Jan. 31, 1967 S. J. HENDRICKS 3,301,249

PRECAST FIREPLACE, METHODS OF MANUFACTURE AND ERECTION

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FIG. 1.

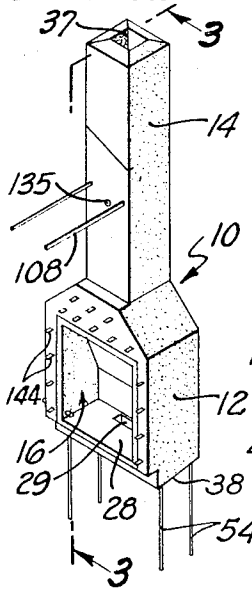


FIG. 2.

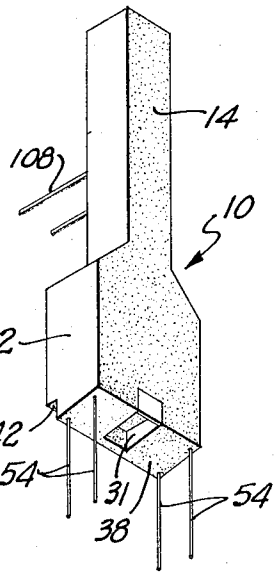


FIG. 3.

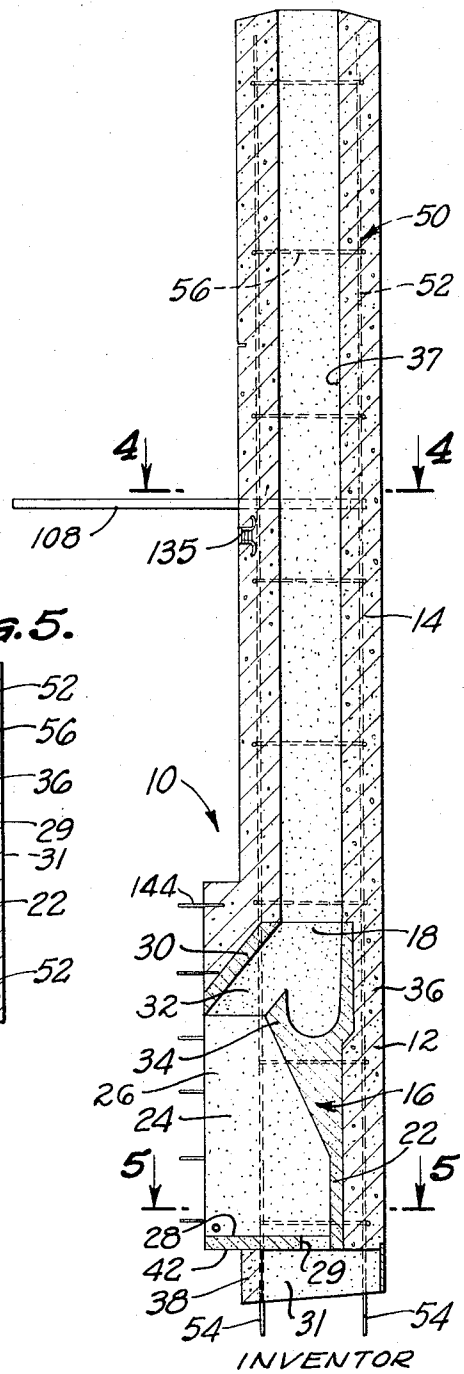


FIG. 4.

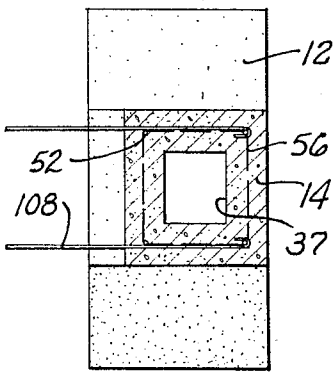


FIG. 5.

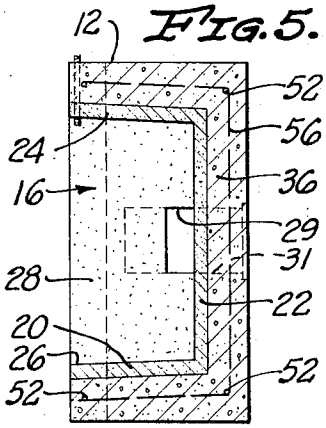


FIG. 6.

