(No Model.)

2 Sheets—Sheet 1.

R. H. SARGENT.

FLUID FUEL BURNER.

No. 544,646. Patented Aug. 13, 1895.

Fig. 1.

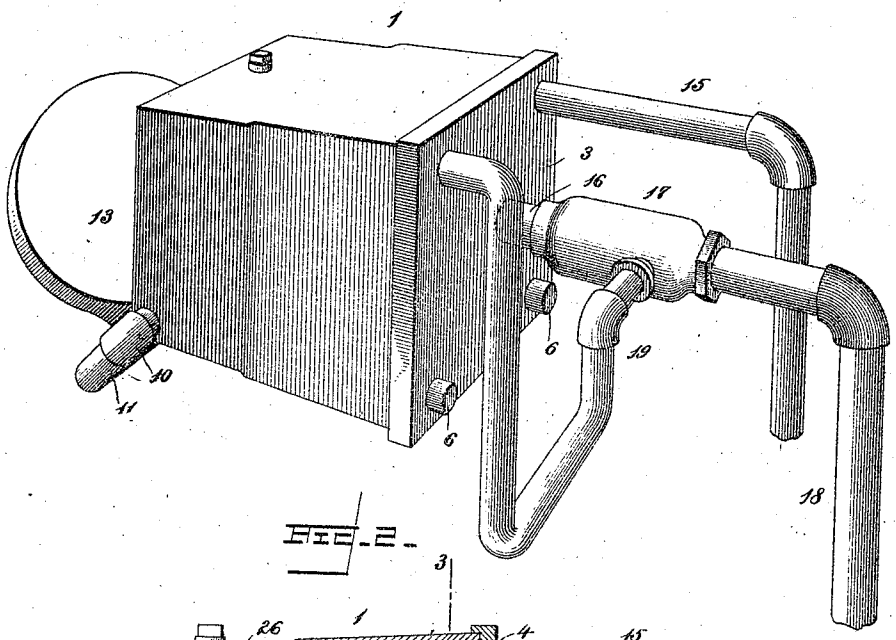


Fig. 2.

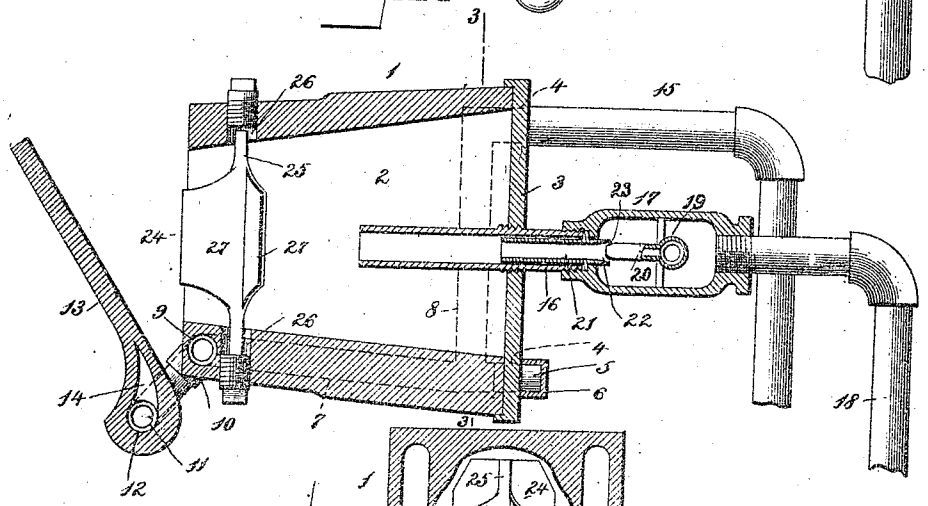
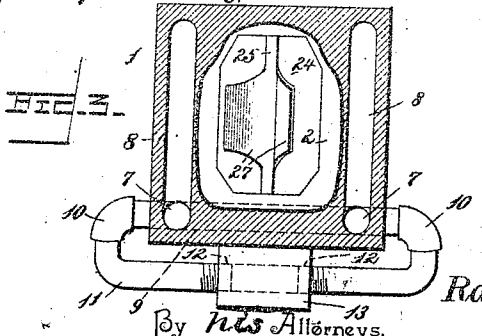


Fig. 3.



