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COMBINATION GAS AND OIL BURNER

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2 Sheets-Sheet 1

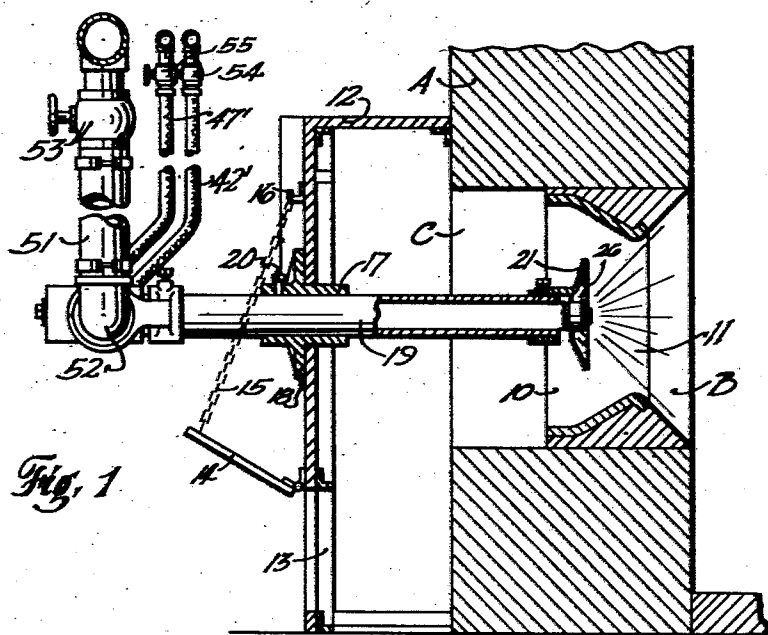


Fig. 1

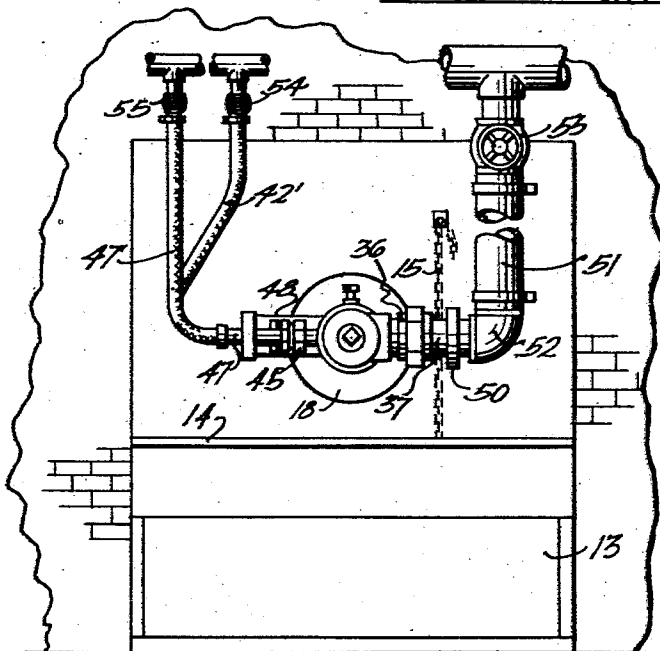


Fig. 2

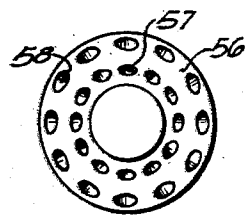


Fig. 5

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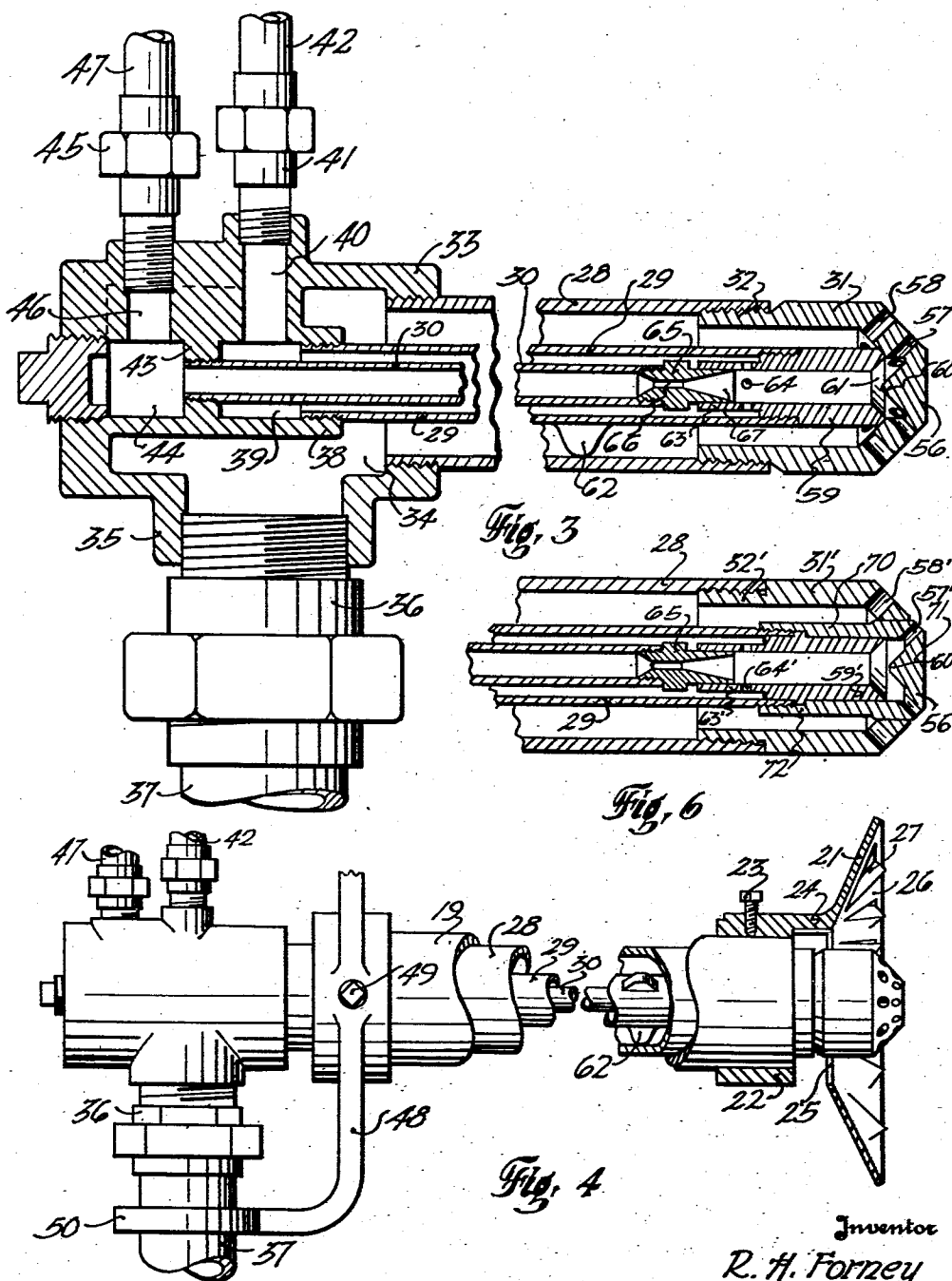
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2 Sheets-Sheet 2



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COMBINATION GAS AND OIL BURNER

Application filed February 3, 1930. Serial No. 425,651.

This invention relates to new and useful improvements in combination burners.

One object of the invention is to provide in a combination burner, means whereby one or
5 two fuels or either of said fuels may be used without disconnecting or attaching parts.

A further object of the invention is to provide a burner nozzle adapted to burn fuel fluids of different characteristics, such as
10 gas and oil.

Another object of the invention is to provide a burner wherein one of the fuels is atomized by steam and mixed therewith prior to discharge, to form a combustible
15 mixture; while the other fuel is discharged under its natural pressure.

