Oct. 2, 1945. J. J. WOLFERSPERGER 2,385,854

GAS BURNER

Filed Oct. 21, 1940

Fig. 1.

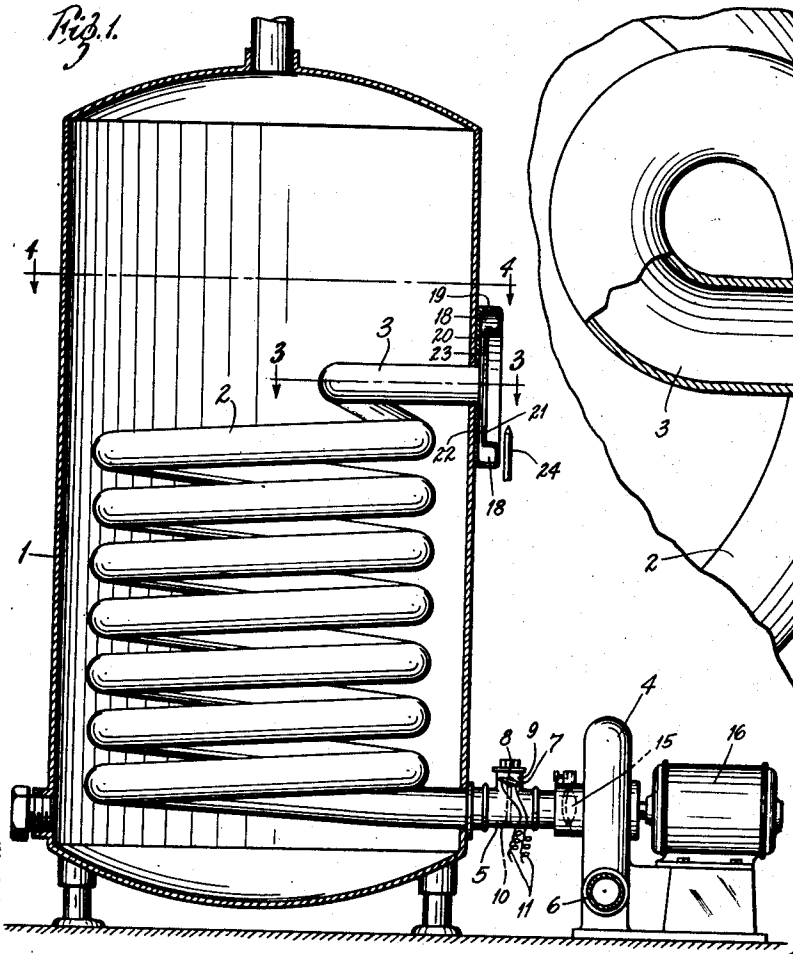


Fig. 3.

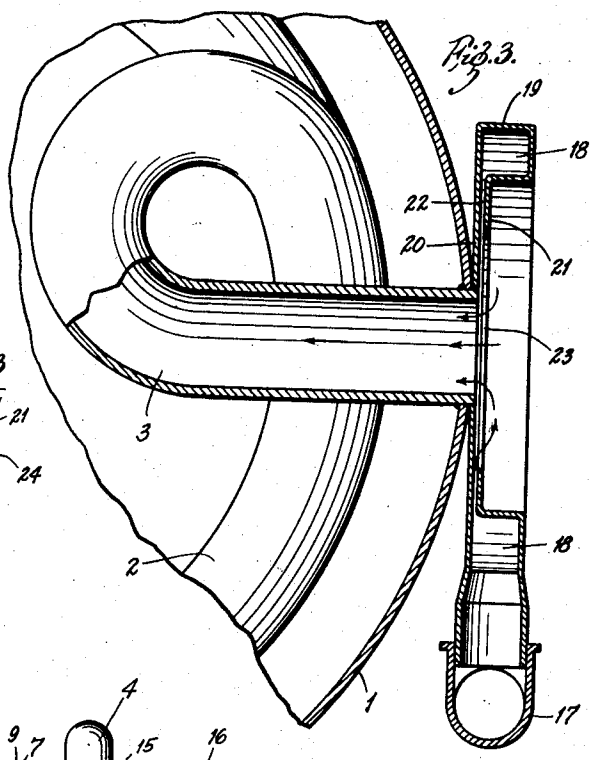


Fig. 4.

