Aug. 24, 1954 J. J. LEFFLER 2,687,127

INSULATED FLUE

Filed June 18, 1951

Fig. 1.

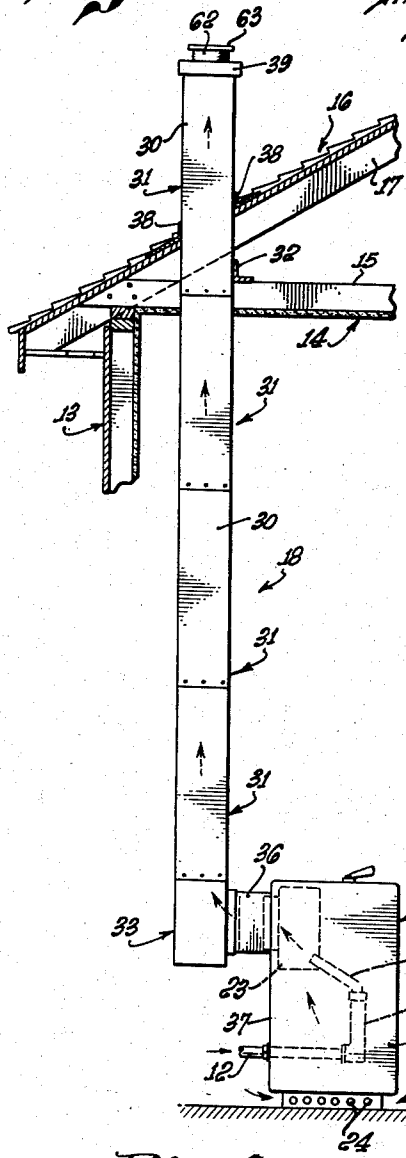


Fig. 2.

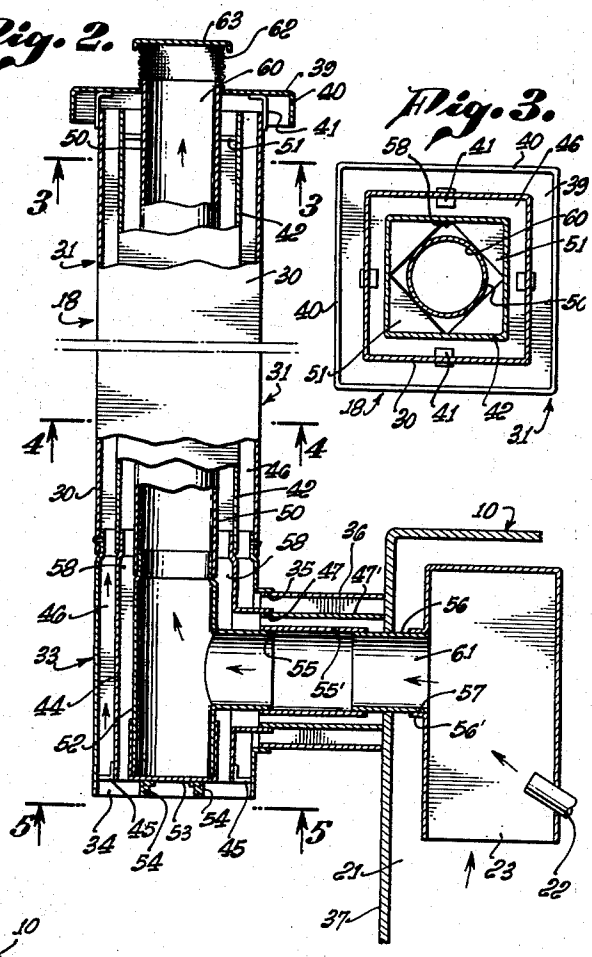


Fig. 3.

Fig. 5.

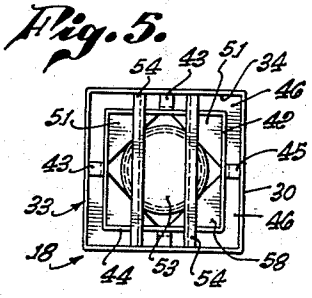
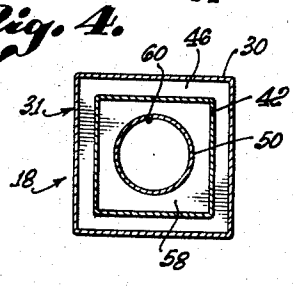


Fig. 4.



JOHN J. LEFFLER,
INVENTOR.