Witnesses

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By his Attorneys.

Church & Co.

(No Model.)

2 Sheets—Sheet 2.

R. H. SARGENT.

FLUID FUEL BURNER.

No. 544,646. Patented Aug. 13, 1895.

Fig. 5.

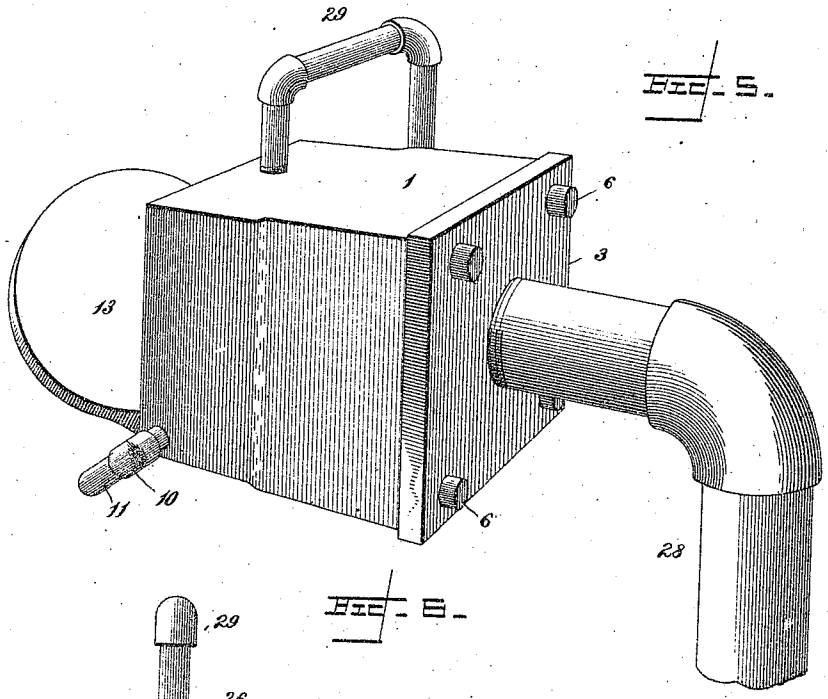


Fig. 6.

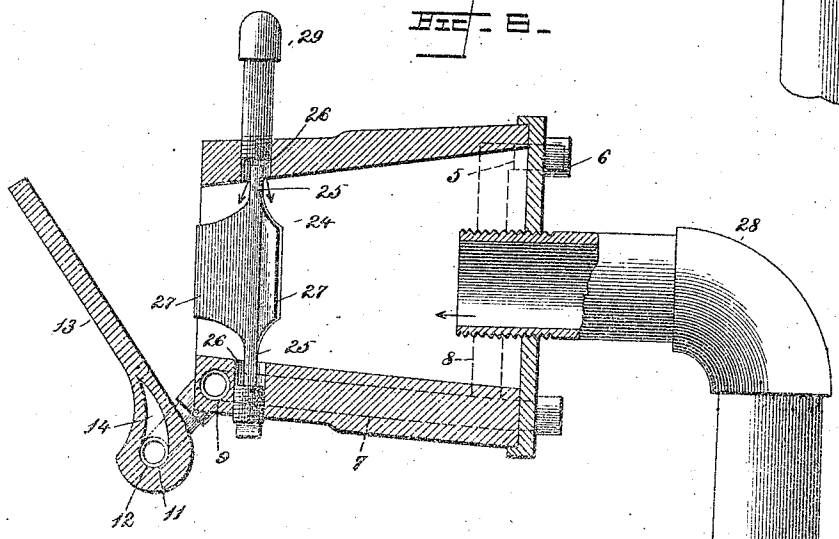
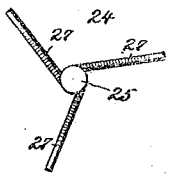


Fig. 4.



