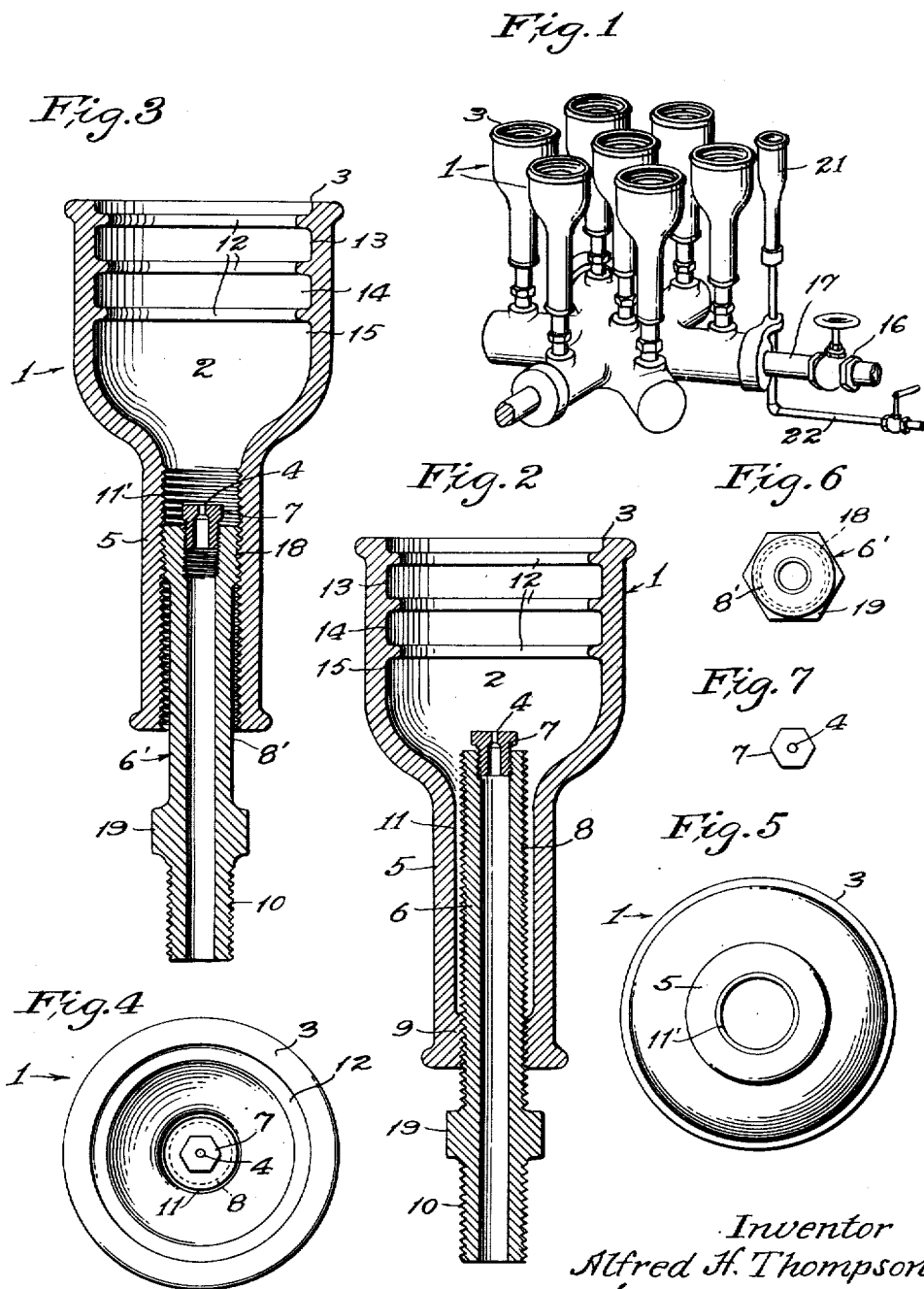


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ART OF AND MEANS FOR BURNING DOMESTIC OR PRODUCER GAS.
APPLICATION FILED JAN. 22, 1919.

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UNITED STATES PATENT OFFICE.

ALFRED H. THOMPSON, OF VENICE, CALIFORNIA.

