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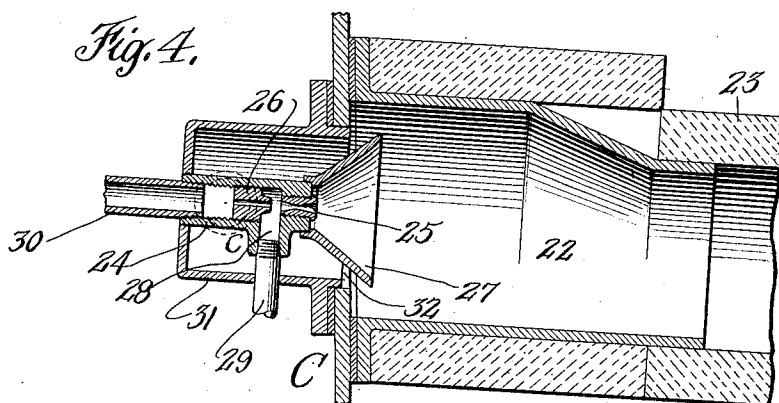
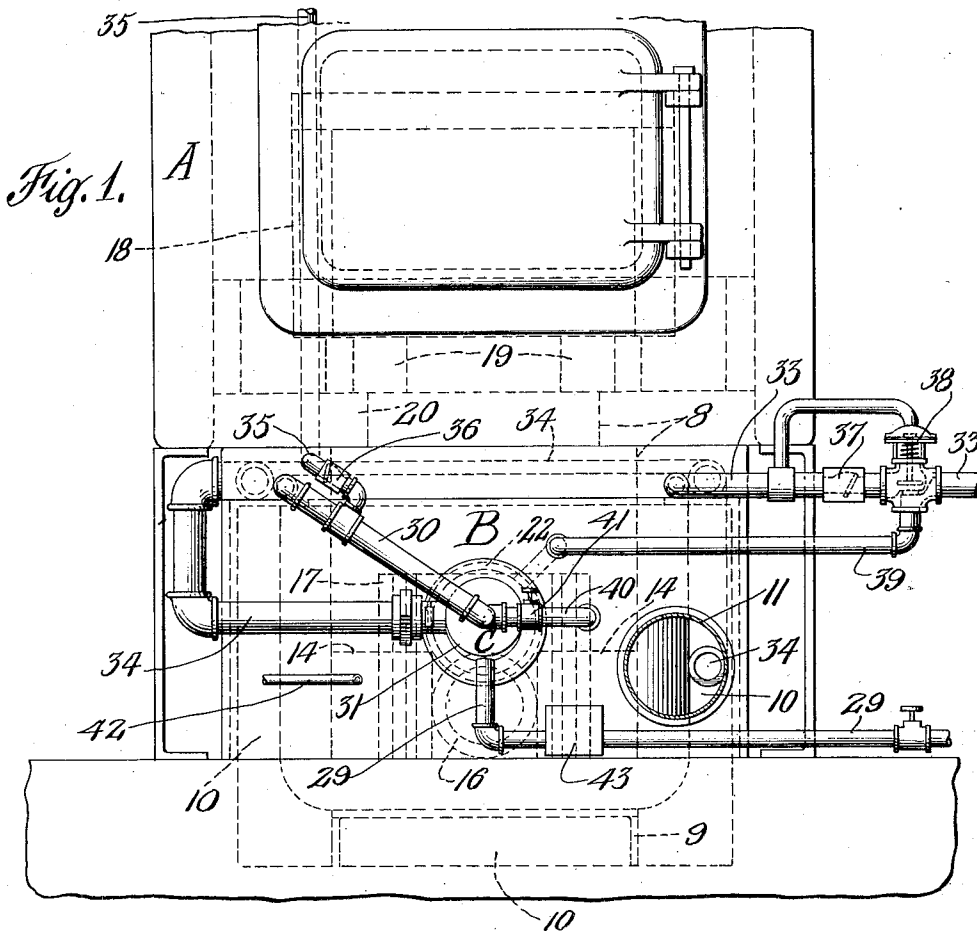
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OIL BURNING APPARATUS

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OIL BURNING APPARATUS

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This invention relates to apparatus for burning oil, and while it is especially useful for domestic purposes, it may also be used for industrial purposes. For convenience of illustration, the invention will be described as applied to a domestic furnace of the steam generator type.

One of the primary objects of our invention is to burn the fuel efficiently.

Another object of the invention is to burn the fuel in a manner to obtain substantially noiseless operation, which is very advantageous for domestic use.

Still another object of the invention is to provide a very simple apparatus which can be readily adapted to either existing or new furnace equipment and which will function with any of the standard blower and control units now on the market.

A further object of the invention is the provision of novel means for preheating combustion air; novel means for securing an intimate and substantially perfect admixture of the fuel and the air whereby substantially perfect and complete combustion is secured; and an arrangement whereby admixture is brought about by means which also serve to muffle or deaden any sound.

The foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to our invention, are realized by means of a construction which we have illustrated in the preferred form in the accompanying drawings, wherein—

Fig. 1 is a fragmentary front elevation of a domestic steam heater equipped with our improved oil burning apparatus.

Fig. 2 is a horizontal section through a portion of the oil burning apparatus taken on the line 2—2 of Fig. 3.

Fig. 3 is a vertical section through our improved apparatus, and

Fig. 4 is a section through the oil burner proper drawn on an enlarged scale.

Referring now to Fig. 1, the reference character A denotes the furnace and the reference character B denotes the oil burning unit.

The oil burning unit comprises the refractory combustion chamber 7 which is adapted

to be inserted, for example, into the ash-pit of an ordinary domestic furnace. This combustion chamber has an outlet 8 at the upper part thereof toward the rear, and it has a burner indicated as a whole by the reference character C in its front wall. The combustion chamber is supported on the channel-like member 9 which will be further described, and it is provided with an air chamber or space 10 at the front, rear, sides and bottom. Air from the blower (not shown) is supplied to the air space 10 through the pipe 11 located at the front of the unit. The air so supplied enters the space 10 and flows beneath the bottom wall of the combustion chamber and then up around the rear wall thereof and thence forwardly along the side walls thereof to the inlet ports 12 provided in the side walls of the combustion chamber at a point adjacent the delivery end of the burner C. The air is caused to take this path by means of the baffles 13 which prevent direct communication between the ports 12 and the incoming air. The air in thus passing over the refractory walls of the combustion chamber becomes highly heated.

In front of the delivery end of the burner C are a pair of baffles 14 laterally spaced from one another and located about midway of the length of the ports 12 whereby air enters the combustion space proper, both in advance and to the rear of the baffles. Immediately behind the baffles 14 is bridge wall 15 which has its central portion formed into what may be termed a muffle tube 16, and beyond the bridge wall is what may be termed an upright and arcuate baffle or collector 17 which is located below the outlet 8. Above the outlet 8 there is a muffle chamber 18 which may be supported, for example, through the medium of the spacer blocks 19 on the tile 20 resting on the top of the combustion chamber proper. By spacing the muffle chamber from the tile 20 an outlet to the fire box of the furnace is provided for the waste products of combustion. Additional outlet means may be provided in the form of a series of annularly arranged holes 21.

Referring now to the burner C, this comprises a nozzle means *c*, a mixing chamber 22, and the refractory sleeve portion 23 extending beyond the end of the mixing chamber which is preferably a casting. The nozzle *c* comprises the sleeve 24 which carries the nozzle proper 25 preferably in the form of a Venturi tube of appropriate cross sectional area, the adjustable spud 26 and the expanding cone 27. Oil is led to the small reservoir 28 between the parts 25 and 26 by means of an oil line 29 leading from any float controlled source of supply or other standard source of oil. An aspirating blast is delivered to the sleeve 24 by means of the pipe 30, this blast picking up oil from the space 28 and delivering it through the nozzle proper 25 in atomized form. Adjustment is afforded in a very simple manner by merely screwing the spud 26 toward or from the nozzle proper 25. The sleeve 24 is surrounded by a casing 31 which is open at one end to provide an annular space 32 around the cone 27. Air or steam, in addition to that utilized in aspirating the oil, is admitted to the casing 31 and discharges through the annular space 32 surrounding the mixture of air or steam and oil leaving the cone 27. The air or steam supplied through the casing 31 mixes with the atomized oil in the mixing chamber 22 and constitutes a portion but not all of the air required for combustion.

Air from a compressor is supplied to the pipe 30 through the medium of the pipe 33, and air is supplied to the casing 31 by means of the damper controlled pipe 34 which communicates with the blower line 11 and passes around the combustion chamber before it connects with the casing 31, in consequence of which the air delivered by the pipe 34 to the casing becomes preheated. Similarly, the pipe 33 passes around the combustion chamber so that the compressed air admitted to the nozzle is also preheated.

The atomized oil mixed with a portion of the air required for combustion in the mixing chamber 22 ignites, ignition being assisted by the preheating of the air and by the fact that the mixing chamber is surrounded by the refractory sleeve portion which becomes very hot in service and radiates heat.

The ignited mixture leaves the discharge end of the sleeve 23 and meets with the additional air required for combustion, the stream being agitated by the interrupted bridge wall and by the air which enters transversely in advance and behind such bridge wall. Further agitation and turbulence is brought about by the second bridge wall and the muffle tube 16 which directs a portion of the fuel and flame stream against the collector. Violent eddying is set up by the baffles and bridge wall and also by the collector and finally the flame is forced

through the outlet 8 into the muffle chamber 18 where normally combustion is completed, the waste gases leaving the muffle chamber as before described. It will be understood that the baffle bridge wall, the muffle tube, the collector and the muffle chamber are also composed of refractory material.

