This invention relates to fireplace construction generally and more particularly to a prefabricated fireplace construction for mounting on building walls.

Heretofore, lightweight prefabricated fireplaces formed substantially entirely of sheet metal material have been devised, however, under severe fire conditions within the fireplace, the external temperature of such devices often reached a dangerous level which prevented mounting against combustibles such as wooden studs and beams in building walls.

The principal objects of the present invention are: to provide a lightweight prefabricated fireplace construction for mounting on building walls and formed substantially entirely of sheet metal such as aluminum coated steel or stainless steel which construction may be located in contact or at zero clearance against combustible surfaces without fire danger; to provide such a fireplace construction wherein the exterior surface of the entire device is relatively cool to the touch although high energy fuels such as logs, charcoal, flashing grease, or the like are burning therewith; to provide such a device having an air flow pattern resulting in cooling outside air being directed over heated interior surfaces to substantially eliminate heat transfer to the exterior surfaces of the device; to provide structural mounting strips extending outwardly from exterior fireplace wall surfaces and having staggered slots therein for inducing air circulation in the area of contact with structural wall combustibles; to provide such a device having a sliding door damper with a flow directing lip for creating an air flow which urges air to exit and also extend the rear of the fireplace and out the flue to prevent the entry of smoke into a room and help cool the top wall of the fireplace; to provide such a device having a decorative hood with ventilating openings therethrough for draining heated air collected therein; to provide such a fireplace construction wherein outside air flows across the entire bottom wall of the fireplace for cooling and to reduce the effect of high temperature corrosion; to provide such an apparatus having a coaxial air conduit around the flue pipe with a lower mouth spaced above the hottest portion of a fireplace smoke chamber to induce rapid air flow and mixing with cool air while exhausting same from the area; to provide such a construction having baffles for reducing temperature in areas where “hot spots” occur; to provide such a fireplace construction having a unique flue cap which induces increased flow from coaxial outer hot air conduits due to out-flow of hot gases from the central flue; to provide such a fireplace construction adapted to support a rotatable spit for safely barbecuing meats although grease fires may be induced therewithin, and to provide such a construction wherein the smoke chamber also acts as a smoke box adapted for smoking meats or the like.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIGURE 1 is a perspective view of a prefabricated fireplace construction embodying this invention with parts broken away to reveal the inner construction thereof.

FIGURE 2 is a vertical cross-sectional view through the fireplace construction showing same mounted in a building wall opening.

FIGURE 3 is a cross-sectional view through the fireplace construction taken on the line 3-3 of FIGURE 2 particularly showing the relationship of parts therewithin.

FIGURE 4 is a cross-sectional view through the fireplace construction taken on the line 4-4 of FIGURE 2 particularly showing cooling passageways about the rear portion of the fireplace.

FIGURE 5 is a cross-sectional view through the fireplace construction taken on the line 5-5 of FIGURE 2 particularly showing supporting members for the rear portion of the fireplace bottom wall.

FIGURE 6 is a fragmentary vertical cross-sectional view through the fireplace construction on an enlarged scale particularly showing details of the cooling draft inducing damper construction.

Referring to the drawings in more detail:

The reference numeral 1 generally indicates a fireplace construction illustrated as mounted in an opening 2 formed in a building wall 3 by conventional flammable structural members such as wooden boxing studs 4 abutting against wall studs 5. It is to be understood that the opening 2 may take the form of a common, double-hung window opening (not shown) and the building wall 3 may be an outside or inside wall without departing from the scope of this invention. The wall 3 has a finished interior surface 6 and an exterior surface 7 illustrated herein as having exterior wooden shingles 8.