ART OF AND MEANS FOR BURNING DOMESTIC OR PRODUCER GAS.

Application filed January 22, 1919. Serial No. 272,587.

To all whom it may concern:

Be it known that I, ALFRED H. THOMPSON, a citizen of the United States, residing at Venice, in the county of Los Angeles and State of California, have discovered and invented a new and useful Art of and Means for Burning Domestic or Producer Gas, of which the following is a specification.

This invention relates to the art of producing from domestic or producer gas a flame of high heat value, and is adapted to both domestic and industrial purposes.

An object of the discovery and invention is to produce a torch or blast flame from domestic or producer gas at low pressure and to provide a gas burner adapted to such production.

Another object is to provide a burner of this character which is adjustable to various pressures and qualities of gas.

An object is to obtain maximum efficiency and maximum heat from a given amount of domestic or producer gas.

Heretofore there have been two widely different methods of burning domestic or producer gas; one being the method exemplified in the Bunsen burner, and the other in illuminating.

The invention is broadly new, basic and pioneer in that the burner is in the form of a cup the open end of which extends beyond and is adjustable toward and from a gas injecting orifice.

I have discovered that by relative adjustment between the gas injecting orifice and the open end of the cup, gas having various pressures and B. T. U. values may be thoroughly mixed and combusted so as to support a blue flame within the cup, thus making the burner practical for industrial purposes. The cup being so constructed that when said jet of gas is ignited, atmospheric air within the cup will flow directly toward the jet within the cup from all sides and will supply oxygen equally from all sides to the ignited gas which entrains and expands an inner column of air that thus becomes mixed with the carbonaceous sub-

stance of the jet and a violent and explosive combustion takes place within said burner giving the effect produced by a jet of gas and air under high pressure.

This invention is distinguished from burners which are merely intended to support a flame such as illuminating lamps or cigar lighters in that none of such devices heretofore made, have been intended for or capable of industrial use for heating purposes.

This invention is adapted for burning gas under domestic pressure in a manner feasible for domestic and industrial and all other uses in which heat is produced from the combustion of gas under moderate pressure. The burner is not intended for lighting except in cases where an incandescent element is heated for producing the light.

The burner is adapted for use in stoves and furnaces and also in the open air and is adapted to use gas at domestic pressure or other pressure; that is to say from a pressure equal to five to eight inches water pressure up to high pressure, and to cause the gas to burn with blue flame within the burner with the same violence of combustion at domestic pressure as has heretofore been obtained with the use of gas under many pounds pressure.

An object of this invention is to provide a burner for the use of gas for industrial purposes which can be operated without the installation of a pressure plant which has heretofore been necessary in burning domestic gas for industrial purposes.

An object is to produce with low pressure gas a torch flame which has heretofore been produced only by the use of high pressure gas.

Another object of the invention is to so construct the burner as to effect the maximum intimate admixture of air with the gas.

The torch flame or flame for industrial purposes above referred to is a blue flame.

An object of this invention is to maintain such blue flame without liability of extinguishment so long as the fuel is supplied.

Further objects, advantages and features

of invention may appear from the accompanying drawing, the subjoined detail description and the appended claims.

The accompanying drawing illustrates the invention.

Figure 1 is a perspective view of a group of seven burners and one pilot light constructed in accordance with this invention, applied to a base for heating.

Fig. 2 is an axial section of one form of a burner constructed in accordance with this invention.

Fig. 3 is an axial section of another form of burner.

Fig. 4 is a plan view looking into the outlet end of the burner shown in Fig. 2.

Fig. 5 is a detached view of the burner head shown in Fig. 3, looking at the inlet end.

Fig. 6 is a plan view of the outlet end of the stem of the burner shown in Fig. 3.

Fig. 7 is a plan of the nipple shown in Figs. 2 and 3.

The burner shown in Fig. 2 comprises a cup 1, having a wide cylindrical chamber 2, open to the air at its rim 3 and having at the end of the chamber 2, opposite the rim, a jet inlet 4 that after the common construction of jet orifices is of small diameter. Said jet orifice is minute as compared to the outlet orifice of the cup, and also relative to the cross sectional area of the chamber 2 at the level of the jet orifice. Said cup terminates in a narrow neck 5, closed to the external air by the stem 6 screwed into the said neck and provided with a jet piece 7 having a reduced orifice 4 through which the gas issues from the bore of the stem. Said stem is provided with an elongate threaded portion 8 which screws into the neck 5. The neck 5 has at its lower end a reduced internally threaded portion 9, through which the threaded stem 6 is screwed. Said stem is externally threaded at 10 opposite its jet end into which the jet piece screws.