A further object of the invention is to provide a combination burner wherein the burner elements are cooled by the fluids flowing therethrough.
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A still further object of the invention is to provide a combination burner tip which may be readily cleaned, changed or adjusted without affecting the operation of the boiler.

25 A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:
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Figure 1 is a partial vertical sectional view of a furnace equipped with a burner constructed in accordance with the invention,
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Figure 2 is a front elevation of the same,

Figure 3 is an enlarged longitudinal sectional view of the burner,
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Figure 4 is a partial view of the same partly in plan and partly in section,

Figure 5 is a front elevation of the burner tip, and
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Figure 6 is a longitudinal sectional view of a modified form of the burner tip.
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In the drawings the numeral 10 designates a metal barrel, cylindrical at its rear or outer end and frusto-conical at its inner or front end from which the flame is projected. The barrel is designed to be embedded in the fire opening C of the furnace wall A with its

rear end and its front end terminating within the wall. The frusto-conical portion of the barrel causes a concentration of the currents and these are discharged through a bell or outwardly flared lip 11 at the front end
55 of the barrel.

The wall A of the furnace has a flared or frusto-conical port B flush with the bell and consequently the heated currents which are concentrated in the conical portion of the barrel, are expanded and spread when passing through the bell and port. This arrangement makes for a thorough mixing of the air and gas currents as well as for an ample and hot flame.
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An upright metal air box 12 is fitted against the outer face of the furnace wall A so as to cover and extend above the fire opening C. This box may be of any suitable construction. A transverse draft opening 13 is provided in the front wall at the bottom of the box below the fire opening C. A damper or draft door 14 is hinged to the top of the opening and is supported by a chain 15 adjustably engaged with a hook 16, whereby the damper may be suspended at different heights to control the draft.
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An elongated collar 17 is mounted in the front wall of the box 12 and has a radial flange 18 secured to the face of said wall. The collar extends on both sides of the said front wall and carries a set screw 20. An elongated tubular guide or support 19 has a sliding fit in the collar and is fastened by the set screw 20 carried in the outer projection of the collar. The extension of the guide into the opening C and barrel 10 may be regulated as desired.
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On the inner end of the guide is mounted a deflector 21 which includes a collar 22 encircling the end of said guide, and fastened thereon by a set screw 23. The collar has a reduced extension 24 having air openings 25. A flared spreader 26 is carried by the extension. The spreader has upset vanes 27 bent toward the front side thereof and these act to admit air tangentially and impart a whirling or circular motion thereto, whereby combustion is promoted and a more intense flame is produced.
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A burner including a gas tube 28, an oil tube 29, a steam tube 30 and tip 31, is mounted coaxially in the guide 19. The gas tube 28 has a snug fit in the guide; while the oil tube 29 is considerably less in diameter than the gas tube, and the steam tube 30 is smaller than the oil tube. The tip 31 has a reduced screw threaded shank 32 which screws into the inner end of the gas tube, the outer surface of the tip being flush with the gas tube, so as to slide through the guide. All the tubes discharge into the tip.

A manifold head 33 (Figure 3), is internally screw-threaded, and the outer end of the gas tube is screwed into the same. The head has a chamber 34 and an internally screw-threaded collar 35 at one side receiving a union 36 connected to a gas supply pipe 37. Thus gas or other fuel flows from the pipe 37 into the chamber 34 and thence to the tube 28.

A boss 38 in the chamber 34 is tapped to receive the outer end of the oil tube 29 and has a chamber 39 communicating with a passage 40 extending at right angles to the tube through the boss and the head. The nipple of a union 41 is screwed into said passage and an oil supply pipe 42 is connected to said union.

The steam tube 30 extends through the chamber 39 and has its outer end screwed into a partition 43 separating the chamber 39 from a chamber 44. The nipple of a union 45 screws into a passage 46 into the chamber 44. The union is connected to a steam supply pipe 47. A yoke 48 held on the outer end of the guide sleeve 19 by a set screw 49 has an eye 50 at one side receiving the gas pipe 37 (Figures 1 and 4). The pipes 42 and 47 are carried in the side of the yoke. By this means the head and guide are held in fixed relation to each other.