HUEBNER, BEEHLER, WORREL & HERZIG,
BY
Vernon D. Beehler

ATTORNEYS.

Patented Aug. 24, 1954

2,687,127

UNITED STATES PATENT OFFICE

2,687,127

INSULATED FLUE

John J. Leffler, Los Angeles, Calif., assignor, by mesne assignments, to John R. Davidson, Los Angeles, Calif.

Application June 18, 1951, Serial No. 232,227

7 Claims. (Cl. 126—307)

1

The invention relates to flues for burner units and especially a flue insulated by means of circulating air passages capable of impeding the flow of heat outwardly so that the flue can be safely installed within the wall of a building structure. The flue structure of the invention is especially well adapted to oil and gas burning units located within the buildings for such purposes as incineration and heating.

Various structures have been resorted to for carrying combustion gases upwardly within building structures such, for example, as solid transite, cementitious material having insulating properties, asbestos lined flues, and on some occasions multiple wall flues constructed either for the purpose of providing a dead air space or perhaps a recirculating air space. Flues of this kind have either been unsafe where inside flue temperatures have been in the high range, expensive to install because of their size or the length of flue sections, or so big in overall dimension that they could not be contained within a building wall and when located outside present an unsightly appearance.

Flues of the type heretofore employed have frequently been objectionable because of sooting at the top or, in the case of recirculating air chambers, have been so constructed that the interior could not be raised to a sufficient temperature to induce the necessary amount of recirculation to assure a proper draft and proper insulation.

It is therefore among the objects of the invention to provide a new and improved multiple wall flue structure which is efficient in its operation and which at the same time is safe to install within a building structure under all circumstances.

Another object of the invention is to provide a new and improved multiple wall flue structure which is relatively light in weight, which can be constructed of inexpensive materials and which can be fabricated in a size sufficiently small to be readily adapted for installation inside building structures.

Another object of the invention is to provide a new and improved multiple wall flue structure which embodies a substantially maximum degree of safety in that the hazard of splitting of the flue passage is eliminated and wherein the multiple wall construction provides a sufficient free circulation of air outside the heated flue passage, which circulation is enhanced as the temperature of the flue rises so that a sufficient degree of insulation is provided under all circumstances.

2

Also included among the objects of the invention is to provide a new and improved multiple wall flue construction which can be fabricated of inexpensive materials and which can be assembled either inside or outside a building structure, whether newly constructed or of old construction, at a minimum of expense.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is an elevational view of the multiple wall flue construction showing a typical installation of the flue construction in a section of building structure and connected to a typical burner unit.

Figure 2 is a vertical view partially in section and foreshortened showing the multiple wall flue constructions.

Figure 3 is a cross-sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 2.

Figure 5 is a bottom view taken on the line 5—5 of Figure 2.

Although the multiple wall flue construction forming the subject matter of the invention may be considered as a multiple purpose device suited to a great variety of burner units, it has been found particularly effective for use with incinerator units which burn at times at an appreciably high temperature and which at other times may burn at a relatively low temperature, these units being located inside the building structure such as dwellings. Inasmuch as many such units are installed after the initial construction of the building, it is incumbent to provide a flue construction inconspicuous in its appearance so that after installation there will be no unsightly protuberance within the building. At the same time the construction need be of such character that it can be installed with equal facility in a newly constructed building.

As shown in the drawings a burner unit 10 rests upon a building floor 11 and is adapted to be connected to a gas supply 12. The building is suggested by the representation of an outer building wall 13, a ceiling 14 supported by beams 15, and a roof 16 supported by rafters 17. A multiple wall flue construction generally indicated by the reference character 18 is shown con-

nected at the bottom to the burner unit 10 and extending upwardly within the building through the ceiling 14 and the roof 16.

To understand the operation of the flue construction, reference is made again to Figure 1 and also to Figure 2 wherein the burner unit 10 is shown as being provided with a combustion chamber 20 located within a heated space 21. The combustion chamber vents through a combustion vent pipe 22 into a flue chamber 23, whereas the heated space 21 is not vented. Draft holes 24 are provided for the admission of air into the heated space and the combustion chamber.

The multiple wall flue construction comprises an exterior sheet metal wall 30 which may be most advantageously built in sections 31 of substantially equal length. Inasmuch as these sections are constructed of relatively thin sheet metal material, joints can be made by diagonally splitting the upper ends of each section and pressing the lower ends of the next higher section over the split upper end of the lower section after which the two may be fastened together by screws or other appropriate securing means.

