

Dec. 2, 1952

W. L. SHEPHEARD

2,620,431

COMBINED ELECTRIC HOT WATER HEATER, FLUE, AND CHIMNEY UNIT

Filed March 17, 1952

2 SHEETS—SHEET 1

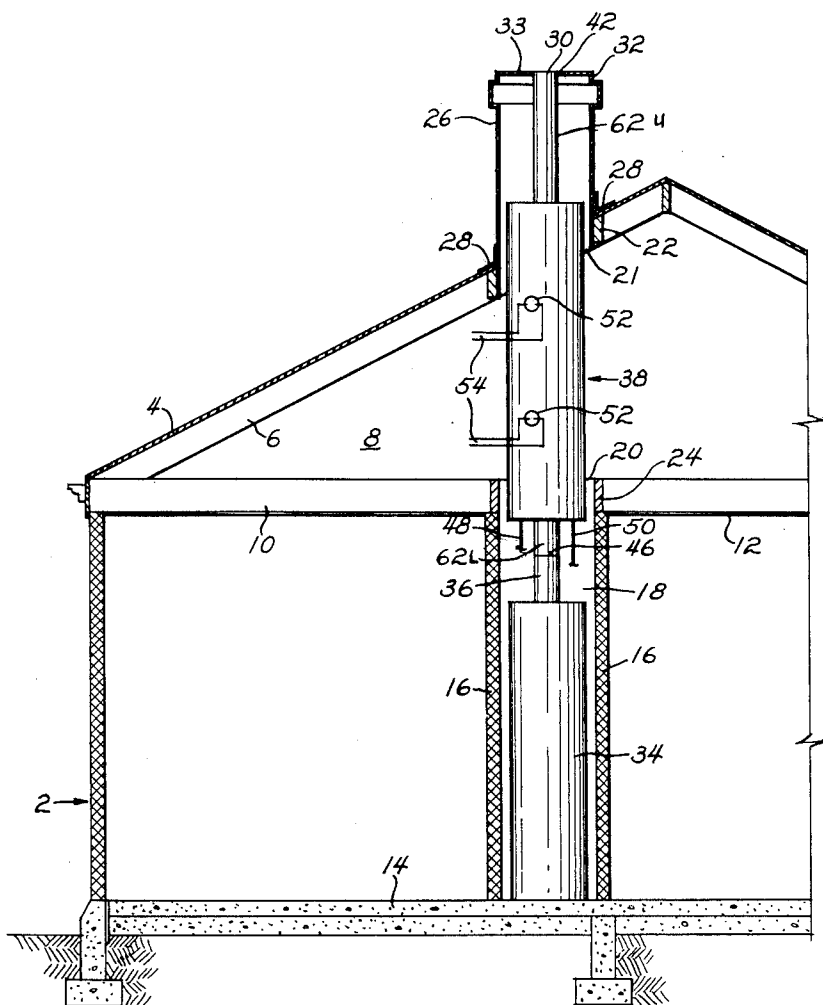


Fig. 1

INVENTOR

WILLIAM L. SHEPHEARD

BY

James H. Littlepage

ATTORNEY

Dec. 2, 1952

W. L. SHEPHEARD

2,620,431

COMBINED ELECTRIC HOT WATER HEATER, FLUE, AND CHIMNEY UNIT

Filed March 17, 1952

2 SHEETS—SHEET 2

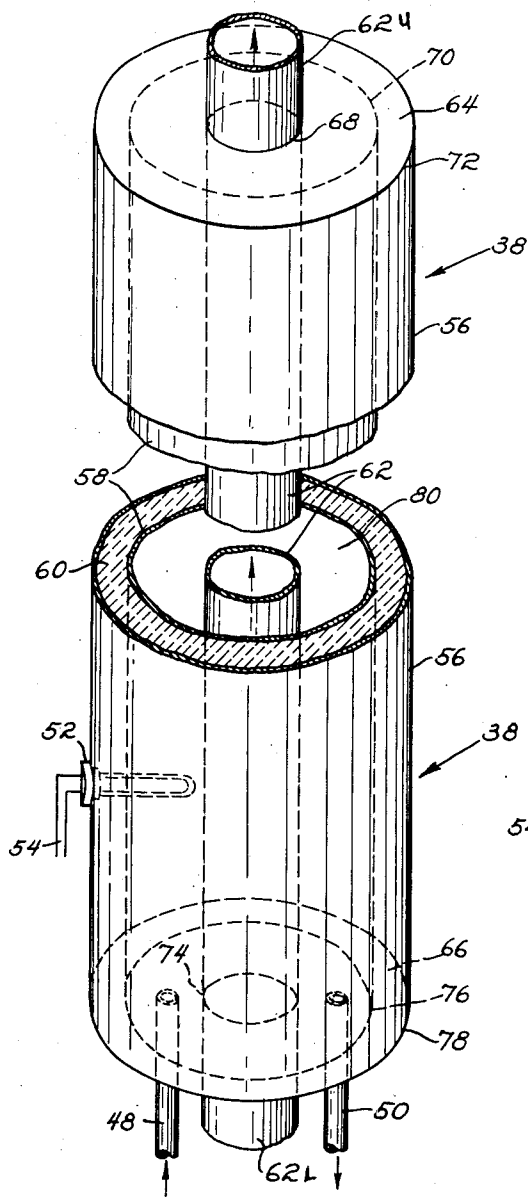


Fig. 2

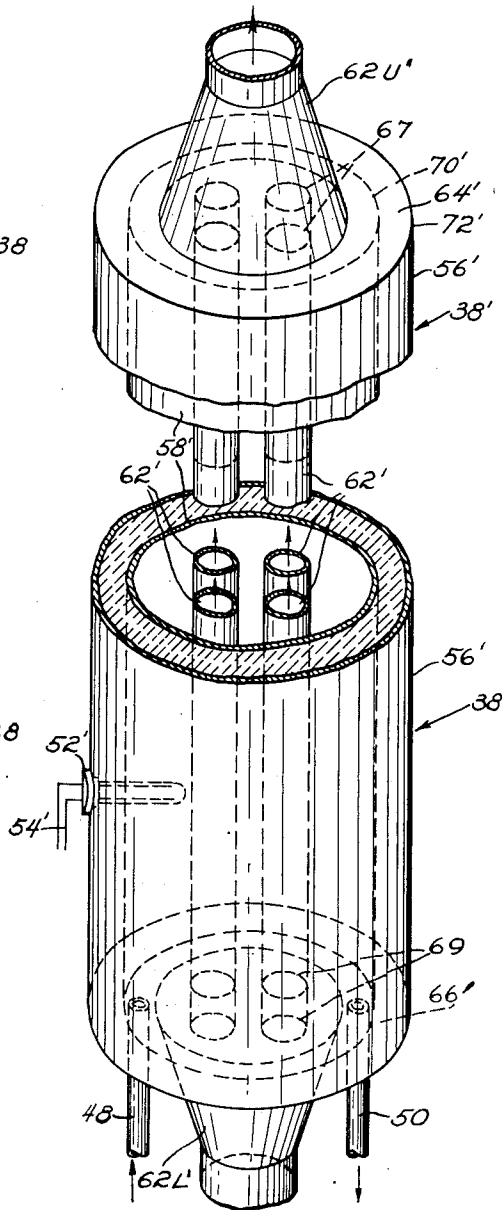


Fig. 3

INVENTOR

WILLIAM A. SHEPHEARD

BY

James H. Littlepage

ATTORNEY

UNITED STATES PATENT OFFICE

2,620,431

COMBINED ELECTRIC HOT WATER HEATER,
FLUE, AND CHIMNEY UNITWilliam L. Shephard, Norfolk, Va., assignor to
Marie T. Shephard, Norfolk, Va.

Application March 17, 1952, Serial No. 276,920

12 Claims. (Cl. 219—38)

1

This invention relates to electric water heaters and, more particularly, to a combined domestic hot water heater and flue structure.

The object of this invention is to provide a combined electric water heater and flue structure installable in dwellings above a furnace. It is intended also that the combined electric water heater and flue be embodied in a hollow metallic chimney supported on the roof structure of a dwelling or the like building.

