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OIL BURNER MUFFLER

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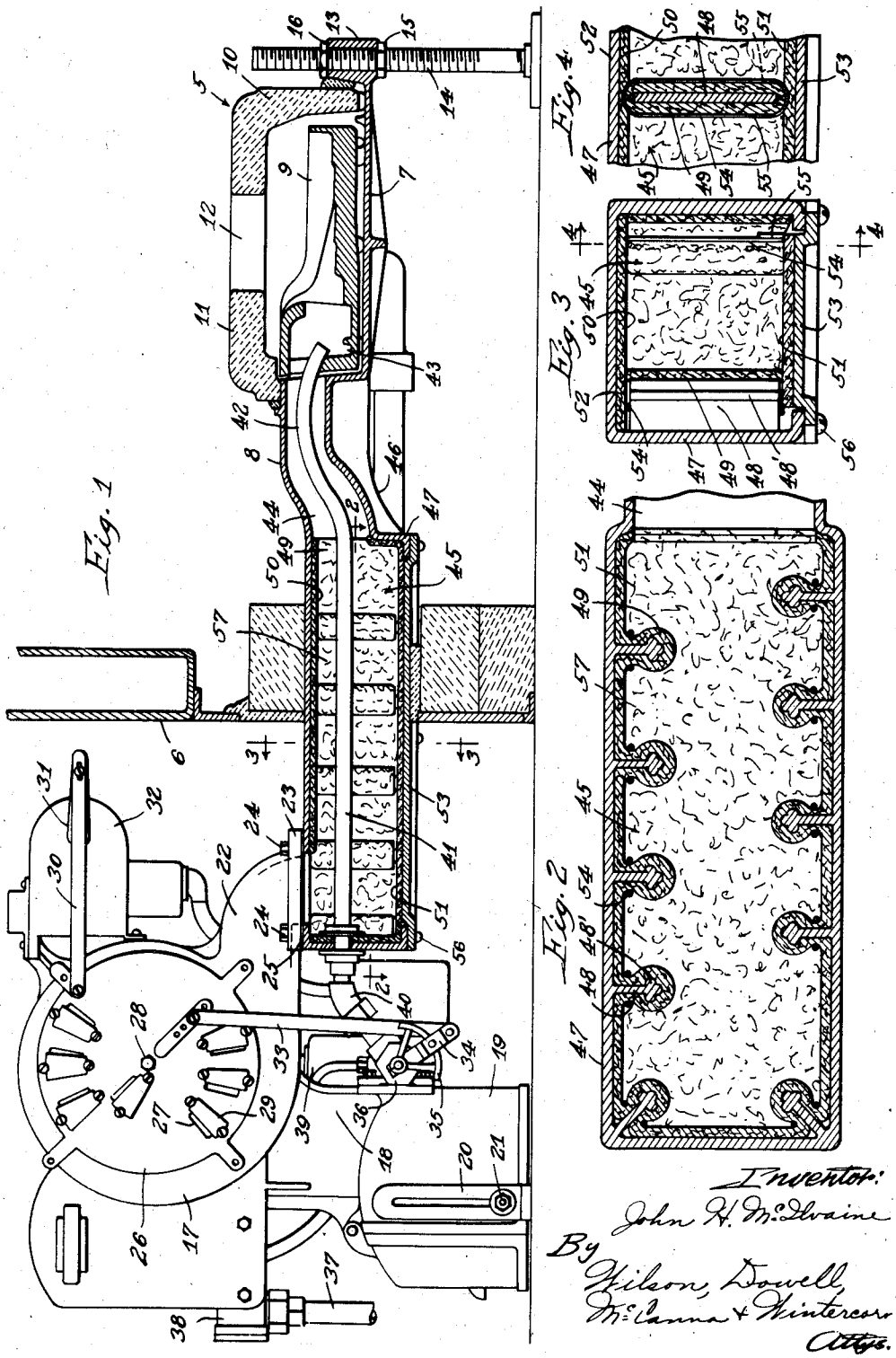

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OIL BURNER MUFFLER

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Application April 3, 1937, Serial No. 134,699

15 Claims. (Cl. 181—42)

This invention relates to oil burners for domestic heating furnaces.