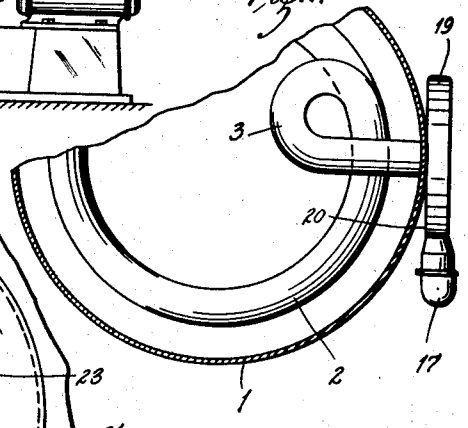
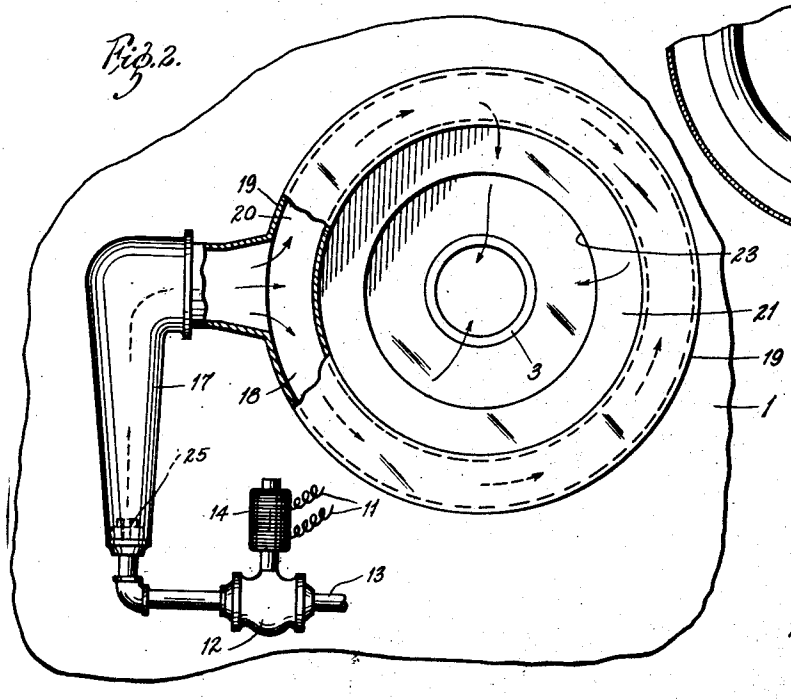


Fig. 2.



Inventor:
John J. Wolfersperger,
by John D. Rippey
his Attorney.

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GAS BURNER

John J. Wolfersperger, Webster Groves, Mo.

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8 Claims. (Cl. 158—99)

This invention relates to gas and oil combustion.

It is well known that gas and air, when perfectly mixed, will burn with a flame propagation velocity of approximately a thousand feet per second; and, as this high flame propagation velocity is not attained in conventional gas fired equipment, it is evident that gas can be burned in much less space, in much shorter distance of travel, and in much less time than is now done in conventional gas fired equipment, if the gas and combustion air can be rapidly and perfectly mixed.

An object of this invention is to provide a dependable and practical method and means for effecting rapid and complete mixing simultaneously with the combustion of the mixture and thereby to effect complete and perfect combustion in so small a space and in such short distance of travel that mixing, combustion and heat transfer can be performed simultaneously in a passageway of relatively very small cross-sectional area, such as a heat transfer coil in a water heater or steam generator, thus eliminating the necessity of providing special space for combustion as is necessary in conventional equipment.

Other objects and advantages of the invention will appear from the following description, reference being made to the annexed drawing, in which—

Fig. 1 is a vertical sectional view of a boiler equipped with one form of my present invention.

Fig. 2 is an enlarged side elevation of the fuel inlet device attached to the sharply curved portion constituting the inlet to the tortuous tube.