With the advent of modern, comparatively low cost housing have come various flue and chimney substitutions for conventional masonry chimneys. Despite precautionary measures, in the form of insulation or ceramic lining, many of the units thus far developed are subjected to the corrosive effects of hot flue gases and are also vulnerable to physical displacement resulting from expansion or contraction of the supporting house members. Leakage resulting from any damage to the flue structure is particularly dangerous because it is liable to remain undetected until a fire in the ceiling, attic or roof occurs, or until noxious gases collect in the house. An object of this invention is to provide an electric hot water heater having a flue passage therethrough and constituting at least the major portion of the flue-pipe run through the attic of a typical dwelling house. By this device it is intended not only to decrease the likelihood of corrosive damage to, or puncturing of the flue-pipe by heat, gases or physical forces, but also to provide an immediate telltale, in the form of water leakage, in the unlikely event that a leak does occur in that critical portion of the flue-pipe which extends through the attic. A further feature of the device is that any such leakage must be immediately stopped in order to operate the furnace therebelow.

Still another object is to provide a combined electric water heater and flue-pipe structure constituting a heat-exchanger, and in which the heat from the water and that from the hot flue gases are most efficiently utilized, and to provide for the most efficient utilization of floor space required for a furnace and electric water heater. While the tank for the electric water heater forms a water-cooled jacket for the flue-pipe, and thereby protects the metal of the flue-pipe and absorbs the otherwise waste heat from the flue gases while the furnace therebelow is burning, the electrically heated water tank also functions as a flue heater when the furnace is first started, thereby inducing a slight upward draft for more efficient starting of the furnace..

2

Yet another object of the invention is to provide a vertically elongate, combined electrically heated hot water tank and flue-pipe and metal chimney wherein the hot water tank and flue-pipe are supported between the furnace and chimney cap, thereby avoiding the necessity for any metallic supports running directly from the house ceiling or roof to a hot part of the flue or chimney structure. With this arrangement it is intended that the previously waste space above a furnace and adjacent the flue-pipe run be utilized.

These and other objects will be apparent in the following specification and drawings in which:

Fig. 1 is a vertical section through a typical dwelling housing the subject invention, the furnace, tank and flue-pipe being in side elevation and the metallic chimney being in sections;

Fig. 2 is a perspective, broken away to show the interior of the single flue embodiment of the invention illustrated in Fig. 1; and Fig. 3 is a perspective partially broken away to show the interior of a multiple flue structure alternatively useable in an installation such as illustrated in Fig. 1.

Referring now to the drawings in which like reference numerals denote similar elements, Fig. 1 shows a typical installation of the invention in a one-story dwelling house 2 having a conventional pitched roof 4 supported on roof rafters 6 overlying an attic 8, the latter having floor joists 10 under which is a ceiling 12, and the house floor 14, and preferably partitions 16 enclosing a comparatively small furnace closet 18. Extending through ceiling 12 is a well opening 20 above furnace closet 18, the well opening 20 through the ceiling registering beneath a similar well opening 21 through roof 4. The roof and ceiling well openings are surrounded by well frames 22 and 24 respectively.

Rigidly affixed in registry with roof well frame 22 is the lower end of a hollow metal chimney 26, suitable flashing 28 sealing the joint between the chimney and roof in accordance with conventional practice. The central part of the chimney cap 32 has a flue-pipe opening 30 through its top wall 33. Because of the structure and arrangement described hereinafter, the shell of chimney 26 may be formed of sheet metal with little or no internal structure or insulation since there is no danger from heat transmitted through it, and the structure depending from it forms a ballast. Disposed below chimney 26 and in furnace closet 18 is shown a furnace 34 which may be of any

conventional type, such as with an oil burner, and having upwardly extending flue stub 36.

The invention is primarily concerned with the combined electric hot water tank and flue unit indicated generally at 38, from the upper end of which extends an upper flue-pipe extension 62U rigidly affixed and sealed within flue-pipe opening 30 in chimney cap top 33 as indicated at 42. Extending downwardly from the unit 38 is a lower flue-pipe extension 62L joined as at 46 to furnace flue stub 36. It should be understood that the entire assembly from furnace 34 to chimney 26 is in structural unity, all joints and connections being gas-tight. While the load of the combined electric hot water tank and flue structure 38 may be carried by suitable conventional strips or brackets connected around unit 38 and supported by well frames 22 and 24, it is a particular feature that chimney 26 provides lateral support for the electric hot water tank and flue unit 38, and that no support from the house structure to the hot parts 62U or 62L is necessary. The cold water inlet 48 and hot water outlet 50 are provided for the hot water tank portion of unit 38, and one or more electric water heating units 52 having the usual electric conduits 54 leading therefrom are provided for unit 38.