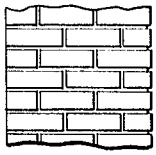
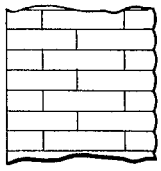


FIG. 7.



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Jan. 31, 1967 S. J. HENDRICKS 3,301,249

PRECAST FIREPLACE, METHODS OF MANUFACTURE AND ERECTION

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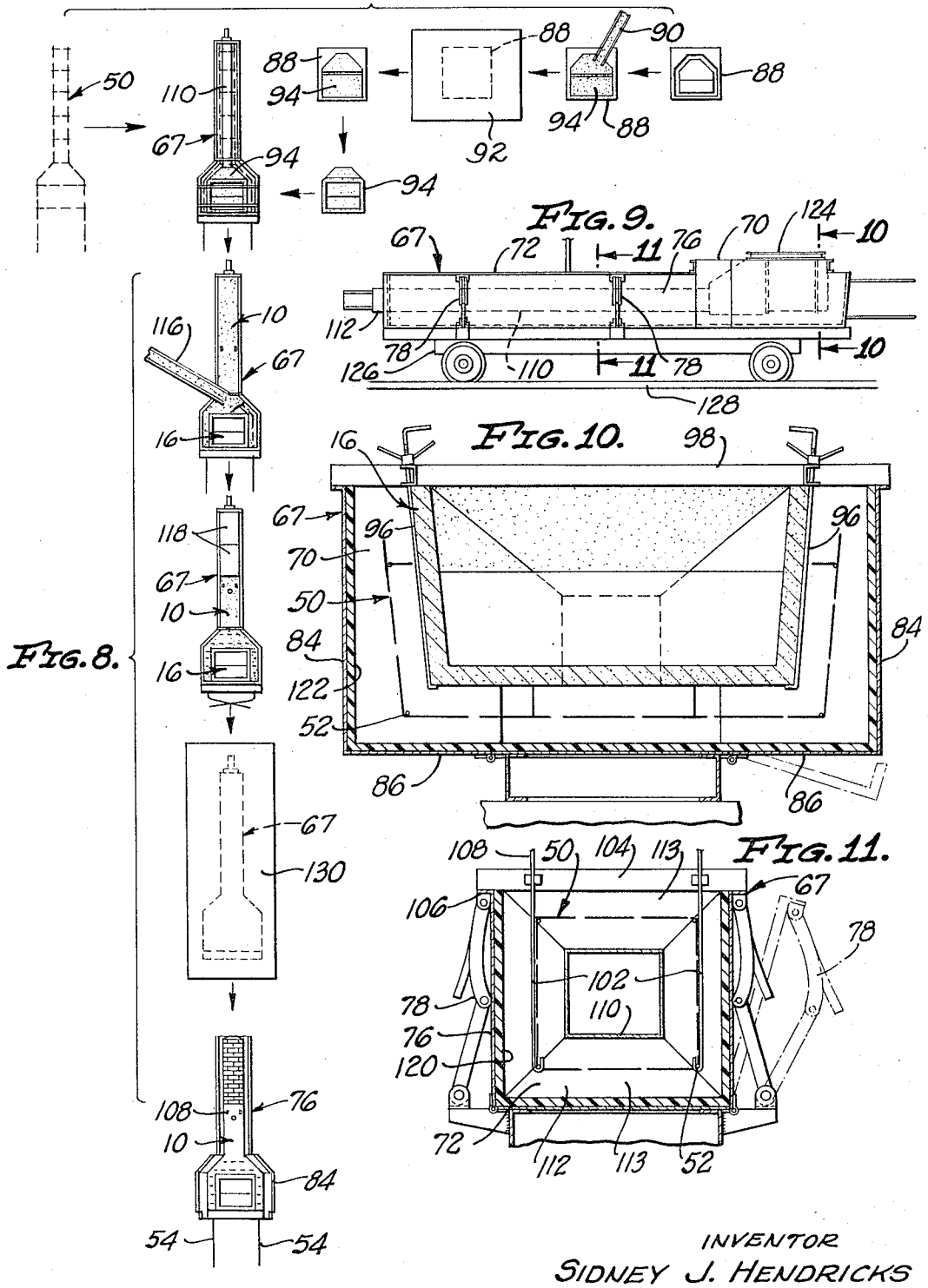

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Jan. 31, 1967 S. J. HENDRICKS 3,301,249

PRECAST FIREPLACE, METHODS OF MANUFACTURE AND ERECTION

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FIG. 12.

