Aug. 28, 1951 A. J. PERLE 2,565,879

BURNER FOR COMBUSTION CHAMBERS

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Fig. 1.

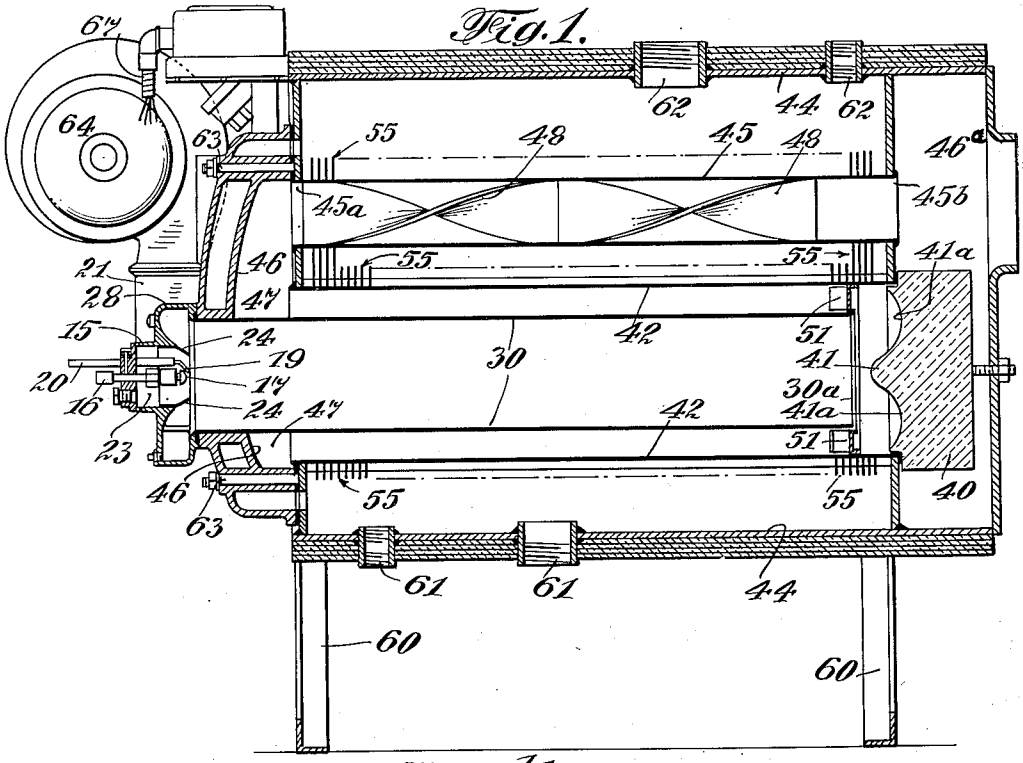

Fig. 2.

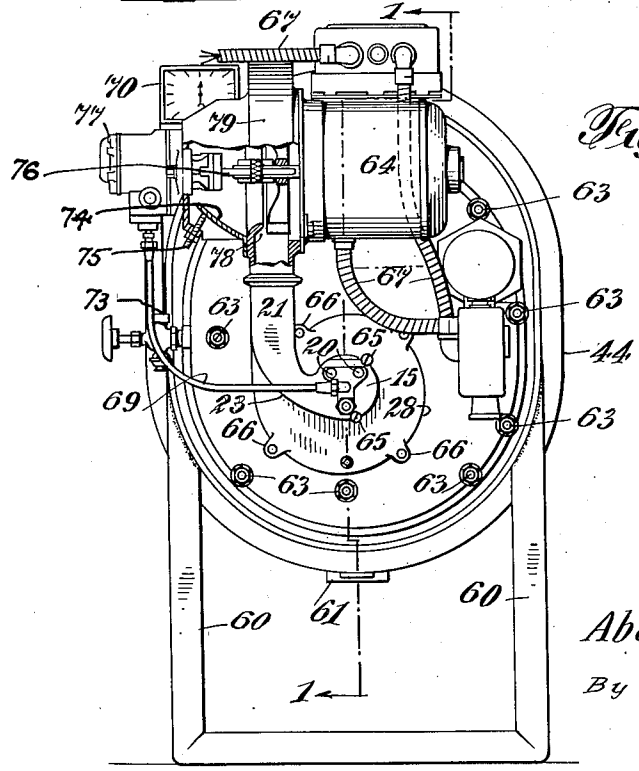

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Fig. 3.