The fireplace construction 1 is mounted on and supported by the building wall 3 and extends through the opening 2 as best illustrated in FIGURE 2. The fireplace construction 1 has opposed spaced sheet metal side walls 9, a sheet metal bottom wall 10, a sheet metal back wall 11, and a sheet metal top wall 12 together forming a solid fuel burning fireplace 13. The walls 9, 10, 11 and 12 are preferably of aluminum coated steel sheets for strength without excessive weight and for resistance to corrosion. The fireplace 13 extends slightly forward past the building wall interior surface 6 and is there provided with decorative finishing members consisting of a hood 14, a hearth 15, hearth supporting chains 16, and fireplace framing members 17 which act as front closure members for cooling air passageways described hereinafter. The hood 14 is located adjacent the fireplace top wall 12 and extends forwardly therefrom. The hood 14 has openings 15 at opposite ends thereof and a ventilating slot 19 extending across the front thereof for draining any heated air flowing therein from the fireplace 13.

The fireplace 13 has a forward portion designated 20 with a normally open entranceway 21. The fireplace forward portion 20 is surrounded by the boxing studs 4 and opens in the usual manner toward or inwardly of the interior surface 6 of the building wall 3. The fireplace 13 includes a rear portion designated 22 which extends rearwardly of the building wall exterior surface 7.

The fireplace top wall 12 is spaced forwardly from the fireplace back wall 11 forming therewith a fireplace draft opening 23 in the fireplace rear portion 22. Sheet metal walls 24, 25, 26 and 27 preferably of aluminum coated steel form a smoke chamber 28 extending upwardly from the fireplace rear portion 22 and having a lower part 29 communicating with the fireplace draft opening 23. The smoke chamber 28 also has an upper part 30 forming an inverted high temperature funnel portion 31.

An upwardly extending inner flue pipe 32 preferably of 430 stainless steel sheet is positioned rearwardly of the building wall exterior surface 7 and has an upper exhaust end 33 and a lower end 34. The flue pipe lower end 34 forms a communicating junction 35 with the smoke chamber funnel portion 31 for draining smoke and combustion fumes therefrom.
An upwardly extending sheet metal secondary sleeve 36 preferably of aluminum coated steel surrounds and is spaced from the flue pipe 32 and forms a coaxial secondary conduit 37 therewith. Suitable bracing members 38 support the secondary sleeve 36 and maintain same in fixed relation with respect to the flue pipe 32. The secondary sleeve 36 has an upper exhaust end 39 and a lower mouth 40, said mouth being spaced a short distance above the smoke chamber funnel portion 31 for receiving heated air generated on the exterior thereof.

Secondary sheet metal walls 41, 42, 43 and 44 preferably of aluminum coated steel are spaced outwardly of the firebox side walls and top wall and bottom wall at said firebox portion 20 forming forward portion air current passageways 45, 46, 47 and 48 therebetweeen.

The framing members 17 form front closing walls extending between the firebox walls 9 and secondary walls 41 and 43 to prevent forward leakage from the passageways 45 and 47. A depending lip 80 extending from the forward edge of the bottom wall 10 prevents air flow forwardly from the passageway 48. The secondary wall 42 has a downwardly sloping forward portion 51 which terminates adjacent the forward edge of the firebox top wall 12 to prevent forward flow from the air passageway 46. Thus, the passageways 45, 46, 47 and 48 communicate with each other whereby air is free to flow completely around the firebox walls at the forward portion 20. Outer sheet metal walls 52, 53, 54 and 55 preferably of aluminum coated steel are spaced outwardly of the secondary walls 41, 42, 43 and 44 and suitable heat insulating material such as glass fiber blanket 56 is contained therebetweeen to further reduce outward heat transfer from the firebox.

Suitable elongated angles 57 have one leg 58 respectively secured, in the illustrated example by spot welding to the exterior surface of the outer walls 52, 53, 54 and 55 in spaced relation and extending longitudinally of the firebox 13. The other leg 59 of each angle 57 extends outwardly from the surface of the outer walls and has spaced openings or slots 60 cut thereinto at respectively staggered positions on respective angles 57. The legs 59 contact the opening forming members, in the illustrated example being studs 4, supporting the fireplace construction while permitting air circulation between the outer walls 52, 53, 54 and 55 and the boxing studs 4. Additional air circulation is permitted due to the spaced slots 60 and said slots are staggered to prevent the accidental insertion during fireplace installation (as shown in the example shown), across the angles 57 which would block free air flow. Thus, the angles 57 act as spacer members for maintaining the outer walls 52 out of direct contact with the combustible studs 4 but permit free air circulation therebetweeen.

