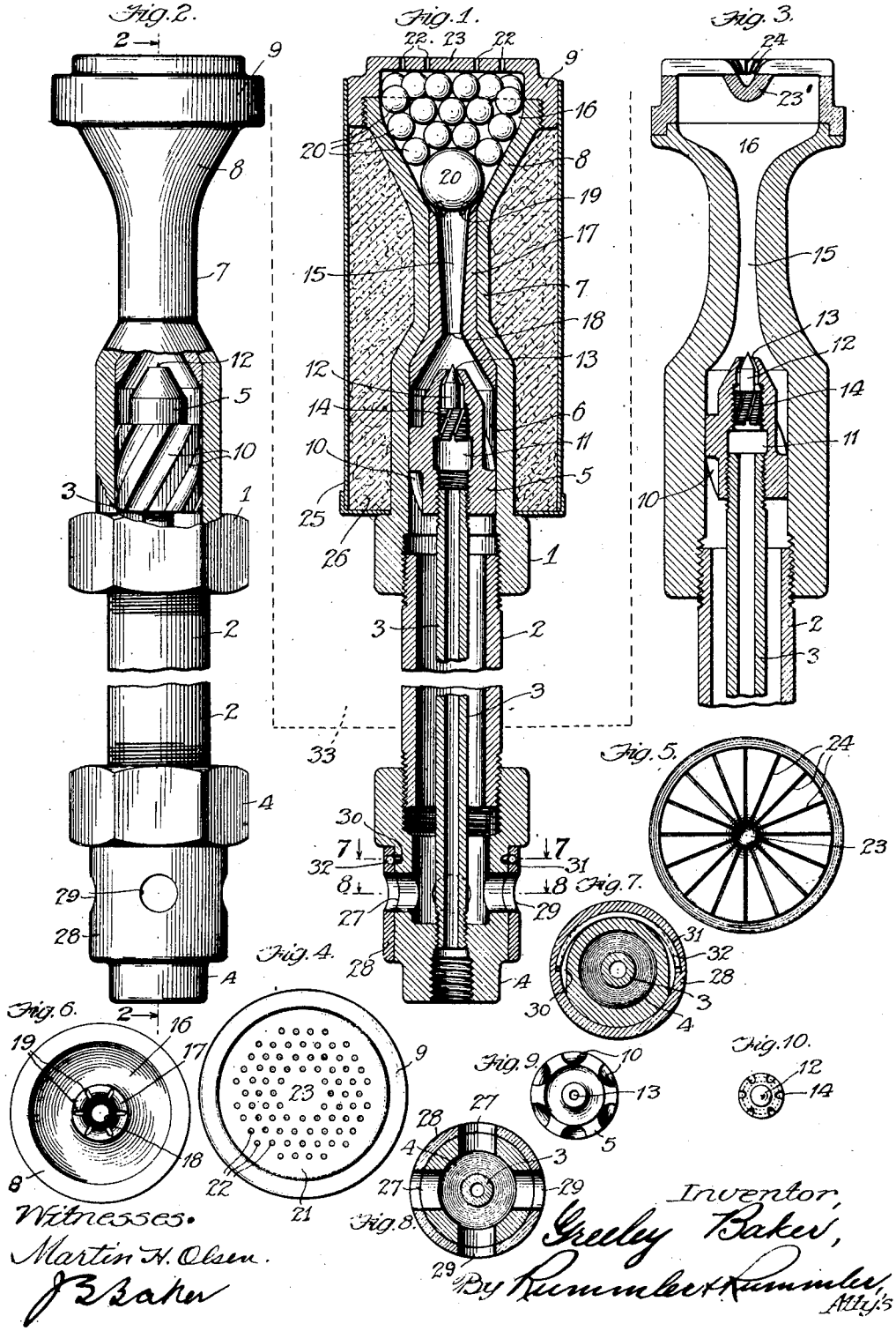
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BLUE FLAME GAS BURNER.

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1,330,048. Patented Feb. 10, 1920.



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UNITED STATES PATENT OFFICE.

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BLUE-FLAME GAS-BURNER.

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To all whom it may concern:

Be it known that I, GREELEY BAKER, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Blue-Flame Gas-Burners, of which the following is a specification.

This invention relates to blue-flame gas burners of the Bunsen type and is especially adapted for use in places where all of the oxygen required for combustion is supplied by the burner.