During the past few years there has been considerable thought given to obtaining quiet operation of oil burners but, so far as I am aware, it was not heretofore fully realized to what an appreciable degree noisy operation was traceable to the air tube "telephoning" the combustion noises from the furnace. As a result, most of the improvements made with a special view to quietness of operation have been confined to other portions of the apparatus. When transverse baffles were provided of sufficient size to cut down the transmission of sound, they invariably interfered with the free flow of air, and hence such constructions have not been practical. Special formations of air tubes have been tried with a view to overcoming that difficulty, but invariably they have not provided the desired silent operation. It is the principal object of my invention to provide an oil burner, the air tube of which incorporates a muffler so constructed that while it does not interfere in any way with the delivery of air from the blower to the combustion head or firepot, the transmission of sound from within the furnace is effectually cut off by entrapment and absorption in the muffler with the result that the burner operates much more quietly than heretofore.

The invention embraces other objects and advantages hereinafter pointed out in the description of the accompanying drawing, in which—

Figure 1 is a view partly in longitudinal vertical section and partly in side elevation of an oil burner installation illustrating the muffler chamber of my invention;

Fig. 2 is a horizontal section on the line 2—2 of Figure 1 on an enlarged scale;

Fig. 3 is a cross-section in a vertical plane on the line 3—3 of Figure 1, and

Fig. 4 is a sectional detail in a vertical plane on the line 4—4 of Fig. 3.

The same reference numerals are applied to corresponding parts throughout the views.

The oil burner shown in Figure 1 is generally similar to that disclosed in the copending application of Peter I. Hollman and myself, Serial No. 74,952, filed April 17, 1936. The combustion head or firepot 5 disposed inside the furnace 6 forms the subject matter of another joint application of Peter I. Hollman and myself, Serial No. 165,262 filed September 23, 1937, and comprises, generally speaking, a metal overflow pan 7 cast integral with the end of the air tube or conduit 8, a metal tray 9 placed in the pan 7, and a ceramic ring 10 resting on the pan and surrounding the tray, formed with a top 11 provided with an oblong or oval-shaped central flame opening 12. The air tube 8 is supported inside the furnace by the hollow boss 13 cast integral with the pan 7 and having the vertical supporting post 14 extending therethrough, as shown, with adjusting and locking nuts 15 and 16 threading thereon and engaging the bottom and top of the boss 13. The blower housing 17 has a web 18 cast integral therewith and terminating in a trip bucket housing 19 that is supported on opposite sides by feet 20 bolted adjustably thereto, as at 21. The blower housing has a tangential discharge neck 22 which is flanged, as at 23, for fastening the same to the outer end of the air tube 8, as by means of bolts 24. A gasket 25 of compressible material is interposed at the connection to prevent air seepage. The blower housing has an air impeller therein driven preferably at a constant speed by means of an electric motor seated on the opposite side of the housing from the shutter plate 26. The latter has openings 27 which register with openings in the side wall of the housing 17 in different positions of rotation of the plate about its center 28. The shutter mechanism is covered in my Patent 1,797,293 wherein I have described how the closure plates 29 are adjusted relative to the openings 27 so that only the proper amount of air will be allowed to enter the blower housing 17 at each one of a series of positions of the shutter plate, the shutter plate at the time of installation of the burner being turned one step at a time and the appropriate closure plate being adjusted at each step so as to secure the correct amount of air in proportion to oil. A link 30 provides an operating connection between the shutter plate 26 and the rotatable crank arm 31 of the regulator 32, that is, where automatic control is desired. In some installations a remote control unit is provided having connection with the shutter plate 26 for direct manual adjustment thereof. In the automatic control the room thermostat located conveniently upstairs causes the regulator 32 to operate so as to regulate the size of the flame and always balance the heat loss of the building and accordingly maintain an even temperature. Another link 33 provides an operating connection between the shutter plate 26 and a lever 34 adjustably connected with a quadrant 35 fixed to the rotatable stem of the control valve 36 so that the control valve will be opened wider and wider at each step in the progressive opening of the shutter plate, whereby to secure correct proportioning of oil and air for

each flame, from the low flame that serves as a pilot through the various intermediate sized flames up to the high flame.