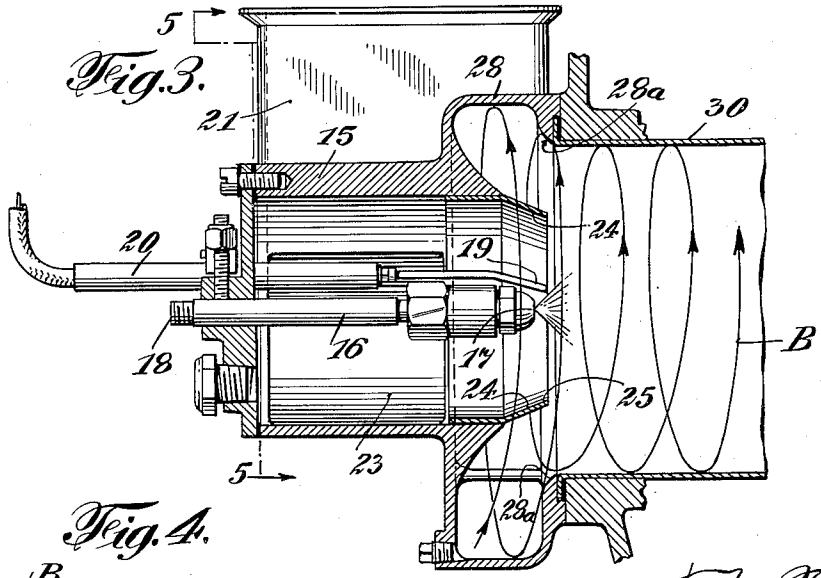


Fig. 4.

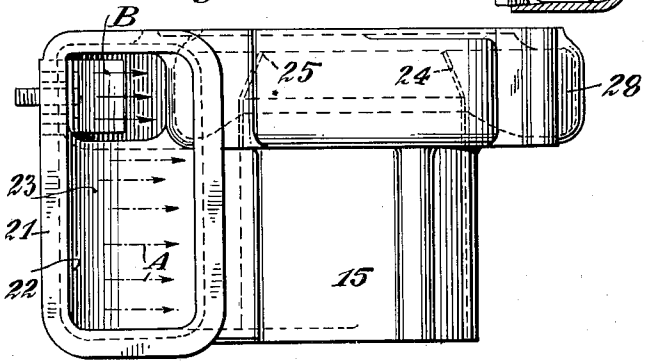


Fig. 5.

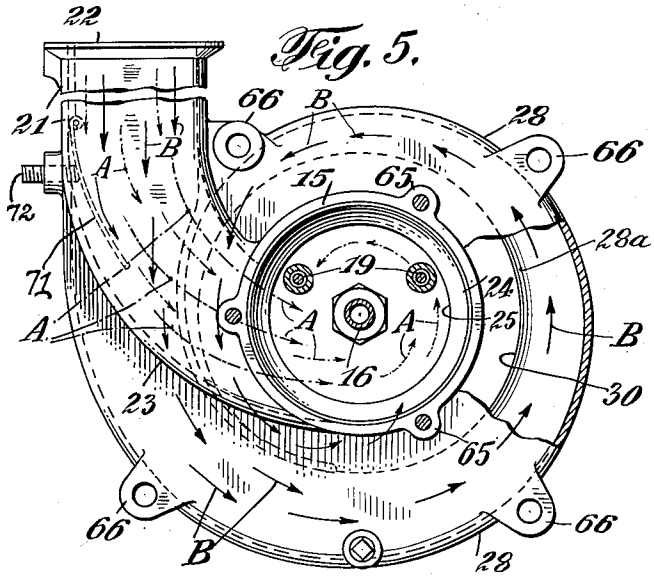


Fig. 6.

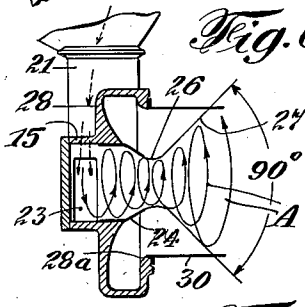


Fig. 7.

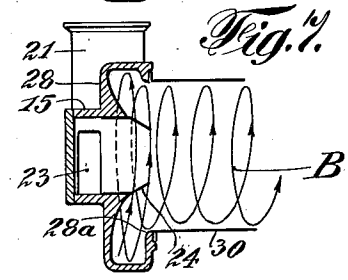
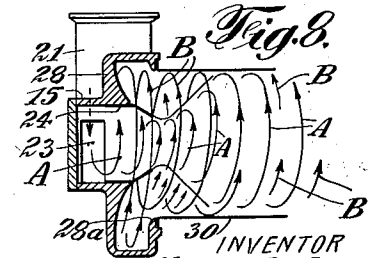


Fig. 8.