The main objects of this invention are to provide an improved gas burner in which the mixing chamber and the air and gas inlets are of such form and dimensions as to provide a proper mixture for blue-flame combustion and discharge the same before it reaches its ignition temperature; to provide improved means for mixing and distributing the gaseous mixture within the burner; to provide an improved form and arrangement of the fuel and air ducts; and to provide an improved construction for the various parts of the burner.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the complete burner, the dotted lines representing boundaries of a furnace chamber or other inclosure.

Fig. 2 is a side view of the same, partly broken away and omitting the insulation.

Fig. 3 is a fragmentary sectional view showing slightly modified forms of the mixing chamber and burner cap.

Fig. 4 is a plan of the burner cap shown in Figs. 1 and 2.

Fig. 5 is a plan of the modified form of burner cap shown in Fig. 3.

Fig. 6 is a top view of the burner with the burner cap and distributing means removed.

Fig. 7 is a sectional view on the line 7—7 of Fig. 1.

Fig. 8 is a section on the line 8—8 of Fig. 1.

Fig. 9 is a top view of the spiral guide member.

Fig. 10 is a top view of the needle valve.

In the form shown the burner comprises a burner body 1, air and fuel ducts 2 and 3 respectively, a fitting 4 for controlling the admission of air to said air duct, and a fitting 5 having means for regulating the flow of gas and means for imparting a spiral motion to the air and gas as they enter the mixing chamber.

The burner body 1 has a cylindrical tubular part 6 within which the fitting 5 is adapted to enter and this cylindrical part is connected by a contracted neck 7 with a flared head 8 provided with a burner cap 9 detachably secured thereto. The body 1 has threaded engagement with the air duct 2 within which is concentrically arranged the fuel duct 3.

The fitting 5 fits loosely within the bore 6 and has threaded engagement with the discharge end of the fuel duct 3. Spiral grooves 10 in the periphery of fitting 5 serve as air passages therethrough. A central passage 11 communicates with the fuel duct 3. A needle valve 12, adjustably mounted in the passage 11, has threaded engagement with the member 5 and coacts with a tapered gas nozzle 13 to regulate the flow of fuel from the duct 3. Spiral grooves 14 cut into the periphery of the body of the needle valve impart a spiral motion to the gas.

The passage through the neck 7 is provided with a bushing which is gradually contracted to a point above and near the gas nozzle 13 and then is gradually increased to form an expanding chamber 15. The gas enters the contracted portion of the bushing at a high velocity, drawing air with it, and when it enters the expanding chamber it loses its velocity and by a well-known dynamic principle, gains in pressure so that when the gaseous mixture has reached the chamber 16 formed by the flared walls of the head 8, it has a relatively low velocity and high pressure. The said bushing in the neck 7 is fundamentally a Venturi-tube of the form used in the ordinary injector, and for maximum efficiency should be proportioned to suit the gas pressure with which the device is to be used.

In order to obviate the necessity of making many different sizes of burners and permit the burner body to be of standard design and dimensions for different conditions, the Venturi-tubes are made in the form of linings 17 having standard external dimensions to fit the standard body, but having different internal dimensions. In the preferred form of construction, as shown in Fig. 1, the internal diameter of the neck 7 is substantially uniform through-

out its length. The passage through the lining 17 is contracted to form a throat 18 a short distance above the gas nozzle and is then gradually increased in cross section so as to form the expanding chamber 15. The upper end of the lining is swaged so as to grip the flared inner walls of the head and is grooved at 19 to provide gas passages which will not be choked by the spherical bodies or balls 20 which are employed for equally distributing the gaseous mixture over the area of the burner cap 9. One of said balls is of sufficient diameter to permit it to rest upon the upper end of the lining 17, and the remaining balls, which may be smaller, are distributed uniformly throughout the chamber 16.

In the form shown in Fig. 1, the burner cap 9 comprises a disk 21 having a multiplicity of small outlet apertures 22 formed therein, but they are omitted from the central part to form a baffle area 23 which spreads the stream of gas when the balls are not used. In the modified form of nozzle shown in Fig. 3, the central part 23′ dips downwardly into the chamber 16; and the apertures are a plurality of radially disposed slots 24 milled into the face of the disk.

In order to prevent the gases in the burner from reaching the ignition temperature before reaching the nozzle, the burner body is equipped with an insulating jacket consisting of a housing 25 of suitable material packed with asbestos 26 or the like, and the mixing chamber is made as short as possible, consistent with its function of mixing the air and gas.