Upwardly extending sheet metal false chimney side walls 61, front wall 62 and rear wall 63 all preferably of aluminum coated steel form an outer shell 64 about the firebox rear portion 22 and the smoke chamber 28. The outer shell has lower edges 63 and is spaced outwardly from the firebox rear portion 22 and smoke chamber 28 forming therewith rear portion air current passageways 66.

The forward portion air current passageways 45 and 47 communicate with the rear portion air current passageways 66 through structural strips 67 perforated with suitable ventilating holes 68 spaced therealong. The air current passageways 46 and 48 open rearwardly into the rear portion air current passageways at 69 and 70 respectively.

The lower edges 65 form intake draft openings 71 for the rear portion air current passageways 66, the draft openings 71 being located rearwardly of the building wall exterior surface 7 and spaced above the ground for providing a free flow of air adjacent the atmosphere near the building wall exterior surface.

The outer shell 64 has inwardly sloping walls 72 near the upper terminus 73 thereof forming an inverted funnel portion 74. The funnel portion 74 is spaced generally upwardly from the smoke chamber funnel portion 31 and substantially surrounds the secondary sleeve mouth 40. Heat baffles 75 and 76 are respectively mounted on the false chimney walls 62 and 63 generally between the respective funnels 74, 31 and 72 for limiting the external temperature of the funnel portion 74. The heat baffles 75 and 76 are supported and spaced inwardly of the respective false chimney walls 62 and 63 by means of suitable spacing brackets 77 and the side and bottom edges of the heat baffles 75, 76 and 79 are open to permit free flow of air adjacent the respective false chimney walls 62 and 63 but reduce radiant heat transfer therethrough.

An upwardly extending sheet metal outer or chimney sleeve 78 preferably of aluminum coated steel surrounds the secondary sleeve 36 and is spaced therefrom by means of bracing members 79 forming an outer conduit 80 therebetween. In the illustrated example, the outer or chimney sleeve 78 is of rectangular construction and has an upper exhaust end 81 and a lower intake end 82. The intake end 82 communicates with the outer shell funnel portion 74 for receiving heated air therefrom.

An adjustable horizontally extending damper plate 83 is located between the firebox 13. The damper plate 83 rests on guides 84 secured to the firebox side walls 9 for selectively slidable supporting the damper plate 83 over the draft opening 23. The damper plate 83 is generally parallel to and spaced from the firebox top wall forming an air passageway 85 having one end 86 communicating with the interior of the firebox forward portion 20 and the other end 87 communicating with the smoke chamber 28. The damper plate 83 has a rear deflector lip 88 extending upwardly from the rear edge 89 thereof within the draft opening 23. The deflector lip 88, due to the flow of gases therepast from the firebox, induces a partial vacuum in the passageway 85 which causes an increased air flow through the passageway 85 for cooling purposes as hereinafter described. A suitable handle or knob 90 is secured to the damper plate 83 to aid in sliding the damper plate into a desired position with respect to the draft opening 23.

Elongated horizontally extending supporting guides 91 and 92 are secured at different elevations on the firebox side walls for supporting suitable trays (not shown) for cooking in the usual manner. In the illustrated example, a spit 93 is rotatably mounted on and extends between the firebox side walls 9 and a spit motor is provided encased in a separate wooden box 94, also rotatably supporting the spit 93 at a suitable rate for cooking. The spit motor is powered through suitable electrical wires 95 leading to an electrical junction box 96 attached to the outer shell and shielded against moisture. A grate 97 is provided for resting on the bottom wall 10 at the rear portion 22 for supporting logs 98, charcoal (not shown) or the like, spaced above the bottom wall 10 for burning efficiency. A removable, open back, warming pan 99 rests on the bottom wall 10 in the forward portion 20 and is particularly adapted for receiving a coffee pot (not shown) or the like for heating.