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UNITED STATES PATENT OFFICE

2,565,879

BURNER FOR COMBUSTION CHAMBERS

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Application March 28, 1947, Serial No. 737,862

1 Claim. (Cl. 158—1)

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This invention relates to oil or gas burners for boilers and to combustion chambers for such burners.

The present invention comprises a burner having an oil or gas supply nozzle surrounded by a primary air supply chamber having its outlet concentric with the nozzle orifice, and a secondary air supply chamber having its outlet concentric with the primary air supply chamber. The air flows discharged at these outlets have a rotary motion. The primary air flow intimately commingles with the atomized or gaseous fuel issuing from the nozzle. The secondary air flow unites concentrically with the primary air flow and is mixed with the burning primary air fuel mixture.

One essential feature is that the primary air flow has a higher pressure than that of the secondary air flow at their discharge orifices, and that the rotative velocity of the primary flow is less than that of the secondary flow. Under this relationship, the secondary commingles with the primary air flow as the primary air flow leaves its discharge orifice with the fuel.

More particularly a conical outlet is provided for the primary air chamber and the fuel and air mixture is discharged along the inner surface thereof. The secondary air flow is guided by the outer surface of said conical outlet, and is discharged along the same. These conical or conoidal air flows so formed are concentric with the centrally disposed fuel jet or jets. The primary air flow mixes with the ignited fuel flow, and the secondary air flow with its higher rotative velocity imposes itself upon the burning mixture of fuel and primary air, all rotating in the same direction. In consequence, an intimate intermixing with ample air supply for combustion is obtained.

The improved burner head may be and is preferably combined in use with a combustion chamber of substantially cylindrical shape and with both ends open, one open end for receiving the fuel and primary and secondary air flows from the burner, and the other open end for discharging the products of combustion, with a cylindrical flue spaced from and concentric with the combustion chamber a distance to permit the radiant heat of the combustion chamber wall to pass to the flue wall. One end of the flue is closed to receive the products of combustion from the combustion chamber, the closed end being spaced from the discharge end of the combustion chamber to enable the products of combustion to flow between the end of the wall of

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the combustion chamber and the surrounding and spaced flue with the other end of the flue open to discharge the products of combustion into conduits for heat abstraction and for final guidance to the chimney.

Embodiments of the invention described, in their separate uses and in combined use, will be further described and shown in the drawings, and the invention will be finally set forth in the claim.

In the accompanying drawings,

Fig. 1 is a longitudinal central vertical section of an embodiment of the improved burner and the improved combustion chamber combined with a boiler;

Fig. 2 is an end view of Fig. 1;

Fig. 3 is an enlarged longitudinal central vertical section of an embodiment of the burner;

Fig. 4 is a top view of Fig. 3;

Fig. 5 is a vertical section front view of Fig. 3 taken on line 5—5;

Fig. 6 is a diagrammatic view of the burner casing showing the action of the primary air flow;

Fig. 7 is a diagrammatic view of the burner casing; and

Fig. 8 is a diagrammatic view of the burner casing showing the action of the primary and secondary air flow.

Similar characters of reference indicate corresponding parts throughout the various views.

Referring to the drawings, and more particularly to Figs. 3 to 8, the improved burner consists of a cylindrical casing 15 having centrally disposed therein, a fuel supply tube 16 with its outlet orifice 17 disposed within the casing, and having a supply orifice 18 exterior to the casing 15. Adjacent to the orifice 17 is an igniter 19, having its holder 20 extending exterior to the casing 15.

The casing 15 is preferably cast with a primary air supply conduit 21 which receives air at 22 (Fig. 5) and conducts it into the interior of the casing 15 by the curved portion 23, in order to give the air in the interior of the casing a rotating movement around the centrally disposed fuel supply tube 16 and its adjacent igniter 19. The rotating air flow finally meets the interior surface of the conical flange 24 disposed coaxially with the axis of the casing 15. The inner surface 25 of the flange 24 reduces the perimeter of the flow of air, compelling the air to discharge from the flange outlet in the form of a converging cone 26, and merging into a diverging

cone 27 of about 90°, as shown diagrammatically in Fig. 6. The primary air flow is indicated by A.