The oil, the flow of which is controlled by the valve 36, is delivered through the pipe 37 by gravity feed to a filter 38 communicating directly with a float valve, the purpose of which is to maintain a constant level of fuel in relation to the tray 9 in the combustion head. The oil flows from the float valve by gravity feed to a solenoid valve 39, the function of which is to permit an unrestricted flow therethrough so long as the current for the motor of the blower is not interrupted. If the current is interrupted, the solenoid valve automatically operates to reduce the flow of oil to about one-third the maximum capacity of the burner, sufficient for it to continue operating on natural draft and sufficient to keep the house warm until normal operation is resumed. The oil passes from the solenoid valve into the control valve 36 and flows from this valve by gravity feed through the pipe connection 40 to the pipe 41 which extends lengthwise inside the air tube 8 and has an upwardly and downwardly bent end 42 to discharge the oil into the groove 43 in the tray 9. The oil so discharged is vaporized and mixed with air from the tube 8 and burned in the combustion head 5 in the manner substantially as set forth in the first mentioned copending application.

In accordance with my invention, the air tube 8, instead of having the same sized bore from the point of its connection with the neck 22 to the point of its communication with the combustion head 5, as indicated at 44, is of increased width and height from its outer end all the way in nearly to the point of connection with the combustion head to provide a muffler indicated generally by the reference numeral 45. Reinforcing ribs 46 are cast integral with the bottom of the tube 8 between the end wall of the muffler chamber 47 and the adjoining side of the overflow pan 7. In other words, the muffler 45 forms a portion of the length of the air tube and, as will soon appear, is so constructed that while it allows free passage of air from the blower housing 17 to the combustion head 5, it effectually cuts off the transmission of sound from the furnace by entrapment and absorption within the muffler chamber 47. To begin with, it is apparent from Figs. 2 and 3 that the vertical walls or baffles 48 projecting inwardly from the opposite sides of the chamber 47 in staggered relation and around which the sound deadening felt 49 is wound or threaded, are amply spaced laterally with respect to one another for free passage of air through the muffler chamber from the discharge neck 22 of the blower housing 17 to the combustion head 5. The fuel feed pipe 41 also extends lengthwise through the chamber 47 between these baffles, as indicated in Figure 1. However, owing partly to the fact that the outer ends of the walls 48 are enlarged, as at 48', so that the intervening stall-like spaces 57 are narrower at their entrances than at their inner ends to serve as sound traps, and partly to the fact that there is moreover good absorption and deadening of sound throughout the interior of the muffler by reason of the lining of the end and side walls with the felt 49 and the lining of the top and bottom walls with felt, as indicated at 50 and 51, sound cannot travel back from inside the furnace 6 through the muffler chamber 47. The felt, in other words, prevents the transmission of sound by reflection off the walls of the air tube, and the bottle-neck restriction of the outer ends of the stalls 57 interferes with escape of sound therefrom. Then, too, there is good assurance that the sound will be thrown into the stalls 57 by causing the air to flow along a zigzag or sinuous path by reason of the staggered relationship of the walls 48 on one side of the muffler in relation to the walls 48 on the other side. I have found that with my construction, at least 90% of the combustion noise otherwise audible outside the furnace 6 is not apparent. This naturally is a great advantage in the home. The addition of the muffler chamber is considered preferable, for example, to the redesigning of the combustion head to a form operating more quietly but less efficiently. This is mentioned because efforts to obtain quiet operation by redesign of the combustion head or firepot usually necessitate a compromise and lower efficiency is tolerated in return for quieter operation. With the present invention there is no such compromise necessary.

Figs. 3 and 4 show that the baffles 48 projecting from the side walls of the chamber 47 terminate in spaced relation to the top and bottom walls 52 and 53. In that way the felt 50 extending the full width of the chamber 47 can be placed between the ends of the baffles 48 and the top wall 52 either before or after the felt 49 covering the side walls and baffles is placed, and the felt 50 will be supported by the baffles 48 and felt 49 to a certain extent, although I prefer to cement the felt 50 in place. The felt 49 is held in place by wires 54 which are bent to U-shape so as to extend over the tops of the baffles and along the felt on opposite sides, as clearly appears in Figs. 2 and 4, the ends of the wires being bent in opposite directions under the lower ends of the baffles and against the felt on the opposite sides, as indicated at 55 in Figs. 3 and 4. The enlarged outer ends 48' of the baffle walls 48 are formed preferably to a cloverleaf cross-section, as indicated, so that there are sharply defined shoulders behind the enlarged ends and the wire fasteners 54 are not apt to slip off in the placing of the felt on the baffle walls. The bottom wall 53 is a separate cover plate suitably secured in place by screws 56 and the felt 51 is cemented thereto and extends beneath the baffles 48, as clearly appears in Fig. 3.