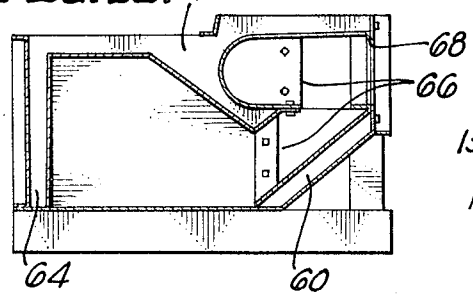


FIG. 13.

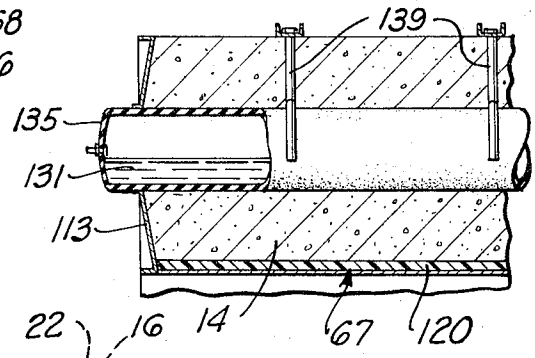


FIG. 14.

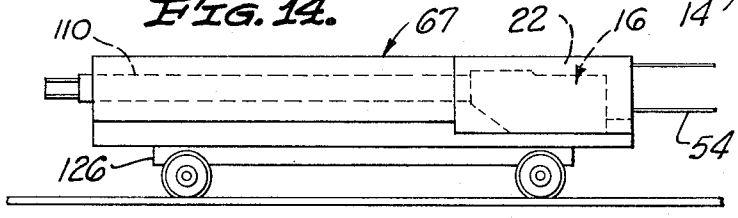


FIG. 15.

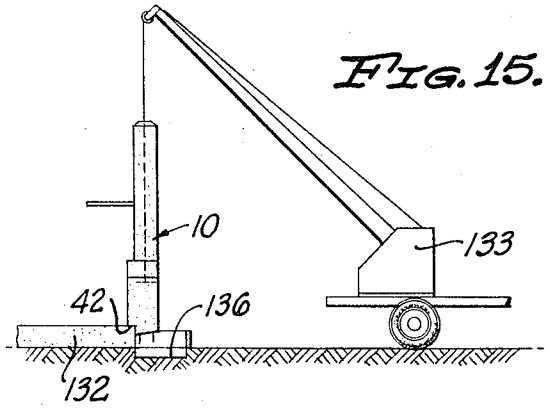


FIG. 16.

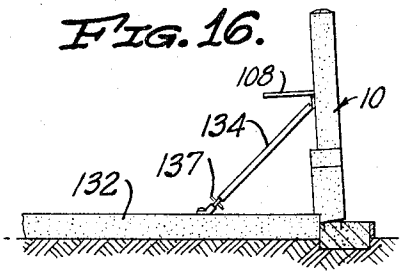


FIG. 17.

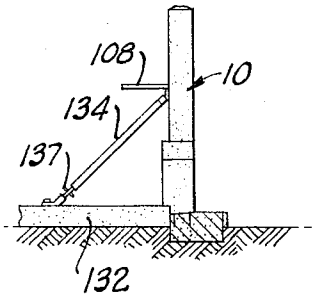
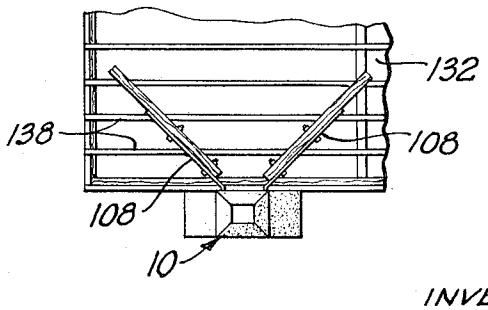


FIG. 18.