Some of the exterior wall sections may be attached to the building as, for example, by means of an angle 32 shown resting on the beam 15. As shown particularly in Figures 3, 4 and 5, the exterior wall sections 30 are square in cross section and in practice are frequently made about ten inches by ten inches. Twenty-six gauge sheet metal material may be used satisfactorily and the exterior is preferably painted.

At the lower end there may be provided a T 33 having an opening 34 at the bottom and a flanged opening 35 at one side. Use of a T at the bottom provides, if desired, a means for supporting the multiple wall flue. A joint or nipple 36 closes the flanged opening 35 and extends tightly against a rear wall 37 of the burner unit 10. The uppermost exterior wall section 30 is shown extending through the roof 16 and surrounded by a conventional flashing 38 so as to seal the hole through which the multiple wall flue extends.

At the top there is preferably provided a downdraft diverter cap or cowl cap 39 having downwardly turned edges 40 overlying the upper ends of the uppermost exterior wall section. Brackets 41 secure the cap to the exterior wall section.

Inside the exterior wall sections is an intermediate wall comprising sheet metal wall sections 42 joined one with another in the same fashion as described for the exterior wall sections. The intermediate wall sections are also square and preferably about eight inches by eight inches. The intermediate wall sections are spaced from the exterior wall sections by spacers 43 which may be spot welded to the exterior wall sections.

An intermediate T section 44 may be provided at the bottom of the intermediate wall and supported by angle supports 45 which in turn engage the exterior T section 33.

The intermediate wall provides a draft passage 46 open at the bottom and at the top for the free circulation of air from the bottom to the top of the multiple wall flue. A lateral opening 47 is closed by interposing a nipple 47' the free end of which abuts tightly against the rear wall 37 of the burner unit 10.

Inside the intermediate wall is an innermost wall comprising sheet steel sections 50, these being preferably circular in cross-section as illustrated in Figures 3, 4 and 5. The innermost wall sections are best made of sheet steel having on the inner surface a baked-on enamel. The innermost sections are designed to be telescoped so that the upper sections telescope over the top ends of the next lower section in each case, thereby to avoid the possibility of a leak at the joints.

To space the innermost sections from the intermediate wall there may be provided spacers 51 as illustrated in Figures 3 and 5. At the bottom end of the innermost wall there may be provided a T section 52 having a cap 53 at the bottom closing the bottom. Angle supports 54 are illustrated as extending across the bottom attached at the ends to the outermost T section, thereby forming a support for holding the innermost wall in place. The T section 52 is shown as having a lateral opening 55 joined by a nipple 55' to a section of pipe 56 which in turn joins a flange 56' on the flue chamber 23, the nipple extending through an aperture 57 in the rear wall 37 of the burner unit where the fit is made snug.

The innermost wall provides a draft passage 58 between the outer wall thereof and the inner surface of the intermediate wall. The draft passage 58 is open at the bottom and the top, thereby assuring a clear free flow of cooling air around the exterior of the innermost wall. The innermost wall at the interior thereof provides a flue passage 60 closed at the bottom by the cap 53 but opening through a lateral passage 61 into the flue chamber 23 by means of which products of combustion from the unit are exhausted above the roof. A spark arrester 62 of some conventional manufacture covered by a cap 63 may be employed at the top of the flue passage. A conventional down-draft diverter may also be employed if desired. It should be noted further that the outer draft passage is substantially of the same capacity as the flue passage and that the capacity of the inner draft passage is at only a slightly smaller ratio, being about 75% of the capacity of the flue passage.

In operation when the multipe wall flue construction is used with a burner unit such as the incinerator suggested in the drawings, temperatures generated in the flue at ten inches above the center line of the passage at the side of the T seldom exceed 1480° F., although on occasions should the incinerator unit be loaded with highly combustible materials, the temperature might reach 1960° F. Under the high temperature conditions, temperature at the outer surface of the outermost wall at the same distance above the center line may be about 98° F. and 156° F. sixty-nine inches above the center line, these temperatures being respectively 77° F. and 111° F. under normal conditions with a room temperature of 72.2° F. It will be apparent therefore that even when there are exceedingly high temperatures in the flue, the circulating draft passages will provide sufficient insulation so that the outermost wall has a temperature relatively little above room temperature. Moreover, the heat present in the flue passage when at a relatively low temperature is still sufficient to induce a draft in the inner and outer draft passages because of the fact that the innermost walls conduct heat through the walls to a sufficient degree to set up the draft. As the temperature in the flue rises, the temperatures in the inner and outer draft passages rise, the effect of which is to accelerate the drafts of air in the inner and outer draft passages, thereby improving the insulating effect to the end that the outermost wall never becomes

too hot. The flow of air through the inner and outer draft passages is straight and unimpeded.