It is believed the foregoing description conveys a good understanding of my invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. A noise muffler for an air delivery conduit for an oil burner in a furnace adapted to be supplied with air under pressure from a blower, said muffler comprising an elongated casing, opposed longitudinal walls of which are formed to provide stalls opening off a longitudinal air passage through said casing, the walls of said stalls being covered with sound absorbing material, each of the stall spaces defined by said sound absorbing material being of dovetail cross-section narrow at the entrances and wide remote from said entrances, substantially as and for the purpose described.

2. A noise muffler for an air delivery conduit for an oil burner in a furnace adapted to be supplied with air under pressure from a blower, said muffler comprising an elongated casing, opposed longitudinal walls of which are formed to provide stalls opening off a longitudinal air passage through said casing, the walls of said stalls

being covered with sound absorbing material, each of the stall spaces defined by said sound absorbing material being of dovetail cross-section narrow at the entrances and wide remote from said entrances, substantially as and for the purpose described, the stalls on one wall being in staggered relation to the stalls on the opposite wall of said casing.

3. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the baffles being covered with sound absorbing material.

4. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the said longitudinal walls and baffles being covered with sound absorbing material.

5. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having the opposed side walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the top, bottom and side walls and baffles being all covered with sound absorbing material.

6. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the baffles on one wall of the casing being in staggered relation to the baffles on the opposite wall.

7. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the baffles on one wall of the casing being in staggered relation to the baffles on the opposite wall, the baffles being covered with sound absorbing material.

8. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers, the baffles on one wall of the casing being in staggered relation to the baffles on the opposite wall, the said longitudinal walls and baffles being covered with sound absorbing material.

9. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls adapted to serve as sound trapping chambers, the outer ends of the baffles being of enlarged cross-section whereby to proportionately restrict the entrance of each of said stalls.

10. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls adapted to serve as sound trapping chambers, the outer ends of the baffles being of enlarged cross-section whereby to proportionately restrict the entrance of each of said stalls, the baffles being covered with sound absorbing material.

11. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls adapted to serve as sound trapping chambers, the outer ends of the baffles being of enlarged cross-section whereby to proportionately restrict the entrance of each of said stalls, the said longitudinal walls and baffles being covered with sound absorbing material.

12. A noise muffling air delivery conduit for an oil burner in a furnace adapted to be supplied with air under pressure from a blower, said conduit being of enlarged cross-section for at least a portion of its length to provide a muffler chamber, a removable cover plate forming one wall of said chamber, two opposed side walls of said chamber having outwardly projecting baffles in longitudinally spaced relation forming stalls

therebetween which are narrower at their entrances than at their inner ends, sound absorbing material covering the interior of said chamber and extending over said baffle projections, and a covering of sound absorbing material on the inside of said removable cover plate.

13. In a muffling device, an elongated shell of substantially rectangular cross-section having an inlet opening in one end and an outlet opening in the other end thereof, baffles extending inwardly from the opposed longitudinal walls of said shell toward one another, the inner ends of said baffles being enlarged, a covering of porous sound absorbent material for the inside walls of said shell and baffles, the sound absorbent material for covering the baffles and the longitudinal walls carrying the same being of flexible sheet form and extending lengthwise of said longitudinal walls between and over the baffles, and means for retaining said sheet material, said means being retained on the baffles behind the enlarged inner ends thereof.

14. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls which are narrower at their entrances than at their inner ends and adapted to serve as sound trapping chambers.

15. A noise muffling air delivery tube for an oil burner in a furnace including an elongated muffler casing having an inlet at one end remote from the burner and an outlet at the other end nearest the burner, said casing having opposed longitudinal walls thereof provided with inwardly projecting baffles in longitudinally spaced relation between the inlet and outlet ends of the casing, each of the rows of baffles providing therebetween a series of stalls adapted to serve as sound trapping chambers, the outer ends of the baffles being of enlarged cross-section whereby to proportionately restrict the entrance of each of said stalls, the baffles on one wall of said casing being in staggered relation to the baffles on the opposite wall.

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