As is shown in Figures 1 and 2, the gas pipe is connected with an upright gas hose 51, by an elbow 52. The hose 51 is connected to a cut-off valve 53 which controls the supply from the gas main. A hose 42' extends up from the pipe 42 to an oil valve 54, while a hose 47' extends from the pipe 47 to a steam valve 55. By means of the valves the supply of steam, gas and oil may be controlled or cut off.

Referring to Figure 3 it will be noted that the tip 31 has a frusto-conical head or nozzle 56 provided with inner and outer circular rows of ports 57 and 58 respectively, inclined radially of the tip. A mixing sleeve 59 screwed into the end of the oil tube 29 abuts the inner wall of the nozzle and separates the ports 57 from the ports 58. The sleeve receives a conical spreader boss 60 disposed axially of the nozzle and sleeve, and the end of the sleeve has an inward bevel 61 co-acting with boss to deflect and spread the fluids into the ports 57.

The tube 29 is concentrically supported in the gas tube 28 by lugs 62, whereby the sleeve is held in place. The sleeve has a reduced shank 63 extending into the oil tube and provided with inlet ports 64. The shank being less in diameter than the inner diameter of the tube, oil will readily flow along the shank, and through the ports into the sleeve.

A steam nozzle 65 screwed into the end of the steam tube 30 has an axial duct 66 discharging into a flared nipple 67 telescoping the shank 63. Steam flowing through the conductors 47', 47, 46 and 44, and the tube 30 is discharged from the nozzle 65 at a relatively high velocity, and readily expands in the mixing sleeve 59. The oil flowing through the conductors 42', 42, 41, 40 and 39, and tube 29 is discharged through the ports 64 and atomized by the steam, thus being mixed with the latter.

The oil and steam mixture is discharged through the ports 57 in numerous jets. Gas flowing through the conductors, 51, 52, 37, 36 and 34, and tube 28 is received in the tip 31 and discharged in a multiplicity of jets through the ports 58. The fluid jets are ejected in more or less concentric or coaxial conical zones. Air is admitted to the deflector 21 through the openings 25 and around the vanes 27.

The deflector 21 is located in the barrel 10 in advance of the reduced end thereof, so that the gaseous currents, resulting from the admixture of air and gas, are deflected by the spreader 26, and directed through the bell 11. The draft currents are concentrated in the reduced end of the barrel and mixed with the gaseous currents projected from the burner nozzle 56, thus causing the flame to spread through the bell 11, and frusto-conical port B into the fire box. This results in a maximum combustion and a hot flame of high heat potentiality.

The fuel and steam tubes being contained in the tubular guide 19 which carries the deflector 21 combine therewith to form a unit. By loosening the screw 20, the unit may be adjusted longitudinally and thus moved inward or outward in the barrel 10. This arrangement assures the best results according to the fuel mixture used.

While it is possible to use both gas and oil at the same time, more satisfactory results will be had where one or the other is used individually. Where oil is used steam is an advantageous adjunct, but with gas, steam would not be necessary. The valves 53, 54 and 55 permit a ready selection of fuels. Should it be desired to employ gas alone the valves 54 and 55 may be closed. Gas flowing through the tube 28 will be discharged through the ports 58 and admixed with air.

By closing the valve 53 and opening the

valves 54 and 55, oil and steam flow through the tubes 29 and 30. The steam discharged from the nozzle 65 into the sleeve 59 will atomize the oil from the ports 64 and form a gaseous mixture in the said sleeve, which mixture will be discharged through the ports 57. The tip 31 may be readily removed for cleaning and likewise the sleeve 59 and the nozzle 65.

In Figure 6 I have shown a modified form of burner tip. It happens under some conditions that the unequal expansion of the sleeve 59 and the nozzle 56 causes a separation, whereby the oil leaks onto the top 31 and finds its way back into the tube 28 and eventually to the gas main. In said figure the tip 31' has a reduced shank 32' screwed into the end of the tube 28 and a frusto-conical head 56'. The steam nozzle 65 fits into the reduced shank 63' of a mixing sleeve 59' having ports 64' like the sleeve 59.