Preferably, the casing 15 is cast also with an Archimedean spiral casing 28, arranged co-axially with the casing 15 and around the flange 24, to enable the outer surface of the flange 24 to guide a secondary air flow, indicated by B, as shown in Fig. 7. The rotating flow of secondary air B is in the same direction as that of the primary flow A, and the flow B surrounds the flow A, as shown diagrammatically in Fig. 8. The diagrammatic lines of flows A and B, are merely symbolic to indicate the directions of the flows. In practice, the air flows with the burning fuel have a volume which fills a combustion tube from the center outwards, under rotative and forward movement.

To the casing 28 is secured a cylindrical combustion tube 30 having an internal diameter equal to the larger diameter of the outlet end 28*a* of the casing 28. This tube 30 encloses the primary and secondary air flows A and B, as they discharge in a manner described from flange 24 of the casing 15 and from the outer end 28*a*. These air flows enclose the ignited fuel discharging from the orifice 17, the line of fuel discharge and the air flows A and B being coaxial, or substantially so, and generally co-axial with the axis of the combustion tube 30.

The primary flow A forms a distinct cone of about 90°. The secondary flow B where it impinges upon the primary cone 27, merges therewith, the secondary air flow having a higher rotative velocity and a lower pressure. This impingement zone is at the actual flame front, and supplies additional oxygen. The rotating air and fuel with the products of combustion flow maintains itself at a pitch which decreases at about 40% along the length of the combustion tube. The fuel flow, preferably has a slight rotary flow, in the same direction as the air flows A and B. The outer surface of the flange 24 guides the secondary flow conically outwards, and due to the centrifugal effect forms a flow hugging the inner walls of the combustion chamber 30, and with its speed of rotation greater than that of the primary flow, washes the same, and tends to break up any fuel particles or partially consumed particles, at the same time supplying oxygen thereto. There is, of course, a centrifugal action upon the fuel particles until converted into carbon dioxide gas, and a centripetal action upon some of the gases.

To complete the description of the boiler, this is provided with a plurality of flue tubes 45, the outer walls of which are surrounded by the water to be heated, and the tubes 45 extend, in the embodiment, from end to end of the boiler, the entrance 45*a* receiving the products of combustion and the discharge end 45*b* discharging the products to a chamber 46*a* (Fig. 1) in communication with a chimney or the like. The boiler casing 44 has an end 46 providing a chamber 47 which receives the products of combustion from the flue tube 42, and directs them into flues 45 at their entrance ends, the combustion tube 30 extending through this chamber 47. The tubes 45 are surrounded by water.

The flue tubes 45 may each be provided with a spirally shaped guide 48 (Fig. 1) to give the gases a rotary movement to increase the heat exchange.

To increase heat exchange, the outer wall of the flue tube 42 and fire tubes 45, may, each or both, be provided with fins 55, as known.

Operative details include the standards 60 for boiler 44; water supply inlets 61, steam discharge outlets 62; staybolts 63; motor 64 for the primary and secondary air flow; flanges 65 for the casing 15, flanges 66 for the casing 28; electrical conductors or cables 67; oil supply tube 69; pressure indicator 70. An air regulating valve 71 with adjustment 72 is shown in Fig. 5. A water gauge 73 is shown in Fig. 2; also an air supply valve 74 with its adjustment 75. The part 76 is a flexible coupling joining the blower drive, motor 64, and fuel pump 77. The blower 78 within the blower housing 79 provides air under pressure for the primary and secondary air flows.

This is a continuation in part of my application Serial No. 701,153 filed October 4, 1946, now Patent 2,547,040, April 3, 1951.

I have described several forms of my invention, but obviously various changes may be made in the details disclosed without departing from the spirit of the invention as set out in the following claim.

I claim:

In a burner, the combination of a casing having a horizontal longitudinal axis and an interior chamber terminating in an opening concentric with said axis, a frusto conical flange at the said opening convering towards said axis and forming an outlet opening at its smallest diameter, a second casing having a horizontal longitudinal axis co-incident with the first named axis and having an Archimedean spiral interior passage, surrounding the first named casing, and having an outlet opening concentric with the outlet opening of said flange, said flange separating said outlet openings and being common to the interiors of both casings, means for supplying air to the first casing for discharge in a vorticose stream from the inner side of said flange, means for supplying air to the second casing for discharge in a vorticose stream from the outer side of said flange, in circumferential tangential relationship with the first vorticose stream, and a fuel supply nozzle disposed within the first casing and axially thereof and axially of both streams of air.

ABE J. PERLE.

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