The fitting 4 is in the form of a coupling having threaded engagement with the lower end of the air duct and with the upper end of the gas supply pipe (not shown). A plurality of radially disposed air inlets 27 are formed in sides of the fitting 4, and a sleeve 28 mounted over said openings is provided with a plurality of apertures 29 positioned to register with the inlets 27 whereby said sleeve is adapted to regulate the flow of air through said inlets. Semi-circular, transversely disposed grooves 30 and 31 are formed in opposed relation on the abutting faces of the coupling and sleeve respectively, and a resilient member 32, preferably formed of spring wire, is seated in said grooves so as to hold the sleeve 28 in place.

The lower end of the fuel duct has threaded engagement with the coupling so as to hold said duct in its concentric relation to the air duct. The coupling is located outside of the furnace or other inclosure 33 so that fresh air may be supplied to the air duct.

The herein described construction has an advantage over the usual forms of gas burners in that the mixer is of short length and close to the burner outlets reducing to a minimum the amount of combustible mixture within the burner, which can be exploded when the burner back-fires thereby reducing to a minimum the possibility of flame spurting out of the air inlets in case of back-firing. Likewise, by having the air duct extended back a long distance from the gas inlet nozzle, the burner may operate in a space where the surrounding atmosphere is heavily charged with carbon dioxid without danger of having the fresh air supply to the burner polluted thereby.

A further advantage of having the mixer comparatively short and close to the burner outlets is the elimination of back pressure due to friction of the mixture with the walls of the mixing chamber and thereby making it possible to maintain a flow of the mixture through the burner at a rate higher than the rate of combustion whereby the flame is prevented from moving back into the mixture and causing back-firing.

Owing to the efficiency of the fuel-operated air injector means 17 when placed near the burner cap, and the consequent sufficiency of the primary air supply, the burner is independent of any secondary air supply and its incident need for gravity draft and a definite position. Hence I am permitted to place my improved burner in any position whatever, for instance upside-down. The well-mixed and explosively combustible mixture is expelled through the short flash-repelling mixer and cap 9 at a velocity about equal to or somewhat greater than the rate of propagation of inflammation, so that back-flashing is avoided and a very intense heat may be maintained in a limited zone adjacent to the burner cap. By grouping a number of burners about a central body or cavity, an extreme degree of heat may be readily generated and maintained. When the device is thus used, its independence of secondary draft is especially advantageous.

For the purpose of clearness, the foregoing description has been mainly directed to a single specific construction, but it will be understood that some of the details of the device shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A gas burner comprising a multiple-duct conduit, in combination with a burner body mounted on one end thereof, said conduit at its opposite end being formed and adapted to admit air and fuel to its respective ducts, said burner body having a burner cap, and concentrically arranged mixing means adjacent thereto in the paths of the fuel and air respectively.

2. A gas burner for explosive fuel mixtures, adapted for use in a non-combustion supporting medium, comprising a compact

mixing chamber, a burner cap secured thereto, an insulating jacket surrounding said chamber, a pair of ducts extending to a distance from said chamber for supplying gas and air respectively, the air duct having an inlet port remote from said mixing chamber and an adjustable valve for said port, and restricted neck ejector means adapted by reason of the gas pressure to draw in air and to expel the inherently combustible mixture forcibly from said chamber through said cap at a velocity greater than the rate of propagation of inflammation.

3. A gas burner, comprising an air duct, a gas duct, a burner body detachably secured to one end of said air duct, a gas nozzle on said gas duct and directed into said burner body, said body having a hollow neck, a head formed on the outer end of said burner proper, a lining mounted in said neck, said lining being contracted to form an orifice intermediate the ends thereof, the inner walls of said lining being flared outwardly from said orifice, the upper end of said lining having recesses formed therein, and a spherical body loosely mounted on said upper end of said lining for distributing the gaseous mixture which passes through said recesses.

4. A gas burner, comprising a body having air and gas inlet means at one end, a perforated cap at the other end, and a contracted neck between said ends, the contracted passage through said neck being cylindrical, a lining fitting said cylindrical passage and flared at one end to fit the adjacent part of said body and held in place therein by having its opposite end expanded, the interior of said lining being of venturi form, and means providing air and gas inlets directed into the end of said lining which is distant from said burner cap.

Signed at Chicago this 25th day of Jan., 1919.

GREELEY BAKER.