The sleeve 59' telescopes into the cylindrical stem 70 of an oil nozzle 71 which has a snug fit in the head 56'. The head has ports 58', while the nozzle has ports 57'. The sleeve has an annular flange 72 engaging the end of the oil tube 29 onto which the stem is screwed. The sleeve terminates short of the nozzle 71 and its spreader boss 60'. By this arrangement the sleeve may elongate under expansion without injuring the tip or causing oil to leak into the gas conductor.

Various changes in the size and shape of the different parts, as well as modifications and alternations may be made within the scope of the appended claims.

What I claim, is:

1. In a combination burner, a steam conductor, a pair of fuel conductors arranged one within the other, all of said conductors being coaxially disposed, each conductor having an individual inlet, and a burner tip connected with the fuel conductors and having separate discharge outlets therefrom for each fuel conductor.

2. The combination set forth in claim 1 with a nozzle extending from the steam conductor to one of the fuel conductors.

3. In a combination burner, a pair of fuel conductors one within the other, a burner tip having ports opening into the outer conductor, a mixing tube within the tip, said tip having ports communicating with said tube, said tube having ports communicating with the inner fuel conductor, a steam conductor within the inner fuel conductor, and a nozzle extending from the steam conductor into the mixing tube in advance of the ports thereof for atomizing fuel discharged from said inner fuel conductor and for mixing with said fuel in said tube.

4. A burner tip for a combination burner comprising a cylindrical shell having a frusto-conical head, and a mixing sleeve within the shell, the head having outer discharge

ports extending from the shell and inner ports separated from the shell and extending from the sleeve.

5. In a combination burner a fuel tube, means within the fuel tube for conducting another fuel and steam through the fuel tube but separately from the first named fuel, and a burner element connected with the tube and said means and having a set of discharge ports for the fuel tube and a separate set of discharge ports for the steam and fuel conducting means, the ports being divergent to spread the fuels.

6. The combination set forth in claim 5 with a support for the fuel tube, and a deflector carried by the support and surrounding the burner element.

7. In a combination burner, a fuel tube, means for conducting a second fuel and steam through the tube separately from the fuel thereof, burner means, including ports for discharging the first fuel from the tube and also burner means, including ports for discharging the steam and second fuel separately from the first fuel, one set of ports surrounding the other.

8. The combination set forth in claim 7 with a support for the fuel tube, and a deflector carried by the support and surrounding the burner means.

9. A burner tip for combination burners comprising a shell having discharge ports, a nozzle separately inserted in the shell of the tip and having discharge ports separate from the ports of the shell, a mixing sleeve fitting in the stem of the nozzle, the sleeve having fuel inlet ports, and a steam nozzle extending into the sleeve.

10. In a combination burner, a plurality of fuel conducting tubes arranged one within the other, and a burner tip connected to the adjacent ends of said tubes and receiving fuel therefrom, said tip having divergent discharge ports, some of said ports being separately connected to one fuel conductor and the other of said ports being separately connected to the other conductor, whereby said fuels are discharged in separate flaring formations.

11. A combination burner as set forth in claim 10, and a spreader for diverting one of the fuels to its ports.

12. A combination burner as set forth in claim 10, and means for supplying and mixing steam with the fuel in one of said conductors.

13. A combination burner as set forth in claim 10, and means for mixing steam with one of the fuels prior to the discharge of said fuel through its outlets.

14. A combination burner as set forth in claim 10 in which the central portion of the tip containing one set of ports is separate from the remainder of the tip and the other

set of ports to permit expansion and contraction.

15. A combination burner as set forth in claim 1 in which one of the discharge outlets of the tip is arranged in a separate movable portion from the other discharge outlet for permitting expansion and contraction of the conductor connected thereto.

In testimony whereof I affix my signature.

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