In consequence of the foregoing there is violent agitation and mixture, the fuel and flame stream is subjected to a high degree of radiation from all of the refractories, and this, coupled with the employment of preheated primary air, secures not only substantially perfect and complete combustion, but also noiseless operation. The shape and disposition of the baffles and bridge wall also tends to secure a maximum degree of agitation.

The intensity of the combustion is further enhanced by virtue of the fact that combustion is preferably carried on under pressure, the positive pressure being brought about by the employment of high pressure air for the aspirating blast and by air from the blower for the auxiliary air supply.

If desired, the aspirating blast of air may be supplanted by an aspirating blast of steam, and in the drawings we have shown one way of bringing about this result. A steam line 35 leading from the steam space of the boiler is connected to discharge into the pipe 30 which is the pipe to which the high pressure air line 33 is connected. Air cannot enter the boiler, however, because of the check valve 36 which remains closed as long as the air pressure is above that of the steam. When the steam pressure rises above that of the air, steam will enter the pipe 30 and provide the aspirating blast. The check valve 37 in the line 33 prevents steam from flowing through the line 33. As it is desirable, however, that the pump or compressor should be kept in operation, we provide an automatic control valve 38 which is operated by the pressure in the line 33 on the left of the check valve 37 when steam is flowing through the pipe 30 to close the valve, causing the air delivered by the compressor to enter the by-pass 39 which discharges into the mixing chamber 22. Another by-pass 40 may also be provided leading from the pipe 30 to the mixing chamber, said by-pass being controlled by a hand valve 41 by virtue of which a portion of the air or the steam, as the case may be, which is flowing through the pipe 30, may be diverted to the mixing chamber.

The apparatus is simple to manufacture and install. The refractory blocks and tile are of shapes easy to make. The air chamber around the combustion chamber can be formed from simple plates and the channel-like supporting member 9 not only forms a convenient means for supporting the unit,

but also cooperates with the baffles 13 to cause the auxiliary air to take the course hereinbefore described.

The reference numeral 42 indicates a pilot which may be of any standard form.

The reference numeral 43 designates an automatic valve for controlling the oil feed.

We claim:—

1. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil and part of the air for combustion, means in the chamber for setting up turbulence of the fuel and flame stream, means for admitting additional air for combustion at each of two opposite sides of the chamber at a point adjacent the discharge end of the burner, and baffle means in the chamber so located with reference to the auxiliary air admission means that air is admitted in front and behind the baffle means.

2. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil and part of the air for combustion, means for admitting additional air for combustion at each of two opposite sides of the chamber at a point adjacent the discharge end of the burner, and baffle means in the chamber so located with reference to the auxiliary air admission means that air is admitted in front and behind the said baffle means.

3. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil, baffles laterally spaced from one another and located adjacent the delivery end of the burner, and a bridge wall beyond the baffles and provided with a muffle tube portion.

4. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil, baffles laterally spaced from one another and located adjacent the delivery end of the burner, a bridge wall beyond the baffles and provided with a muffle tube portion, and a collector beyond the said wall.

5. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil, baffles laterally spaced from one another and located adjacent the delivery end of the burner, a bridge wall beyond the baffles and provided with a muffle tube portion, a collector beyond the wall, and a muffle chamber above the collector provided with an outlet for the waste gases of combustion.

6. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil, baffles laterally spaced from one another and located adjacent the delivery end of the burner, a bridge wall beyond the baffles and provided with a muffle tube portion, a collector beyond the wall, and a muffle chamber above

the collector provided with an outlet for the waste gases of combustion, the combustion and muffle chambers, the baffles, the bridge wall and the muffle tube being composed of refractory material.

7. Oil burning apparatus comprising, in combination, a combustion chamber, a burner for supplying atomized oil, baffles laterally spaced from one another and located adjacent the delivery end of the burner, a bridge wall beyond the baffles and provided with a muffle tube portion, a collector beyond the wall, and a muffle chamber above the collector provided with an outlet for the waste gases of combustion, the combustion and muffle chambers, the baffles and wall and the muffle tube being composed of refractory material and a sleeve of refractory material for the burner.

8. Oil burning apparatus comprising a combustion chamber having front, rear, side and bottom walls and provided with a burner nozzle at its front wall, said walls being hollow to provide an air space around the front, rear, side and bottom walls, the side walls having port openings for establishing communication between the interior of the chamber and said space, means for admitting air into said space at the front wall, and means whereby the air is caused to travel under the bottom, over the rear and along the side walls of the chamber in traversing said space to the said port openings.

9. Oil burning apparatus comprising a combustion chamber having front, rear, side and bottom walls and provided with a burner nozzle at its front wall, said walls being hollow to provide an air space around the front, rear, side and bottom walls, the side walls having port openings for establishing communication between the interior of the chamber and said space, means for admitting air into said space at the front wall, and means whereby the air is caused to travel under the bottom, over the rear and along the side walls of the chamber in traversing said space to the said port openings comprising baffles located in advance of the port openings.

In testimony whereof we have hereunto signed our names.

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HENRY A. NEDER.

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