Fig. 3 is an enlarged horizontal sectional view approximately on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1, showing particularly the sharply curved inlet portion of the tortuous tubular passageway.

The boiler comprises a wall 1 forming an enclosure adapted to contain water. The wall 1 supports and encloses a spirally curved tube 2 constituting a passage for the ignited mixture of air and fuel. The upper or inlet end of this tube comprises a sharply curved portion 3 the end of which is rigidly secured in an opening in the wall of the boiler and forms therewith an hermetic leakproof joint. The tube 2, 3 is preferably of uniform and relatively small diameter throughout and, being sharply curved at the portion 3, gives high velocity to the ignited mixture passing therethrough. The sharply curved portion 3 further develops a very high turbulence, and thereby produces almost instant and complete mixture of air with the fuel. As a result, perfect combustion is obtained within almost the theoretical ultimate minimum of space and in almost the theoretical ultimate minimum of distance of travel.

The lower or outlet end of the tube 2 is extended outwardly through a hole in the wall of the boiler and forms therewith a leakproof or hermetic joint. A suction device 4 is connected with the effluent end of the tube 2 by a tubular fitting 5 through which the flue gases pass from said tube 2 to the device 4 for discharge through an outlet 6. A mercury switch 7 of conventional and known construction is attached to a rocking pivot 8 supported in an upward extension 9 of the fitting 5. A vane 10 attached to the pivot 8 extends partially across the inside of the fitting 5. In its idle or unoperated position the vane 10 is approximately vertical and substantially closes the passage through the fitting 5. When the device 4 is operating, a suction is created thereto through the fitting 5 and tube 2. This suction or flow of air or flue gases swings the vane 10 toward the machine 4, thereby rocking the pivot 8 and moving the mercury switch 7 to close the circuit through the circuit wires 11. As shown in Fig. 1, the circuit is open; and, when the switch 7 is moved by flow of air or flue gases caused by the machine 4, the circuit through the wires 11 is closed, and the magnetic valve 12 in the fuel supply pipe 13 is opened. This is because the magnet 14 for the valve 12 is connected with the circuit 11 and is energized to open said valve when the switch 7 is moved to closed position by the swinging movement of the vane 10 as described. The quantity of air induced into and through the tube 2 by operation of the machine 4 is controlled by an adjustable damper 15 which, as shown, is located between the vane 10 and the machine 4. The machine 4 may be operated by a motor 16.

In the construction of the invention shown in Figs. 1 to 4, the gas passes the valve 12 through a connection 17 attached to and opening into an annular passage 18. The passage 18 is formed by walls 19 one of which has a flat extension 20 attached to the outer end of the tube portion 3 and forming therewith a tight and leakproof joint. Another inwardly extended flat portion 21 of the wall 19 is substantially parallel with the wall 20 and is separated therefrom by a narrow gas outlet port or space 22. The radial width of the wall 21 is less than the radial width of the wall extension 20, thus leaving an enlarged opening 23 through the wall 21 of considerably larger diameter than the opening into the end of the tube 3. A gas pilot or electric ignition device 24 is located in proper position to ignite the gas and air mixture at the outlet from the port or space 22.

To operate this form of the invention, the damper 15 is adjusted to control and regulate the

amount of air entering into the mixture of air and gas, and also to regulate the velocity of the combustion mixture and flue gases through the tube in cooperation with the cross-sectional area of the tube. The straight extension of the sharply curved portion 3 of the tube does not extend beyond the outer surface of the wall 20 and does not obstruct the free induction of the ignited mixture into the tube. In this form of the invention, the ignited mixture is given a high velocity into and through the tube, and a high turbulence and completion of mixture and combustion are caused at the sharply curved portion 3. The quantity of gas passing to the point of ignition is controlled by the pressure through the supply pipe 13, by a gas orifice 25 in the connection 17 and by the relatively small cross-sectional area of the annular discharge port or space 22. Thus, the amount of fuel gas conducted to the burner and the amount of air mixed therewith to form the combustible mixture are controlled.

It is now clear that the invention attains all of its intended objects and purposes efficiently and satisfactorily, and can be varied without departure therefrom in other particulars than those specifically mentioned.

