the construction, the knurl *k* and the stuffing box *r* may be dispensed with, the rod *e* being fixed to the chamber *b* by means of a nut and counter nut device.

Generally speaking, any other arrangement may be adopted for establishing on the path of the gaseous mixture, at a short distance from the discharge orifice, or at this orifice itself, an annular capillary passage serving to prevent the flame from lighting back; in particular, passages of any desired form may be utilized, but the cylindrical and conical forms are those best adapted for carrying the invention into practice.

I claim—

1. In a blowpipe for burning a mixture of oxygen and a combustible gas, a burner tube and a member within said tube the surface of which forms with the inner surface of the wall of said tube an annular capiliary gas passage the proximity of said surfaces being such as to prevent backward propagation of flame in said burner tube.

2. In a blowpipe for burning a mixture of oxygen and a combustible gas, a burner tube, a tubular gas supply member within said tube, the outer surface of said member forming with the inner surface of the wall of said tube an annular capillary gas passage, the proximity of said surfaces being such as to prevent backward propagation of flame in said burner tube.

3. In a blowpipe for burning a mixture of oxygen and a combustible gas, a burner tube having a frusto-conical discharge orifice, a tubular gas supply member within said tube and having a conical end terminating in said orifice, said member provided with centering means, the outer surface of said member forming with the inner surface of the wall of said tube an annular capillary gas passage, the proximity of said surfaces being such as to prevent backward propagation of flame in said burner tube.

4. In a blowpipe for using a mixture of oxygen and combustible gas, the combination of a burner tube provided with a supply duct for said gases and a frusto-conical discharge orifice, an adjustable tubular central member within said tube for supplying oxygen having centering means, and an enlarged portion having a frusto-conical extremity entering said orifice, said enlarged portion forming with the tube an annular gas supply passage, the proximity of the confining walls of which prevents the backward propagation of the flame.

5. In a blowpipe for using a mixture of oxygen and a combustible gas, the combination of a tapering burner tube, a supply duct for admission of said gases and a discharge orifice, and an adjustable tapering member within said tube forming with the latter an annular capillary gas supply passage, the proximity of the confining walls of which prevents the backward propagation of the flame.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ANDRÉ GABRIEL LE CHATELIER.

Witnesses:

JEAN JOSEPH BRUNEL,

PIERRE JEAN CORRAD.