Referring now to Fig. 2, unit 38 consists of an insulation shell 56 constituting the outer part of the unit and outer tank shell 58 spaced inwardly from insulation shell 56 so as to provide space for insulation 60 therebetween. Running up the interior of unit 38 is a combined inner tank shell and flue-pipe 62. Unit 38 is closed at its ends by upper and lower walls 64 and 66 respectively, upper wall 64 being welded and sealed around inner tank shell and flue-pipe 62 as indicated at 68, and also welded and sealed to the upper edges of outer tank shell 58 and insulation shell 56, as indicated at 70 and 72 respectively. Likewise the lower end wall 66 is sealed and welded around inner tank shell and flue-pipe 62 as indicated at 74, and similarly sealed and welded to the lower edges of outer tank shell 58 and insulation shell 56 as at 76 and 78. The space 80 between outer tank shell 58 and flue-pipe 62 is, of course, occupied by water fed through cold water inlet pipe 48 from the domestic water supply.

The modification disclosed in Fig. 3 is generally similar to that of Fig. 2 described above, the elements of the Fig. 3 structure corresponding to those previously described being denoted with similar reference numerals bearing prime notations. The modification in Fig. 3 differs primarily in the interior structure which, instead of a single combined inner tank wall and flue-pipe, embodies a plurality of such pipes 62' spaced from one another so that water circulates freely between them. The upper and lower ends of unit 38' are provided with headers 64', 66' respectively, apertured as at 67, 69 and sealed around flue-pipe 62'. Upper and lower headers 64', 66' are similarly welded and sealed to the upper and lower edges of outer tank wall 58' and insulation shell 56' as in the previously described embodiment. In the Fig. 3 modification the upper and lower extensions of the flue-pipe take the form of manifolds 62U', 62L', the manifolds being sealed to the chimney cap 32 and furnace flue stub 36 as in the previously described embodiment.

In operation of the invention, water fed into space 80 is heated upon energizing of electric heating units 52, suitable conventional thermo-

stats being provided for controlling the maximum and minimum heat affected by the electric heating units 52. As the water is heated, a slight upward draft is induced in flue-pipe 62 because of the heat transferred inwardly through the combined inner tank wall and flue-pipe 62. When furnace 34 is ignited, the hot flue gases passing upwardly therefrom give off heat through the combined inner tank wall and flue-pipe 62 to the water in space 80, the water thus serving to protect the metal of inner tank wall and flue-pipe 62 against excessive heating and, of course, utilizing the otherwise waste heat from the flue gases. The spent flue gases proceed upwardly through upper extension 62U of the flue-pipe to the atmosphere and, while such spent flue gases are relatively cool, it is noteworthy that there is considerable metal exposed to the atmosphere between the portion of chimney cap 32 which contacts the upper end of flue-pipe extension 62U and roof 4. Thus, very little residual heat reaches roof 4 or the adjacent roof structure. Well frames 22 and 24 are protected and shielded from the heat of the flue gases by the water jacketing effect of the water in space 80 and insulation 60. It is a further feature that the portions of the unit which pass through the wells 22 and 24 are jacketed and insulated by unit 38 so that even should the assembly become cocked to one side or the other as a result of storm or earthquake damage, the danger of charring or burning of the roof or ceiling structure is precluded.

The invention detailed above is not limited precisely to the structure shown, but is intended to cover all modifications, substitutions and equivalents within the scope of the following claims:

I claim:

1. A combined electric hot water heater and flue unit comprising, in combination, a tank having outer and inner side walls of closed configuration separate from one another and defining a space therebetween, said inner side wall circumscribing a passage extending centrally through the tank from one end to the other and adapted for the passage of flue gases therethrough, an upper end wall connected between the upper edges of said side walls, a lower end wall connected between the lower edge of said side walls, said end walls having apertures therethrough registering with said passage, an electric heating unit supported in the space between said side walls, and inlet and outlet water connections leading through at least one of said walls to said space.
2. A combined electric hot water heater and flue unit comprising, in combination, a tank having outer and inner side walls of closed configuration separate from one another and defining a space therebetween, said inner side wall circumscribing a passage extending centrally through the tank and adapted for the passage of flue gases therethrough, an upper end wall connected between the upper edges of said side walls, a lower end wall connected between the lower edge of side walls, said end walls having apertures therethrough registering with said passage, an electric heating unit supported in the space between said side walls, inlet and outlet water connections leading through at least one of said walls to said space, and an insulating jacket surrounding said outer side wall.
3. A combined electric hot water heater and flue unit comprising, in combination, a tank having cylindrical outer and inner side walls of