I claim:

1. A burner comprising walls forming an annular passage arranged to receive gas, wall portions extending inwardly from said walls toward the axis of said annular passage and providing a port of relatively small cross-sectional area for the discharge of gas from said passage, one of said wall portions having an opening therethrough for the admission of air and the other of said wall portions having a smaller opening therethrough for the passage of said air and gas from said burner, and a tube having hermetic connection with said last named wall portion around said opening therethrough for receiving said air and gas from said burner.

2. A burner comprising walls forming an annular passage arranged to receive gas, wall portions extending inwardly from said walls toward the axis of said annular passage and providing a port of relatively small cross-sectional area for the discharge of gas from said passage, one of said wall portions having an opening therethrough for the admission of air and the other of said wall portions having a smaller opening therethrough for the passage of said air and gas from said burner, a straight tube portion having hermetic connection with said last named wall portion around said opening for receiving said air and gas from said burner, and a sharply curved connection with said tube effecting complete mixture of the air and gas passing therethrough.

3. A burner comprising walls forming an annular passage arranged to receive gas and having an annular port opening toward the axis thereof, a flat wall extending inwardly from one edge of said port and toward the axis of said annular passage and having an opening for the discharge of gas and air therethrough, and a combustion tube having hermetic connection with said flat wall around said opening for receiving said air and gas from said burner and having a sharply curved portion for effecting complete mixture of the air and gas passing therethrough.

4. A burner comprising walls forming an arcuate passage arranged to receive gas and having an arcuate port opening toward the axis thereof, a flat wall extending inwardly from one edge of said walled passage and toward the axis of said arcuate port and having an opening for the discharge of gas and air therethrough, and a tube having a hermetic connection with said flat wall around said opening for receiving said air and gas from said burner and having a sharply curved portion for effecting complete mixture of the air and gas passing therethrough.

5. A burner comprising walls forming an annular passage arranged to receive gas, closely adjacent and parallel annular wall portions extending inwardly from an annular port in said walls discharging toward the axis of said annular passage and providing an annular outlet of relatively small cross-sectional area for the discharge of gas from said passage, one of said wall portions having an opening therethrough for the admission of air and the other of said wall portions having an opening therethrough for the passage of said air and gas from said burner, and a combustion tube having an influent end in hermetic connection with said last named wall portion around said opening for receiving air and gas from said annular outlet, and having a sharply curved portion adjacent to said influent end near said connection to effect complete mixture of the air and gas passing therethrough.

6. A burner comprising walls forming an annular passage arranged to receive gas, means forming an arcuate port for the discharge of gas from said passage, a wall portion extending inwardly from said walls toward the axis of said annular passage and having a central opening therein for the passage of air and gas from said burner, and a combustion tube having hermetic connection with said last named wall portion around said central opening therethrough for receiving gas from said annular passage.

7. A burner comprising walls forming an annular passage arranged to receive gas, wall portions extending inwardly from said walls toward the axis of said annular passage and providing a port of relatively small cross-sectional area for the discharge of gas from said passage, one of said wall portions having an opening therethrough for the admission of air and the other of said wall portions having a smaller opening therethrough for the passage of said gas emanating from said port and also for the passage of said air that is admitted through said first opening, a device adjacent to said burner for igniting said gas emanating from said port, and a suction device having imperforate tubular connection with the effluent side of said wall portion that has said smaller opening, for initiating and maintaining flow of a flame of ignition of said air and gas through said smaller opening.

8. A burner comprising walls forming an annular passage adapted to receive gas, means for conducting gas into said passage, two spaced wall portions extending from said walls toward the axis of said annular passage and providing a port of relatively small cross-sectional area for the discharge of gas from said passage, one of said wall portions having an opening therethrough for the admission of air for mixture with said gas and the other of said wall portions having a smaller opening therethrough for the passage of a flame of ignition of said air and gas, and a suction device connected with the effluent side of said wall portion that has said smaller opening, for initiating and maintaining flow of a flame of ignition of said air and gas through said smaller opening.

JOHN J. WOLFERSPERGER.