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United States Patent Office 3,301,249
Patented Jan. 31, 1967

3,301,249

PRECAST FIREPLACE, METHODS OF MANUFACTURE AND ERECTION

Sidney J. Hendricks, Buena Park, Calif., assignor to Prekast Fireplace Manufacturing Company, La Mirada, Calif., a corporation of California

Filed June 3, 1964, Ser. No. 372,227
6 Claims. (Cl. 126—120)

This invention relates to chimney structures and more particularly to a precast chimney structure and to its method of manufacture and method of erection at the construction site.

Historically, the chimney structure including fireplace and stack has been built of bricks or native stone held together by mortar with each brick or stone being individually handled and placed into position by a mason. It has been estimated that a typical fireplace for a modern home incorporates over 1,200 pieces of some 20 different types of materials, all of which must be delivered to the job site. Three man days or more are normally required for the erection of the chimney structure, which not infrequently will fail to meet the building code specifications because of inferior workmanship or materials.

Too often the subcontractor or mason leaves the job site untidy and labor and time must be spent in clearing the area. It will be appreciated that manually erected chimney structures are not uniform in quality and because of the large amount of labor involved, it is difficult to estimate precisely the cost of building a particular chimney structure at a job site where there is to be an assembly of such a large number of pieces.

It is a principal object of the invention to provide a precast or preformed chimney structure including a fireplace and stack of uniform and superior quality.

It is another object of the invention to provide a precast chimney structure of a novel design or construction which facilitates its erection at the job site.

It is another object of the invention to provide a precast chimney structure including a separately cast firebox having a concrete encasement thereabout completing the fireplace and stack.

It is a further object of the invention to provide a method of erecting a chimney structure which minimizes untidiness at the job site.

It is a further object of the invention to provide a method of erecting a chimney structure which because ter of a few minutes, thus avoiding delays common in building schedules.

It is a still further object of the invention to provide a precast chimney structure and method of erection which permits the installers to move through a tract of homes with assembly-line precision and in a day or a few days position all of the chimney structures of the houses of the tract.

It is a still further object of the invention to provide a method of manufacturing chimney structures, preferably at a single site, using equipment which will assure uniform construction not found in conventional fireplaces.

The precast chimney structure of the invention which includes fireplace and stack is preferably made up of a separately cast firebox having an overhead stack opening and a hearth opening. A concrete encasement placed about the firebox substantially encloses the vertical sides of the firebox excepting the hearth opening, forming a fireplace which is integral with a concrete stack having a flue opening into the stack opening of the firebox. The firebox may be manufactured with a plurality of hearth openings, as, for example, two opposed openings as present in look-through fireplaces located between adjoining rooms. The firebox may also be manufactured for a Swedish angle fireplace of the type having adjoining vertical hearth openings in which instance a corner support rod at the adjoining corners of the two openings is desirably used. The firebox is made of refractory material, preferably a refractory concrete, with its bottom serving as the hearth of the fireplace.

In the preferred embodiment of the chimney structure of the invention, the concrete encasement substantially encloses the firebox except for its openings and provides a hearth support slab adjoining the underside of the firebox. The bottom surface of the hearth supporting slab desirably slopes upwardly away from the hearth side of the structure. Preferably, the hearth support slab is set back from the hearth face of the firebox to provide an overhanging ledge formed of the precast firebox. The foregoing configuration of the hearth support slab as hereinafter described facilitates the erection of the precast chimney structure and makes the erected structure more stable to earthquakes.

In some instances, for example, where the precast chimney structure is being placed against an inside wall, it may be more desirable to use a structure having no hearth supporting slab and here the hearth bottom of the firebox will rest directly on a reinforced base.