5

closed configuration radially spaced from one another to define a space therebetween, said inner side wall circumscribing a cylindrical passage extending centrally through the tank and adapted for the passage of flue gases there-through, an upper end wall connected between the upper edges of said side walls, a lower end wall connected between the lower edge of said side walls, said end walls having circular apertures therethrough registering with said passage, an electric heating unit supported in the space between said side walls, inlet and outlet water connections leading through at least one of said walls to said space, a cylindrical insulating jacket surrounding said outer side wall, said inner side wall being substantially longer axially than said outer side wall and extending therebeyond above and below said upper and lower end walls, whereby to constitute a flue pipe.

4. A combined electric hot water heater and flue unit comprising, in combination, a substantially closed tank having side and end walls, a plurality of open-ended flue-pipes extending entirely through said tank between said end walls, a pair of generally funnel-shaped manifolds having their large ends affixed to said end walls, respectively, and overlying the open ends of said flue-pipes, the small ends of said funnel-shaped manifolds constituting flue-pipe extensions, electric water-heating units affixed in said side wall and extending into the interior of said tank, and water inlet and outlet connections extending through one of said walls.

5. The combination claimed in claim 4, and an insulating jacket surrounding said side wall.

6. A combined electric hot water heater, flue and chimney construction comprising, in combination, a sheet metal chimney of hollow configuration, a metallic flue-pipe open at the top of said chimney and having its upper end supported in said chimney, said flue-pipe extending downwardly from said chimney and having its lower end adapted for engagement with a furnace and having an intermediate portion, a tubular shell spaced outwardly from and surrounding said intermediate portion of said flue-pipe and forming the outer wall of a tank, vertically spaced annular metallic end plates having their inner peripheries sealingly and rigidly affixed around said intermediate portion, said end plates being affixed to respectively opposite end edges of said tubular shell, said end plates respectively constituting the upper and lower end walls of said tank, an electric heating unit in said tank, and water input and outlet connections in said tank.

7. In the combination claimed in claim 6, an insulating jacket surrounding said tubular shell, a cylindrical metallic shell surrounding said

6

jacket, said water input and outlet connections being through the plate constituting the lower end wall of said tank.

8. The combination claimed in claim 7, the upper end of said tank lying within said hollow chimney.

9. In a house construction including an attic, an attic floor, a roof spaced above said attic floor, and a furnace disposed in said house on a floor below said attic floor, said attic floor and said roof having vertically aligned well openings therethrough substantially above said furnace, a hollow sheet metal chimney having its lower end affixed in the roof well, a flue-pipe having its upper end supported in said chimney and extending downwardly therefrom to said furnace, a tubular shell of closed configurations surrounding said flue-pipe and lying in outwardly spaced relation thereto and constituting the outer side wall of a tank, the upper end of said shell lying within the lower end of said chimney and the lower end of said shell extending at least partially through the attic floor well opening, centrally apertured upper and lower end plates sealingly affixed to the upper and lower ends of said shell with the central apertures thereof sealingly engaged around said flue-pipe, an electric hot water heating unit in said tank, and water inlet and outlet connections in said tank.

10. The combination claimed in claim 9 and an insulating jacket of solid material surrounding said shell, said jacket being spaced inwardly from the outer confines of said well openings.

11. In combination, a flue structure including a water tank having a wall thereof exposed to flue gases flowing therethrough whereby heat from the flue gases heats the water in the tank by direct transfer through said wall and an electric heater supported in said tank.

12. In a water jacket flue structure, wherein water within the jacket is heated by hot flue gases by direct transfer through the jacket wall, an electric heater positioned in said water jacket for direct contact with water therein.

WILLIAM L. SHEPHEARD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,058,190	McGinnis	Apr. 8, 1913
1,113,003	Griffin	Oct. 6, 1914
1,150,522	Jackson et al.	Aug. 17, 1915
1,175,234	Burroughs et al.	Mar. 14, 1916
1,438,260	Pilcher	Dec. 12, 1922