The gas outlet 4 in the jet piece 7 is of greatly reduced diameter as compared with the bore 11 of the neck 5; and said bore is about one-third the diameter of the chamber 2. Said chamber is provided with interior air current interrupting and distributing means which are shown as being formed of annular beads 12 three in number arranged in planes that are at right angles to the axis of the cup. These rings 12 are for the purpose of causing waves in the air which flows to the plane of burning gas, and serves to provide for the cup annular recesses 13, 14, 15, surrounding the chamber 2, all of the same diameter with annular ribs between them.

In practical operation gas at low pressure is admitted to the stem through the minute nozzle orifice 4 within the reduced cavity or neck of the cup.

In practical operation the gas will be admitted to the orifice 4 through the valve 16, pipe 17, stem 6, and burner tip 7 and will be ignited at the burner tip.

It is not directly known just what operation takes place at this moment, but the phenomena is very striking when the burner tip 7 is adjusted relative to the cup 1 best adapted for burning the quantity of gas admitted when admitted under the pressure determined by the conditions prevailing, that is to say, if the adjustments are such as to comply with the conditions of the gas as to collect the pressure as it issues through the tip 7, a blast flame is immediately produced characterized by very violent combustion, and it is determined by a lighted match at one edge of the cup that the atmospheric air flows down over the rim of the cup around the inner face of the cup walls being caused to have successions of expansions and contractions as it successively passes the ribs 12 and the inner spaces 13, 14, 15, between said ribs. Said match or candle flame is carried violently inward by atmospheric pressure and the combustion within the cup proceeds with a succession of explosions and the atmospheric air which has been admitted in the form of a hollow tube entirely surrounds the flow of the jet piece and appears to be violently agitated or torn by the inflowing tubular body of atmospheric air and a violent mixing of the inner and outward flowing tube of air with the outward flowing jet of gas takes place, and it is found that with a low pressure of atmospheric gas, at say six inches to nine inches water column pressure, will produce a roaring blast flame that I have never been able to produce in any other way.

The method of producing this flame is different from the method of producing the flame of a Bunsen burner, in that method the gas and air are intermittently mixed together before the locus of combustion is reached.

Said method is also very different from that of an open tip burner which is commonly used for illuminating purposes, because with the open tip burner the air flows laterally to the gas jet and apparently cools the heat of the flame on account of the great amount of air which is admitted to said jet. The said method also differs from the acetylene type burner which uses acetylene gas for illuminating purposes and which produces a white flame. In the present mode of burning gas the air is directed in the form of a hollow body toward the base of the gas jet and owing to the friction between the hollow inflowing body of air, the hollow outflowing body which almost instantly becomes a body of air and gas mixture causes a violent admixture of oxygen with the incandescent particles of the ignited gas and a

comparatively large body of flame under violent combustion is produced.

In the two forms which I have shown in the drawing the cup and neck of the burner are made of some suitable material as brass or iron, which may be cast to the form shown; it being understood that the burner threads of the neck are machined after the casting has been made, or they may be made of pressed suitable material.

The form shown in Fig. 2 is deemed preferable for the reason that it is more easily constructed than the form shown in Fig. 3. In this form the stem is threaded from the front end to a wrench boss 19, and screws through an internal projection or threaded collar 9 at the lower end of the burner so that the burner may be easily adjusted to any position required.

If when the burner is lighted, it is discovered that combustion proceeds in the form of a yellow flame without the explosive combustion above referred to it is thus indicated that either the gas is too rich or that the pressure is too low for a particular position the jet piece occupies relative to the chamber of the cup. To adjust this condition and produce the explosive effect above referred to the attendant may screw the cup downward on the stem until the desired combustion results.