In the erection of the chimney structure of the invention, the preformed structure is erected at the building site in an upright position with the overlying ledge at the hearth side at the bottom of the structure resting on a shoring which will ordinarily be the foundation of the house. The erected chimney is preferably slightly tilted towards its hearth side. A concrete footing is poured beneath the tilted chimney structure adjacent the shoring. Thereafter and while the concrete is still sufficiently plastic, the tilted chimney structure is brought into plumb, thus permitting the bottom surface of the lower end of the structure to rest upon the concrete footing and in the instance where the hearth support slab is inclined to impart an inclined surface to the footing. The inclined surface of the footing will slope downwardly towards the shoring. With this arrangement of complementary sloping surfaces of the concrete footing and the bottom surface of the chimney structure, the chimney structure is urged continually towards the house.

The foregoing and other objects of the invention will become more apparent in the following specification and drawings wherein:

FIG. 1 is an isometric view from above, of the inside face of the preferred embodiment of the chimney structure of the invention showing veneer tabs, anchor rods, and some firebox details;

FIG. 2 is an isometric view, from below, of the backside of the chimney structure of FIG. 1, illustrating the location of the ash clean-out pit and longitudinally extending reinforcing rods;

FIG. 3 is a longitudinal sectional view of the chimney structure of FIGS. 1 and 2;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3 showing details of the stack of the chimney structure;

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 3 illustrating details of the bottom portion of the chimney structure;

FIGS. 6 and 7 illustrate various finishes which may be imprinted on the stack of the chimney structure of the invention;

FIG. 8 is a diagrammatic representation of an assembly line showing the manufacture of the precast chimney structure of the invention;

FIG. 9 is a side elevation of a mold mounted on wheels and ready for the pouring of concrete;

FIG. 10 is a cross-sectional view of the mold of FIG. 9 taken along line 10—10 of that figure illustrating in par-

ticular how the firebox is supported within the mold before the pouring of the concrete;

FIG. 11 is a cross-sectional view taken along line 11—11 of FIG. 9 illustrating the stack portion of the mold and showing in particular the toggle and pivot arrangement of the vertical sides of the mold;

FIG. 12 is a longitudinal sectional view through a mold for the casting of the firebox later incorporated in the chimney structure of the invention;

FIG. 13 is a longitudinal sectional view, partly in elevation, illustrating an alternative flue form employing an inflatable tube;

FIG. 14 is an elevational view of the mold for the precast chimney structure generally resembling that of FIG. 9, but with the mold turned upside down with respect to the position of FIG. 9;

FIG. 15 is a side elevational view illustrating the erection of the chimney structure of the invention upon an edge of a concrete foundation;

FIG. 16 is a side elevational view illustrating the chimney structure tilted slightly in the direction of its hearth face;

FIG. 17 is a side elevational view of the chimney structure in its erected plumb position; and

FIG. 18 is a plan view of an erected chimney structure of the invention with laterally extending anchor rods **103** fixed to ceiling joists of the house framing.

As best seen in FIGS. 1–3, a chimney structure **10** of the presently preferred form of the invention comprises a fireplace **12** and a stack **14**. In more detail, the structure includes a separately cast firebox **16** made of refractory material having an overhead stack opening **18**, vertical side walls **20** and **22**, a side or rear wall **24**, vertical hearth opening **26**, and a bottom or hearth **28**. A short sloping top wall **30** extends rearwardly from the top of the vertical hearth opening to the stack opening **18** of the firebox. The firebox **16** is provided with a throat **32** defined by the sloping top or forward wall **30** and a protrusion **34** of the vertical back wall **22**. A concrete encasement **36** substantially encloses the sides of the firebox **16**, excepting the hearth and stack openings, and provides a hearth support slab **38** adjacent the underside of the firebox. In the preferred embodiment illustrated in FIGS. 1–3, the hearth support slab **38** is set back from the hearth face of the firebox to provide an overhanging ledge **42**. As best seen in FIGS. 3 and 15, the bottom surface of the concrete encasement, that is, the hearth support slab **38**, slopes upwardly away from the hearth side of the chimney structure.