The bottom wall 10 at the rear portion 22 of the firebox is supported by elongated bridging angles or supports 100 to prevent deflection under heat load and yet permit outside air to travel across on the underside thereof, and on the underside of the warming pan 99. A preferably 430 stainless steel baffle plate 101 is spaced forwardly of the firebox back wall 11 creating a conduit 102 which openly communicates with the underside of the bottom wall 10 at 103 and with the bottom exterior through spaced ventilating holes 104. The conduit 102 opens into the smoke chamber 28 at 104.

An opening 109 is provided in the smoke chamber wall 24 and a suitable door 110 is hingedly secured adjacent thereto to provide access into the smoke chamber 28. A latch 111 locks the door 110 in closed position. A panel
112 making up a portion of the rear exterior wall 63 is removable by sliding upwardly and outwardly out of engagement with retainer members 113 to provide access to the door 110. Rod retaining members 114 are secured to the walls forming the funnel portion 31 and have spaced receiving depressions 115 for supporting a rod 116 in several positions across the smoke chamber 28. A hook 117 or hooks depend from the rod 116 for receiving a cut of meat 118 for smoking. A pan 119 rests on a deflector plate 119 extending into the smoke chamber 28 from near the bottom thereof for collecting grease drippings from the meat 118. It is noted that the meat 118 may be hung to drip directly into the fire to increase smoke as desired. Flash fires due to grease are safely contained. The deflector plate 119 deflects hot gases away from the portion of the fireplace facing the exterior surface 7.

A flue cap 120 rests on and is preferably spot welded to the upper exhaust end 81 of the outer sleeve 78 and includes upwardly sloping side portions 121 which terminate in a flue opening 122 substantially coinciding with the flue pipe upper exhaust end 33. The side portions 121 are spaced from the upper terminals of both the flue pipe 32 and secondary sleeve 36 to permit gas to flow toward the flue opening 122 from the secondary sleeve conduit 37 and outer conduit 80. The side portions 121 are perforated by spaced openings 123 which permit part of the gases exiting from the conduits 37 and 80 to escape therefrom but force a major part thereof to be deflected toward the flue opening 122. Suitable spacing clips 124 secured to the cap 120 act as a reminder that the flue pipe 33 must be assembled within the secondary sleeve 36 to complete the fireplace construction.

In operation, a fire in the firebox 13 causes the production of hot gases and smoke which rise toward the draft opening 23 as indicated by the arrows 125. The hot gases induce a partial vacuum at the end 87 of the passageway 85 causing relatively cooler air from the forward portion 29 of the firebox to flow through the passageway 85 for cooling the firebox top wall. The deflector lip 88 by increasing the vacuum at 87 aids the rearward flow of relatively cool air into the passageway 85. A deflector lip 126 is secured at the rear thereof to the central underside of the top wall 22 and extends forwardward and slightly downwardly to the front of the firebox where it turns upwardly into the hood 14. A stop 127 prevents the damper plate 83 from being pulled into draft open position to the extent that the deflector lip 88 closes the end 87 of the passageway 85. The smoke and hot gases rise in the smoke chamber 28 and a portion thereof passes over the meat 118. The hot gases and smoke collect in the smoke chamber funnel portion 31 which thereby becomes the fireplace portion with the highest heat potential outside of the area closely adjacent to the fire. The hot gases in the funnel portion 31 are drained into the flue pipe as indicated by the arrows at 128 and the gases exhaust with considerable velocity through the flue opening 122. A suitable screen 128' permits air flow but prevents accidental insertion of a hand therepast for safety against burns.

