Jan. 12, 1932. E. O. HOWLE 1,840,628

CHIMNEY CONSTRUCTION

Filed Jan. 17, 1931 3 Sheets-Sheet 1

Fig. 1

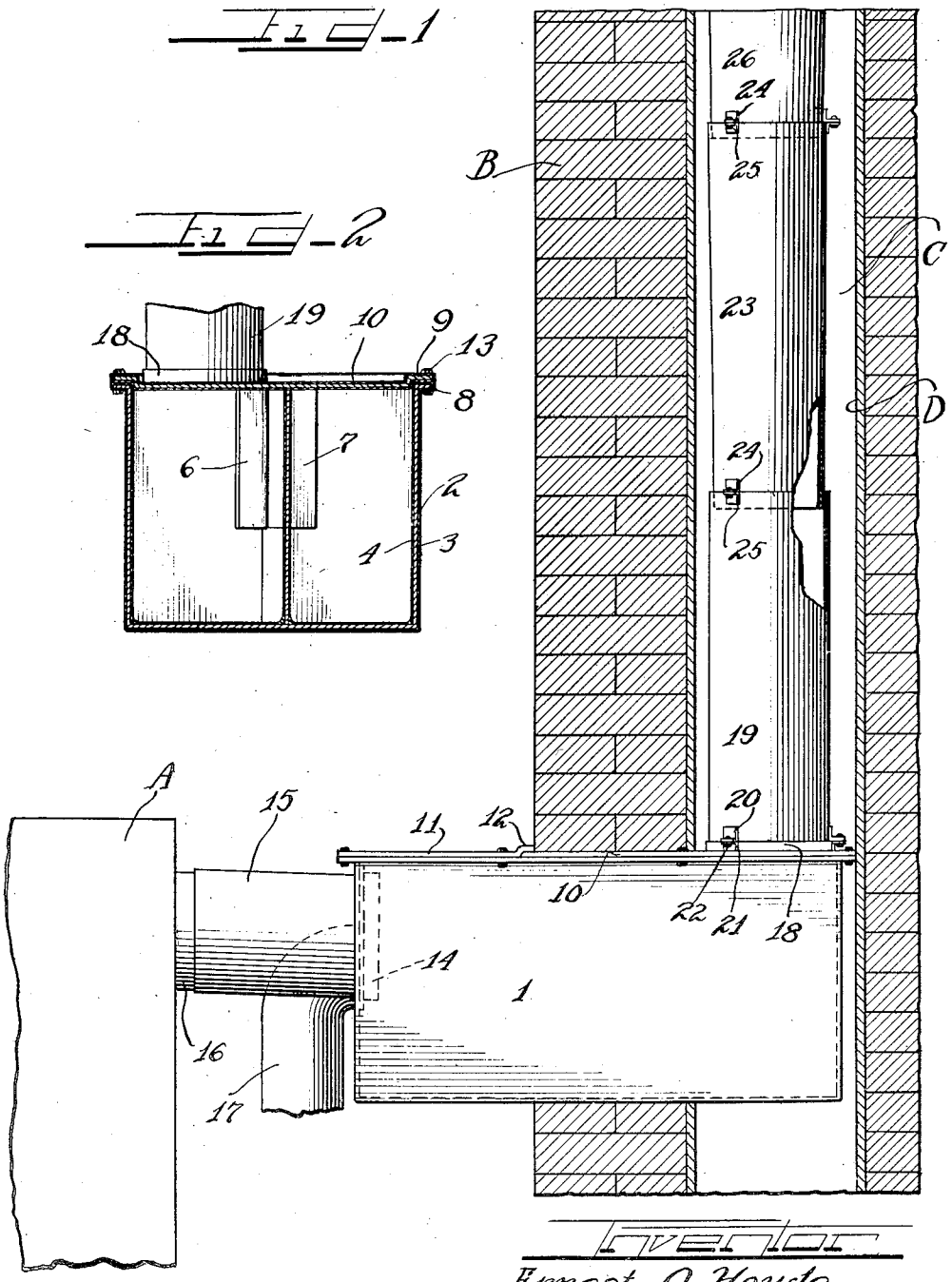


Fig. 2

Inventor

Ernest O. Howle

By Charles T. Wells Atty.