The concrete encasement **36**, together with the firebox **16**, comprises the fireplace **12**. The stack **14**, also made of concrete, is integral with the concrete encasement **36** with a flue **37** of the stack opening into the stack opening **18** of the firebox **16**. The concrete of the structure is desirably reinforced with a network **50** of steel rods comprising longitudinally extending rods **52** equally spaced inwardly from the four corners of the stack and extended to reinforce the concrete encasement about the firebox, as seen in FIG. 5. It is desirable that the hearth support slab **38** also be reinforced with steel rods. The longitudinally extending rods **52** which commence adjacent the top of the stack **14** extend to a point beyond the lower end of the chimney structure to provide vertical anchor rods **54** for embedment in a concrete footing upon installation. The reinforcing network is provided with spaced lateral tie rods **56** which are wrapped about the vertical rods **52**.

The hearth **28** of the firebox **16** adjacent its rear side is provided with a cutaway hole **29** which overlies an elongated ash removal pit **31** formed in the hearth support slab **38** with the ash removal pit opening to the rear side of the structure.

The precast firebox **16** is manufactured in the form or mold illustrated in the sectional view of FIG. 12. The sloping top wall **30** of the firebox is formed in a cavity **60** and the back vertical wall **22** and its protrusion **34** are formed in an area **62** of the mold. The hearth **28** is cast in a cavity **64**. It will be seen that the firebox form is built to permit disassembly and the removal of a core portion **66** of the form through an access **68**. The view of FIG. 12 being a longitudinal section, the cavity areas for formation of the vertical walls **20** and **24** of the firebox **16** are not shown.

The firebox **16** is formed of refractory material, preferably employing an aluminous or high-alumina cement (Lumnite), using two parts of the cement to four parts of sand and four to five parts of gravel. The aggregate is preferably an expanded lightweight clay (Ridgelite). It has been found that the firebox is satisfactorily formed with a two-inch thickness. It will be appreciated that a suitable refractory firebox may be used employing other materials. High-alumina cement is used both for its fire resistance and refractory properties. Under increasing temperature, high-alumina cement will lose less water and less strength than does common Portland cement which becomes substantially dehydrated at relatively low temperatures. Refractory materials using alumina cement appear to acquire a fuse bond which replaces the strength normally lost with partial dehydration of the concrete.

The encasement **36** of the firebox **16**, including the hearth support slab **38** and the stack **14**, is formed from a concrete desirably made up of one part of Portland cement to nine parts of the expanded clay aggregate, principally of gravel size. Desirably, the concrete has a minimum twenty-eight day compressive strength of two thousand p.s.i. Again, it will be appreciated that concrete mixtures differing from the foregoing specification may be successfully employed.

A suitable form **67** for the casting of the over-all chimney structure is illustrated in FIGS. 9, 10, and 11. The form **67** has the general configuration of the desired chimney structure and includes, in the embodiment illustrated, an enlarged fireplace portion **70** opening into a narrow, elongated, stack portion **72**. The vertical longitudinal walls of the two portions **70** and **72** of the chimney structure form are hinged to permit simultaneous outward movement, thus facilitating the removal of the completed chimney structure therefrom. Referring to FIG. 11, it will be seen that the vertical walls **76** are hinged to the bottom of the form **67** and detachably locked in an upright position by a toggle locking arrangement **78**. Two such toggle arrangements **78** are disposed along the length of the stack portion **72** of the mold form. A similar toggle arrangement may be provided on the fireplace portion **70**. Upright, longitudinal walls **84** of the fireplace portion **70**, each having a horizontally disposed flange section **86**, are hinged to the bottom of the mold form **67**.

In the particular embodiments of the chimney structure and mold illustrated, the stack **14** is narrower than the fireplace **12**; however, this need not be as the structure may be manufactured with the stack and fireplace having the same or nearly the same outside dimensions.