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UNITED STATES PATENT OFFICE.

RANSOM H. SARGENT, OF TITUSVILLE, PENNSYLVANIA.

FLUID-FUEL BURNER.

SPECIFICATION forming part of Letters Patent No. 544,646, dated August 13, 1895.

Application filed January 17, 1894. Serial No. 497,162. (No model.)

To all whom it may concern:

Be it known that I, RANSOM H. SARGENT, a citizen of the United States, residing at Titusville, in the county of Crawford and State of Pennsylvania, have invented a new and useful Fluid-Fuel Burner, of which the following is a specification.

My invention relates to a fluid-fuel burner designed for use in connection with furnaces and ovens of various types requiring an intense heat, the object of the invention being to provide an improved burner which is so constructed as to produce a perfect combustion of the fuel at the outlet of the burner, whereby the fuel is not projected into the furnace in an unconsumed state to be subsequently ignited, thereby to a certain extent reducing the temperature of the furnace; furthermore, to provide means for utilizing a combustion-supporter—such as steam, compressed air, or equivalent fluid—such combustion-supporter being superheated and its constituent gases separated before reaching the point of mixture with the fuel; furthermore, to provide improved means whereby the introduction of the combustion-supporter into the mixing-chamber of the burner is utilized to induct the fuel from the tank or reservoir, whereby the latter may be arranged below the level of the burner to avoid the use of a gravity-feed, which is objectionable by reason of the tendency to overflow or flood, and because of the liability of the column of fuel, acting as a conductor, to convey the flame to the tank or reservoir; and furthermore, to provide means for mechanically atomizing and thoroughly commingling the gases at the point of ignition, to provide means for deflecting the column of flame as it escapes from the burner, in order that it may be projected against the desired part of the surface of a boiler or other object to be heated, and to so combine the parts of the device as to form a compact and serviceable structure.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of a burner constructed in accordance with my invention. Fig. 2 is a longitudinal central section of the same, showing the atomizer and nozzle in elevation. Fig. 3 is a transverse sectional view of the pyramidal body portion of the burner upon the plane indicated by the line 3 3 of Fig. 2. Fig. 4 is a detail view of the atomizer. Fig. 5 is a perspective view of the burner as arranged when air under a low pressure is employed as the combustion-supporter. Fig. 6 is a sectional view of the same taken centrally.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates a hollow pyramidal body portion, the cavity 2 of which forms a mixing-chamber which is tapered in section toward its outlet end, the inlet end of such body portion being covered by a flanged plate 3, provided with perfortions 4, through which extend tubular studs 5, engaged upon the outer surface of the plate by the caps 6. Passages 7 are formed in the walls of the mixing-chamber at the angles thereof and are connected at the inlet end thereof by vertical passages 8 and at the outlet end thereof by horizontal passages 9, whereby a continuous duct or passage is provided and is exposed upon opposite sides to the heat within the chamber and the heat of the furnace. The body portion is preferably cast, and hence vents at the terminals of the passages are necessarily formed, and into these vents are fitted the tubular studs 5, which at the outer end of the casting serve as means for securing the plate in position. The ends of the transverse passage 9 at the outlet end of the casting are fitted with couplings 10, which are connected by a transverse pipe or conductor 11, formed in sections with its contiguous inner ends fitted in openings 12, which are provided in the sides of the adjustable deflector 13. This deflector at its lower or pivoted end is hollow, as shown clearly in Fig. 2, such cavity 4 being thus connected with the continuous passage in the walls of the mixing-chamber.