Fig. 3 shows a modified form in which the neck 5 is internally threaded the whole length as at 11' while the stem 6' is externally threaded only a short distance at the top as at 18 where it engages the screw thread 11' for the purpose of raising and lowering the cup 1, the portion 8' of the stem 6' between the threads 18 and the wrench boss 19 is smooth and of a somewhat reduced diameter.

In Fig. 2 the burners are represented as adjusted to an appropriate position for burning low pressure gas of about 600 to 800 B. T. U., and within the range from six inches to nine inches water column pressure. If when the burner is thus adjusted it be supplied with gas of a higher B. T. U. value or a greater pressure the flame would be extinguished by the violence of the combustion, thereupon the attendant will screw the cup upward on the stem until the mixture of gas and hydrogen will support a flame, then the attendant will carefully adjust the cup to that position where the results which he desires are produced.

This invention is applicable to heat producing flames and also to a pilot light, and in Fig. 1 a pilot light 21 supplied through a valved pipe 22 is arranged in position to supply flame to the gas mixture issuing from the group of burners shown in that view.

In practical operation it is found that the method of burning the gas and the results

obtained from thus burning the gas, is not dependent upon the vertical position of the cup shown and the explosive action of the combustion is so great that the flame will be projected upward, downward or at an angle with the same efficiency as that just explained. Of course it is understood if the group of burners such as shown in Fig. 1 were inverted the products of combustion from some of the burners might interfere with the perfect combustion of some of the other burners.

It appears from observation of the operation of the burner that the exit of the air and gas out of the burner in the form of a flame, causes a suction at the bottom of the bowl and draws air into said burner circumferentially between said flame and the rim 3 of the burner to support a blue flame, and it is understood that the atmospheric pressure is removed to a greater or less extent from the orifice of the burner tip, due to a partial vacuum created in said bowl by the successive explosions of the mixture of gas and air therein.

It is apparent that if such pressure from the outside air were fully removed from said orifice 4, thereby creating a true vacuum, the velocity of the flow of the gas through said orifice would equal that of atmospheric air flowing into a vacuum plus the water column pressure because in order for the gas to flow from the orifice under the usual conditions the atmospheric pressure must be overcome. Since said atmospheric pressure amounts to some 14.7 pounds to which must be added the six inch to nine inch water column pressure under which the gas is rated, the gas will flow from the orifice at a speed proportional to the normal atmospheric pressure plus the water column pressure as compared with the lowered pressure at the atmospheric side of the orifice.

The cylindrical form of the cup allows the air to flow uniformly toward the column of gas from the level or the plane of the orifice to the outlet of the cup, thus giving a very high temperature to the torch flame.

It is understood that when the burner tip is screwed down toward or below the bottom of the cup that this suction is decreased and that by screwing the said tip far enough down in the neck such decreasing can be properly controlled as above indicated no matter how high the pressure may be, provided the neck is long enough to allow the gas to expand in said neck, and thereby allowing the reduction of the gas jet reducing the air pressure to be restored nearly to atmospheric pressure at the orifice of the tip.

It is also observed that the explosive combustion which takes place when the burner is properly adjusted for that purpose causes a lateral displacement of the air and pro-

duces an increased pressure upon the ingoing hollow body of air until such pressure is applied more particularly to the surrounding wall and the bottom of the burner cup and with the result that the outward flow is accelerated, consequently entraining the gas jet and serving to remove the pressure from the orifice of the burner tip.

I claim.

1. A burner to burn gas, that sucks air in a bowl, over the sides of said bowl, to supply air for combustion within said bowl, an orifice for supplying gas to said bowl, and means whereby the top of said bowl may be adjusted relative to said orifice so as to produce a blue flame with gas of various pressures and B. T. U. value.

2. A burner to burn gas provided with a deep cylindrical bowl-like cavity and a neck extending down from said cavity and being adjustably mounted on a nipple which extends into said downwardly extending neck and provided with a jet piece to discharge gas centrally into said bowl and up through said downwardly extending neck according to the adjustment of said jet piece in said downwardly extending neck.

3. A burner to burn gas, comprising a deep broad-bottomed bowl-like cavity with a central orifice above the bottom of the cavity, whereby the air supplied to the gas for combustion, is above the orifice admitting the gas to the atmosphere, the pressure of the gas with the combustible explosion, causing a suction and injecting air to the zone where the gas is admitted to the atmosphere to support a blue flame, said central orifice being adapted to be adjusted toward and from the orifice admitting the gas thereto for the purpose specified.