The steps involved in the manufacturing of the chimney structure of the invention are best understood with reference to FIG. 8. In the far right top portion of the figure, a firebox mold form **88** is illustrated. In the succeeding step of the process refractory concrete is supplied through a chute **90** to the firebox form **88** and the firebox form is thereafter transferred to a curing tunnel or room **92** and here the firebox may be cured at an elevated temperature of say 120° F. In the next step, the firebox form **88** is removed from the tunnel **92** and the firebox **94** removed from the mold form. As the first step in the assembly of the over-all chimney structure form **67** for the subsequent pouring of the concrete to form the encasement about the firebox and the integral stack, the reinforcing steel network **50** described previously is positioned within the chimney structure form **67**. Referring to FIG. 11, it will be seen that the reinforcing network **50** within the stack portion **72** of the mold form is supported therewithin by

suspension rods **102** which are held to lateral crosspieces **104** which rest on flanged upper ends **106** of the pivoted vertical walls **76**. In the particular cross section illustrated in FIG. 11, the suspension rods **102** are permanently left in place and have laterally extending anchor portions **108** that secure the stack **14** of the erected chimney structure to the house. However, at different locations (and in some instances) along the length of the stack portion **72** of the mold, some of the suspension rods **102** may be removably held to the crosspieces **104**.

As the next step in assembly of the mold, the firebox **94** is positioned within the fireplace section **70** of the mold (FIG. 10) with the firebox being held therein by several removable suspension rods **96** which at their upper ends are supported from crosspieces **98**. An elongated flue form **110** is positioned within the stack, being held at its inner end within the stack opening **18** of the firebox **16** and at its outer end by an end form **112** which has four sloping walls **113**.

With the location of the flue form **110**, concrete may now be poured into the mold form via chute **116** following the pouring and troweling of the concrete, if a brick (see FIGS. 6 and 7) or similar finish is desired on the upper portion of the stack **14**, plastic form pads **118** are located at the outer end of the stack portion of the mold form as indicated in FIG. 8 and pressed into the concrete. The fireplace portion and stack portion, respectively, of the mold form are lined with plastic form material **120** and **122**.

The supporting rods **96** of the firebox **16** of the reinforcing steel network **50** are removed after the poured concrete has been vibrated and has become stiff enough to support the firebox and steel network. Prior to pouring of the concrete into the mold form **67**, it is desirable to close off the hearth face of the firebox **16** with a closure plate **124** (FIG. 9). Following the pouring and vibration of the cement, the form **67** may be removed on a wheeled carriage **126** along a track **128** into curing tunnel **130**. Following curing and removal of the form **67** from the curing tunnel **130**, the respective sides **76** and **84** are moved outwardly as illustrated in the last drawing as the flow diagram of FIG. 8 to permit removal of the completed chimney structure. The flue form **110** is removed from the chimney structure as soon as the latter comes out of the tunnel.

There is illustrated in FIG. 13 an alternative flue form which comprises an inflatable tube **135** which is held in place by a plurality of arcuate rods **139** which are removably fixed to the form proper. The inflatable tube flue form **135** may also be weighted by water **131** to reduce the tendency for the tube to move about within the mold **67**.

FIG. 14 shows the mold **67** asembled in an inverted form wherein the back vertical wall **22** of the firebox **16** is up in contrast to the preferred form of FIG. 9 wherein the hearth opening is at the top side.

The manner of erecting the chimney structure at the job site is illustrated in FIGS. 15–18. In FIGS. 15, 16, and 17 the erection precedes the framing of the house. This is optional and in many instances it will be found desirable to install the precast chimney structure following framing, there having been left the standard fireplace opening into which the chimney structure is inserted. Referring to FIG. 15, a small crane **133** holding the chimney structure in an upright position rests the ledge **42** on a shoring **132** which in this instance is the foundation of a house. It will be seen that the stack **14** (FIG. 3) centrally of its length and immediately below the laterally extending rods on the hearth side of the structure, is provided with an internally threaded hole **135** which receives the threaded end of an adjustable shoring brace **134**. The shoring brace **134** at its other end is fixed to the foundation **132**. As the next step (FIG. 16) in the installation of the chimney structure, the structure is tilted usually (but not necessarily) to its hearth side up to about 5° causing the structure to pivot about its ledge **42** and to elevate its sloping bottom surface. It will be noted that the latter surface slopes upwardly from the hearth side. A footing hole **136** somewhat larger in cross section than the bottom of the chimney structure, say about six inches wider all the way around and one foot or so below the end of the chimney structure, is provided and into this a steel mat is located and concrete poured. While the concrete is still plastic, the chimney structure is brought into plumb (FIG. 17) by turning a handle **137** of the adjustable shoring brace. FIG. 18 shows the erected and plumb fireplace held by its anchor rods **108** to the ceiling joists **138** of a house frame.