A fire in the firebox 13 produces heating of the firebox walls which in turn heat the air in the forward portion air current passageways 45, 46, 47 and 48 and the rear portion air current passageways 66. The air therein tends to flow generally upwardly where permitted in continuous streams as indicated by the arrows 129 to cool the exterior surface of the smoke chamber 28. It is noted that cool outside air enters from the draft openings 71 and a portion thereof enters into the firebox conduits 102 and 103 and through the openings 103' which then exits into the smoke chamber at 104 after cooling the baffle plate 104. The relatively cool air indicated by the arrows 129 flows along the smoke chamber funnel portion 31 where it picks up a substantial amount of heat by cooling the smoke chamber in this area. The hot flue pipe 33 induces a relatively high velocity upward stream in the conduit 37 which draws the heated air adjacent the smoke chamber funnel portion 31 into the mouth 40 with a considerable suction force. This prevents the high temperature air at the chamber funnel portion 31 from contacting the outer or false chimney walls where it might create a dangerous temperature condition. The balance of the air flows upwardly between the secondary sleeve 36 and the outer sleeve 78 as indicated by the arrows 130 and exits adjacent the side portions 121 of the flue cap 120. The high velocity draft in the flue pipe 33 causes a partial vacuum to form beneath the side portions 121 of the flue cap which increases the draft or suction in the conduits 37 and 80. Note that all pathways of flow in the chimney section are upwardly.

The invention above disclosed permits a fireplace construction substantially entirely of sheet metal except for small amounts of blanket insulation to be mounted in contact with combustible portions of a building wall without any undesirable heating of such portions even during abnormally high fire conditions in the firebox which may reach above 2000° F. for extended periods, for example, during a grease burn out with a charcoal fire.

The unique chimney and firebox construction provides high cooling draft without the need for forced draft devices and substantially independent of the chimney height thereof above the firebox. Cooling air enters the bottom of the construction for maximum cooling efficiency and the hotter the fire, the greater the draft. The fireplace construction, unlike those heretofore, merits approval by the most conservative of fire underwriter agencies. The fireplace construction permits grease-producing barbecuing from inside a building with safety and it has been demonstrated that if desired, the hearth may be safely removed so long as the installation is at least twelve inches above the floor. This device requires no inside floor space, is easily and quickly assembled in position, may be used, for example, as a barbecue in summer due to extremely rapid withdrawal of heat produced. It is to be understood that while one form of this invention has been illustrated and described, it is not to be limited to the specific form or arrangement of parts herein described and shown except as far as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. A prefabricated fireplace construction comprising:
   (a) walls forming a solid fuel burning flue means forming a draft opening in said firebox, sheet metal walls forming a smoke chamber extending upwardly from said firebox and having a lower part communicating with said firebox draft opening and an upper part,
   (b) an upwardly extending flue pipe having an upper exhaust end and a lower end, said pipe lower end being of smaller cross-sectional area than said smoke chamber upper part and forming a communicating junction with said smoke chamber upper part for draining smoke and combustion fumes therefrom,
   (c) an upwardly extending secondary sleeve surrounding and spaced from said flue pipe and forming a co-axial secondary conduit therewith, said secondary sleeve having an upper exhaust end and a lower mouth, said secondary sleeve mouth opening exteriorly of said smoke chamber adjacent said smoke chamber upper part for receiving heated air generated on the exterior of said smoke chamber upper part,
   (d) walls forming an outer shell spaced outwardly from said firebox and said smoke chamber forming therewith air current passageways, means forming lower intake draft openings in said outer shell and communicating with said air current passageways,
   (e) said outer shell having an upper part spaced generally upwardly from said smoke chamber upper part
and substantially surrounding said secondary sleeve mouth, and

(f) an upwardly extending outer sleeve surrounding said secondary sleeve and spaced therefrom forming an outer conduit therebetween, said outer sleeve having an upper exhaust end and a lower intake end, said outer sleeve intake end communicating with said outer shell upper part for receiving heated air from said air current passageways,

(g) whereby said outer shell and outer sleeve remain relatively cool during severe fire conditions in said firebox.

2. The fireplace construction of claim 1 including means providing upwardly extending sheet metal heat baffles mounted on said outer shell walls adjacent said outer sleeve mouth and spaced between said outer shell walls and said smoke chamber upper part for limiting heat transfer to said outer shell.

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