4. The method of burning gas which consists in producing a central jet of gas and directing a hollow cylindrical body of air toward the base of said jet preventing the air from passing on beyond the base of the jet, thereby causing a deflection of an inner shell of air toward the top of the jet, so that the reverse direct inflowing air before the outflowing will impinge the inner wall of another past the outer wall of the other thus causing a mixture by reason of the friction between the air surface, and also causing the gas jet to mix with the inside of the inner wall body of air and also causing a reduction of atmospheric pressure at the orifice through which the gas jet issues, said central orifice being adapted to be adjusted toward and from the orifice admitting the gas thereto for the purpose specified.

5. In the art of combustion the method set forth of increasing a mixture of air with a gas jet, which method consists in removing from the orifice of the gas jet some or all of the atmospheric pressure to which it is ordinarily subject, and surrounding the jet

with a cylindrical column of air from which air may flow directly toward the jet, and varying the jet in said cylindrical column of air to the requisite position in order to produce a blue flame.

6. The method set forth of producing complete combustion which consists in directing a jet of combustible fluid toward the desired locus of complete combustion and toward the base of such jet and directing alongside the jet and enclosing the same at the sides thereof the fluid necessary for effecting the combustion, and adjusting the jet in said fluid so that a blue flame is produced.

7. The combination of the bowl-like burner having a hollow neck and a nipple adjustable in the hollow neck and provided with an adjustable burner tip whereby the distance between the jet hole and the top of the bowl may be accurately adjusted to produce a blue flame of a required character.

8. The combination with a nipple, a burner tip having a reduced orifice adjustably mounted in the end of said nipple, of a bowl-like burner having a hollow neck and being adjustably mounted on said nipple, whereby the distance between the orifice and the top of the bowl may be accurately adjusted to produce a blue flame with gas of various pressure or B. T. U. value, and air current interrupting and distributing means on the interior of said bowl.

9. The combination of the bowl-like burner having a hollow neck, a nipple provided with an orifice which extends into said hollow neck, said bowl-like burner being adjustably mounted on said nipple whereby the distance between said orifice and the top of said bowl may be accurately adjusted to produce a blue flame with gas of various pressure or B. T. U. value.

10. In a burner to burn gas comprising a gas admitting orifice and a burner cup open at the top and so arranged that the gas and the air applied to the gas for combustion flow in opposite directions to the point of combustion; means whereby the distance between the top of the cup and the gas admitting orifice may be varied so as to support a flame with gas at different pressures and B. T. U. value.

11. A burner to burn gas having a bowl-like cavity and a nipple extending into said cavity provided with a gas admitting orifice, and means whereby the distance between the top of said bowl-like cavity and the gas admitting orifice may be varied.

12. A burner to burn gas provided with a bowl-like cavity, and a nipple extending into said cavity and provided with a gas admitting orifice, said bowl-like cavity being adjustably mounted on said nipple.

13. A burner to burn gas provided with a bowl-like cavity and having a neck extend-

ing down from said cavity, a nipple arranged in said neck and provided with a gas admitting orifice, and means whereby the distance between the top of said bowl-like cavity and said gas admitting orifice may be increased and decreased.

14. A burner to burn gas provided with a bowl-like cavity and having a neck extending down from said cavity, and being adjustably mounted on a nipple in said neck and which is provided with a gas admitting orifice.

15. A burner to burn gas so arranged that

the gas and the air applied to the gas for combustion, flow in opposite directions to the point of combustion and means whereby the suction of air to supply gas for combustion can be regulated.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 20 14th day of January, 1919.

ALFRED H. THOMPSON.

Witness:

JAMES R. TOWNSEND.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,434,256, granted October 31, 1922, upon the application of Alfred H. Thompson, of Venice, California, for an improvement in "The Art of and Means for Burning Domestic or Producer Gas," an error appears in the printed specification requiring correction as follows: Page 3, line 53, for the word "hydrogen" read *oxygen*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of December, A. D., 1922.

[SEAL]

KARL FENNING,

Acting Commissioner of Patents.