With reference to FIGS. 1 and 2, it will be seen that the concrete encasement on the hearth side about the firebox is provided with the veneer tabs **144** which are used for anchoring the desired facing whether it be new brick, stone, slump stone or other facing material including a precast facing.

Various arrangements may be employed for installation of the damper and, this not being a part of the invention, has not been illustrated.

Although exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications, and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow.

1. A precast chimney structure including a fireplace structure and stack, said chimney structure comprising:

a separately cast thin walled firebox made of refractory material having an overhead stack opening and a vertical hearth opening;

a concrete encasement having relatively thick walls about said thin walled firebox forming a fireplace and substantially enclosing said firebox excepting the openings thereto and integral therewith a concrete stack having a flue opening into the stack opening of the firebox;

and said chimney structure being further characterized by longitudinally extending steel rods embedded in the fireplace end of the structure and reaching below such structure to provide exposed anchor rods for embedment in a concrete supporting base upon erection of said precast chimney structure;

the bottom surface of the concrete encasement adjoining the underside of said firebox sloping upwardly away from the hearth side of the structure.

2. A precast chimney structure including fireplace and stack, said structure comprising:

a separately cast thin walled firebox made of refractory material and having an overhead opening, a vertical hearth opening, and a bottom having a hole for ash removal; and

a concrete encasement having relatively thick walls about said thin walled firebox substantially enclosing the sides and bottom of said firebox excepting the openings therein, with a section of the portion of the concrete encasement adjacent the firebox bottom being cut away beneath the hole of the firebox bottom to provide an ash removal pit, said concrete encasement about the firebox forming a fireplace and integral therewith a concrete stack having a flue in alignment with the stack opening of the firebox, said concrete encasement having embedded therein a network of steel reinforcing rods;

the bottom surface of the concrete encasement adjoining the underside of the firebox sloping upwardly away from the hearth side of the structure.

3. A precast chimney structure comprising a fireplace having a hearth opening and an integral stack formed of concrete with a portion of the bottom end of the structure set back to form an overhanging ledge at the hearth side of said structure and with the bottom surface of the lower end of the structure sloping upwardly away from the

hearth side of said structure, said chimney structure being further characterized by longitudinally extending steel rods embedded in the fireplace end of the structure and reaching below said structure to provide exposed anchor rods for embedment in a concrete supporting base upon erection of said precast chimney structure.

4. A precast chimney structure comprising a fireplace having a hearth opening and an integral stack formed of concrete with the bottom surface of the lower end of the structure sloping upwardly away from the hearth side of said structure, said chimney structure being further characterized by longitudinally extending steel rods embedded in the fireplace end of the structure and reaching below said structure to provide exposed anchor rods for embedment in a concrete supporting base upon erection of said precast chimney structure.

5. A precast chimney structure comprising a fireplace having a hearth opening and a stack formed of concrete with a portion of the bottom end of the structure set back to form an overhanging ledge at the hearth side of said structure and with the bottom surface of the lower end of the structure sloping upwardly away from the hearth side of said structure, said chimney structure being further characterized by longitudinally extending steel rods embedded in the fireplace end of the structure and reaching below said structure to provide exposed anchor rods for embedment in a concrete supporting base upon erection of said precast chimney structure.

6. A precast chimney structure including a fireplace structure and stack, said chimney structure comprising:

a separately cast thin walled firebox made of refractory material having an overhead stack opening and a vertical hearth opening;

a concrete encasement having relatively thick walls about said thin walled firebox forming a fireplace and substantially enclosing said firebox excepting the openings thereto and integral therewith a concrete stack having a flue opening into the stack opening of the firebox; and

said chimney structure being further characterized by longitudinally extending steel rods embedded in the fireplace end of the structure and reaching below such structure to provide exposed anchor rods for embedment in a concrete supporting base upon erection of said precast chimney structure; a portion of only the bottom end of said encasement being set back at the bottom level of said firebox, from the front of said fireplace whereby said encasement forms an overhanging ledge at the front of said structure.

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