15 represents a steam-supply pipe, which is connected to one of the tubular studs 5, and hence to one end of the continuous passage 7; and the fuel-inlet pipe 16, which is arranged approximately at the center of the cap-plate,

and thus communicates with the inlet end of the mixing-chamber, also communicates with an induction-chamber 17, which is connected by means of a fuel-supply pipe 18 to a tank or reservoir. (Not shown.) This induction-chamber is tapped at one side by a steam-conveyer pipe 19, communicating at one end, within the induction-chamber, with an axially disposed nozzle 20, which is arranged in alignment with a combining-tube 21, which extends a short distance through the inlet-pipe 16 and is provided with a conically-recessed receiving end, into which the tapered terminal of the nozzle projects. The tip of the nozzle is out of contact with the walls of the conical mouth 22 to form an annular passage 23, whereby communication is established between the induction-chamber and the combining-tube. The conveyer 19 communicates with the outlet end of the passage in the walls of the combustion-chamber, whereby steam or compressed air, which is admitted to the passage through the inlet-pipe 15, after passing through the length of such passage, will be conveyed to the interior of the combining-tube, and being projected longitudinally into the same will produce a vacuum in the induction-chamber and thus induct the fuel from the supply-pipe and impel the same through the combining-tube to the interior of the mixing-chamber.

24 represents a rotary atomizer, consisting of a spindle 25, the terminals of which are mounted in bearings 26 in the walls of the mixing-chamber at its outlet end, and wings 27 carried by such spindle and adapted to receive the pressure and impulse of the steam or compressed air to cause rotation.

This being, in general terms, the construction of my improved burner, the operation thereof is as follows: The steam or compressed air is introduced by the inlet-pipe 15 to the passage formed in the walls of the mixing-chamber, where it is subjected exteriorly to the heat of the furnace and interiorly to the heat within the mixing-chamber, and is thus superheated and decomposed into its constituent gases. This fluid or gas is thence discharged into the combining-tube, thus producing a partial vacuum, drawing the fuel into the said tube, and then forcing it into the mixing-chamber, where it becomes mixed with the gases. Ignition takes place at or near the outlet end of the combustion-chamber, as between the atomizer and the deflector, the force of the steam or compressed air causing a rapid rotation of the atomizer, and thus atomizing and thoroughly commingling the gases and insuring perfect combustion. It will be understood that the contact of the superheated and decomposed steam or air with the fuel vaporizes the latter, and thus adds to the effectiveness of the burner and the intensity of the heat produced thereby. The deflector is capable, as will be understood from the foregoing description, of angular adjustment to project the flame as it issues from the burner upon any desired part of the object to be heated, or may be thrown down to form no obstruction to the direct issue of the flame. It will be understood that while the burner is illustrated and described as being in a horizontal position, it may be arranged upright or in an inclined position, as may be required by the nature of the work to be performed.

The object in arranging the atomizer adjacent to and substantially in the outlet opening of the combustion-chamber is to break up the oil and thoroughly mix it in the form of spray with the combustion-supporting agent, whether air or steam immediately prior to the combustion of the fuel. When gaseous fuel is employed in a device of this class the intermingling of the fuel with the supporting agent may be accomplished at a considerable distance from the point of ignition, and the two elements will remain commingled until combustion occurs; but when a liquid fuel is employed, as in the present case, it is obvious that if mixing is accomplished before the fuel reaches the point of ignition the liquid will separate partially or wholly from the supporting agent and fall to the bottom or adhere to the sides of the chamber in which it is liberated. Therefore it is necessary in the use of liquid fuels to arrange the mixing devices, or accomplish the commingling of the fuel and supporting agent, precisely at the point of ignition.