On occasions where the innermost wall is of greater diameter the provision of outer walls which maintain the 1'' or more clearance will also assure additionally greater capacity for the draft passages because of increased overall dimension. The proportions shown provide adequate cooling draft for most sizes of installations which contemplate an innermost wall of 6'' or 8'' diameter.

There has thus been shown and described a particularly effective multiple wall flue construction built in a fashion to insure a cooling and insulating draft surrounding the portions of the flue at all times so that the flue construction is entirely safe for use in building structures for all temperatures ordinarily encountered in burning units of the general character of those herein referred to.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A multiple passage flue construction for a burner unit comprising inner, intermediate and outer imperforate sheet metal wall sections of substantially uniform thinness and length respectively secured together and mounted concentrically in spaced relation one within another forming respectively a central flue passage, an inner insulating draft passage and an outer insulating draft passage separate one from another, said outer and intermediate wall sections having adjacent openings at the top and at the bottom in communication with the atmosphere providing top and bottom openings for the outer and inner draft passages, said inner and intermediate wall sections being of heat conducting material, the inner wall section being adapted to open only into the burner unit thereby comprising a hot walled flue passage for said unit and comprising a draft inciter for said draft passages.

2. In an insulated flue construction for a heating and burning unit the combination of a sectioned exterior substantially vertically extending imperforate wall adapted to be secured to a building structure with a top thereof extending above said structure and a bottom adjacent said unit, said exterior wall having a laterally extending portion adjacent the bottom adapted to abut the unit, a sectioned imperforate intermediate sheet metal heat conducting wall of cross section smaller than the exterior wall and having a laterally extending portion at the bottom and suspended within the exterior wall leaving a clear space therearound forming a continuous insulating draft passage open to the atmosphere at the top and bottom and substantially closed adjacent said unit, and an innermost sheet metal heat conducting wall of substantially the same length as the exterior wall and the intermediate wall, said innermost wall having a laterally extending portion at the bottom adapted to open into said unit and being suspended within the intermediate wall leaving a clear space therearound forming a continuous inner insulating draft passage open to the atmosphere at the top and bottom, said innermost wall being closed at the bottom and forming at the interior thereof a flue passage adapted to communicate between the unit and the top of the flue.

3. In an insulated flue construction for heating and burning units the combination of a sectioned substantially vertically extending sheet metal exterior wall adapted to be secured to a building structure with a top of the flue construction extending above the building structure and a bottom of the flue construction adapted to be located adjacent one of said units, a T section at the bottom having one laterally extending arm adjacent the bottom adapted to abut the unit and another downwardly extending arm, said T section being adapted to be supported by the building structure, a sectioned sheet metal intermediate wall smaller in cross section than the exterior wall, a T section at the bottom of the intermediate wall having one laterally extending arm at the bottom and another downwardly extending arm supported concentrically within the exterior wall at the bottom leaving a clear space therearound forming a continuous insulating draft passage open at the top and bottom and substantially closed adjacent said unit, and an innermost wall, a T section at the bottom of said innermost wall including a laterally extending section adapted to open into said unit and being mounted concentrically upon and within the intermediate wall leaving a clear space therearound forming a continuous inner insulating draft passage open at the top and bottom and adapted to be substantially closed adjacent said unit, said innermost wall being closed at the bottom and forming at the interior thereof a flue passage closed at the bottom adjacent the draft passage openings and adapted to communicate between said unit and the top of the flue construction.

4. In an insulated flue construction for heating and burning units the combination of a substantially vertically extending sheet metal exterior wall of sections secured together and of square cross section adapted to be secured to a building structure with a top of the flue construction adapted to extend above the building structure and a bottom of the flue construction adapted to be located adjacent one of said units, said exterior wall having a laterally extending section adjacent the bottom adapted to abut the unit, a sheet metal intermediate wall of sections secured together and of square cross section smaller than the exterior wall and having a laterally extending section at the bottom, said intermediate wall being mounted within the exterior wall leaving a clear space therearound forming a continuous insulating draft passage open at the top and bottom and substantially closed adjacent said unit, and an innermost wall of sheet metal sections secured together and of circular cross section having an inside baked-on vitreous enamel surface, said innermost wall having a laterally extending section at the bottom opening into said unit and being suspended within the intermediate wall leaving a clear space therearound forming a continuous inner insulating draft passage of lesser capacity than the first identified draft passage and open at the bottom and adapted to be substantially closed adjacent said unit, said innermost wall being closed at the bottom and forming at the interior thereof a flue passage from the unit substantially equal in capacity to said first identified draft passage.