In the above-described construction the spindle of the atomizer is arranged directly contiguous to the outlet end of the chamber 2, the inlet-pipe 16 being extended to a point sufficiently near the atomizer to cause the force of the steam or compressed air to rotate the atomizer. A thorough mixing of the fuel and supporting agent occurs approximately in the outlet end of said chamber, the liquid being broken up or sprayed by the wings of the atomizer. At this point ignition takes place and the column of burning fuel is thrown against the surface of the deflector and thereby still further agitated in order to produce a complete combustion before the fuel can become separated from the supporting agent. It is obvious that the deflector will be superheated during the operation of the burner and that the atomizer will be in a similar condition, owing to the fact that combustion of the fuel takes place between said parts, and therefore the deposit of the fuel upon either the deflector or the atomizer is prevented.

As above described, the burner is designed for use when steam or air under pressure can be supplied; but when this is not practicable a slightly different disposition of the parts, as illustrated in Figs. 5 and 6, is necessary. In this case an air-supply pipe 28 of large diameter, is connected centrally to cap-plate the at the inlet end of the burner to convey air

at a low pressure to the interior of the mixing-chamber, and a fuel-supply pipe 29 is connected to one of the bearings of the rotary atomizer in position to allow the fuel to flow downwardly over the blades of the atomizer, and thus by the rotation thereof mix the fuel and the air at the point of ignition, the atomizer being rotated by the force of the current of air, as described in connection with the other arrangement of the device.

It will be understood that in practice various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having thus described my invention, I claim—

1. The combination of a mixing-chamber having cored walls, a tubular conductor communicating with the mixing-chamber and arranged in alignment with its axis, an induction-chamber communicating with the end of the conductor and attached to a fuel-supply pipe, a combining tube arranged concentrically in the outer end of the conductor and having a flared end arranged within the induction chamber, a nozzle arranged axially in the induction chamber and having a reduced outlet projecting into the flared mouth of the combining tube, a steam-supply pipe communicating with one end of the cored passage in the wall of the mixing-chamber, and a conveyer connecting the outlet end of the cored passage with said nozzle, substantially as specified.

2. The combination of a pyramidal mixing chamber tapered toward its inner end and having cored passages in its walls, a winged atomizer having its axis arranged diametrically in the mixing chamber contiguous to the inner end thereof, a conductor arranged axially in the mixing-chamber, a combining-tube disposed within said conveyer, an induction-chamber in communication with the outer end of the combining tube and connected with a fuel-supply pipe, a nozzle disposed in the induction-chamber and projecting into the combining tube, a steam-supply pipe communicating with one end of the cored passage, and a conductor communicating with the other end of the cored passage and connected to the nozzle within the induction-chamber, substantially as specified.

3. The combination of a pyramidal mixing-chamber tapered toward its inner end and having cored passages in its walls, a cored deflector arranged contiguous to the inner end of the mixing-chamber, the cavity in said deflector being in communication with the cored passages in the walls of the chamber, a winged atomizer having its axis arranged diametrically in the mixing-chamber contiguous to the inner end thereof and adjacent to the deflector, a mixer arranged in communication with the rear end of the chamber and adapted to discharge an admixture of fuel and a combustion supporting agent against the atomizer to communicate rotary motion thereto, and means for supplying fuel and a combustion supporting agent to the mixer, the combustion supporting agent being conveyed through the cored passages of the mixing-chamber prior to its admission to the mixer, substantially as specified.

4. The combination of a combustion-chamber provided in its walls with a continuous super-heating passage for a combustion supporting agent, a deflector arranged adjacent to and in front of the outlet end of the combustion-chamber and provided with a bored cavity in communication with said superheating passage, means for adjusting the deflector angularly with relation to the combustion-chamber, a supply-pipe for a combustion supporting agent connected with the inlet end of the continuous super-heating passage, a fuel supply-pipe terminating within the combustion chamber, and a pipe connecting the outlet end of the superheating passage with the interior of the fuel supply-pipe, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

RANSOM H. SARGENT.

Witnesses:

WM. W. BIRD,

ISAAC W. RISDON.