5. In an insulated flue construction for heating and burning units the combination of a sec-

tioned imperforate outermost sheet metal wall adapted to be secured to a building structure, said outermost wall having a laterally extending portion adjacent the bottom adapted to abut the unit, and an innermost sheet metal wall of heat conducting material and of substantially the same thickness and of cross section smaller than the outermost wall and having a heat resistant inner surface, said innermost wall having substantially the same length as the outermost wall and having a laterally extending portion at the bottom adapted to open into said unit and being suspended within the outermost wall leaving a clear space therearound forming a continuous draft passage open to the atmosphere at the top and the bottom and adapted to be substantially closed adjacent said unit, said innermost wall being closed at the bottom and forming at the interior thereof a flue passage closed at the bottom and adapted to communicate between the unit and the top of the flue.

6. A multiple passage flue construction for a burner unit having a flue comprising inner, intermediate and outer heat conducting sheet metal T sections of substantially uniform thickness, said T sections having two oppositely extending legs disposed vertically and concentrically one within the other providing vertical outer and intermediate insulating draft passages and a central flue passage in said legs, the remaining legs of said sections extending laterally and concentrically one within the other providing outer and intermediate insulating lateral passages and a central lateral passage, uppermost and lowermost ends of the vertically extending insulating draft passages being at substantially the same level and opening directly to the atmosphere, said central flue passage being open at the top at the same level as said draft passages and closed at the bottom, the outer and intermediate of said legs which extend laterally being adapted to have an abutting relation to said unit whereby said insulating lateral passages are adapted to be closed at the ends adjacent the unit, said innermost leg which extends laterally being adapted for connection to the flue of said unit whereby said lateral central passage comprises a flue passage communicating with the vertical central flue passage.

7. A multiple passage flue construction for a burner unit and flue therefor comprising a composite T section having a laterally extending arm adapted to be directed toward the unit, a downwardly extending arm on the T section, said T section being adapted to be supported by a building structure, and an upwardly extending arm in alignment with said last identified arm, said composite T section comprising a sheet metal exterior section square in shape throughout the downwardly and upwardly extending arms and annular in shape throughout the laterally extending arm, said laterally extending arm being adapted to abut said unit, a heat conducting sheet metal intermediate section coextensive with the exterior section having a square shape throughout the downwardly and upwardly extending arms located concentrically within the exterior section leaving a clear space therearound forming a continuous insulating draft passage having an opening at the top and an opening at the bottom, both adapted to communicate directly with the atmosphere, said intermediate section having an annular laterally extending arm concentrically disposed within the corresponding arm of the exterior section and adapted to extend to a location adjacent said unit and to form a substantially closed passage, and an innermost section of heat-resistant and heat conducting sheet material coextensive with the exterior and intermediate section and having an annular form located concentrically within the intermediate section leaving a clear space around the downwardly and upwardly extending arms, said innermost section forming a continuous inner insulating draft passage with the intermediate section having an opening at the top and an opening at the bottom at respectively the same level as said first identified openings, said innermost section including an annular laterally extending arm concentrically disposed within the laterally extending arm of the intermediate section, said innermost laterally extending arm being adapted to communicate with the flue of the burner unit and forming with the surrounding laterally extending arm of the intermediate section a closed intermediate passage, the downwardly extending arm of said innermost section having a closed bottom.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
61,387	Beeuwkes	Jan. 22, 1867
196,698	Peck	Oct. 30, 1877
390,438	Bradbeer	Oct. 2, 1888
717,592	Melsha	Jan. 6, 1903
963,402	Spaulding	July 5, 1910
1,615,909	Nance	Feb. 1, 1927
1,890,930	Blackmore	Dec. 13, 1932
1,988,642	Wolbers	Jan. 22, 1935
2,076,210	Stadtfeld	Apr. 6, 1937
2,275,902	Hasenburger et al.	Mar. 10, 1942
2,277,436	Howle	Mar. 24, 1942
2,423,656	Messer	July 8, 1947
2,475,635	Parsons	July 12, 1949
2,512,116	Siebels	June 20, 1950
2,634,720	Thulman	Apr. 14, 1953

FOREIGN PATENTS

Number	Country	Date
248,410	Switzerland	Feb. 2, 1948