Jan. 12, 1932. E. O. HOWLE 1,840,628

CHIMNEY CONSTRUCTION

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Fig. 3

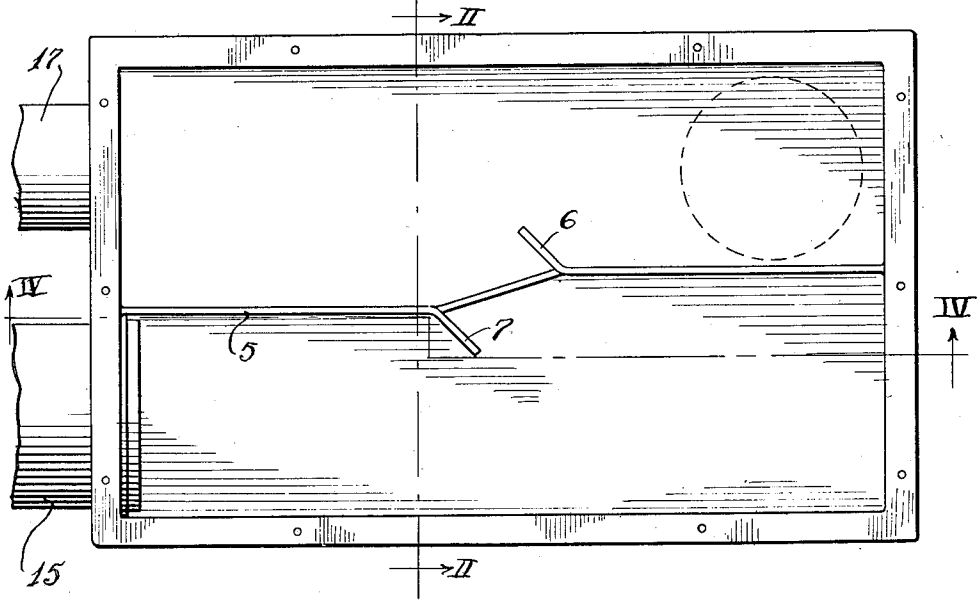
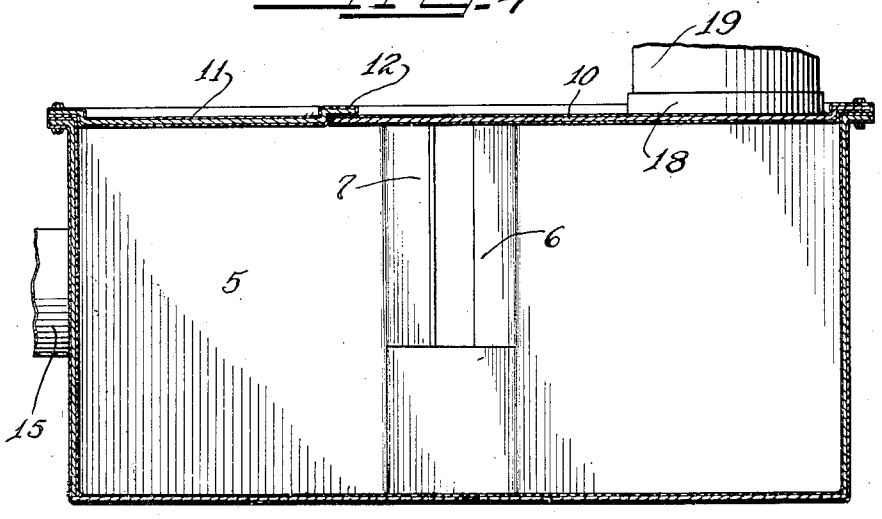


Fig. 4



Inventor

Ernest O. Howle

by Charles O'Neill Atty

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CHIMNEY CONSTRUCTION

Filed Jan. 17, 1931 3 Sheets-Sheet 3

Fig. 5

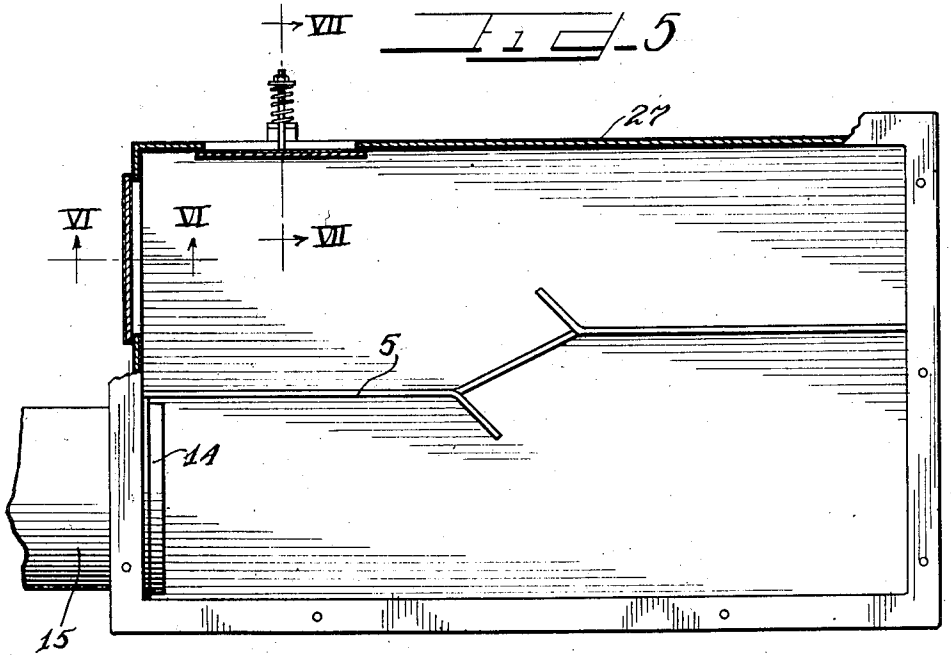


Fig. 6

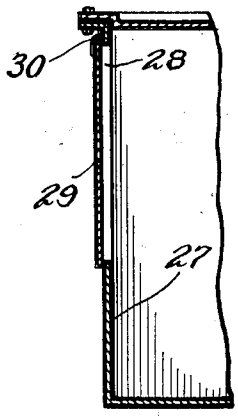
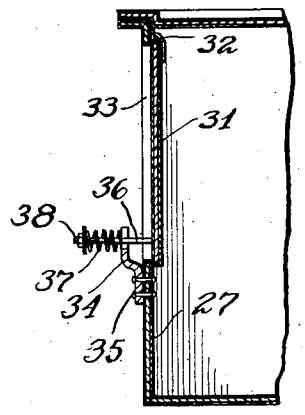


Fig. 7



Inventor

Ernest O. Howle

by Charles A. Wills Attys.

Patented Jan. 12, 1932 1,840,628

UNITED STATES PATENT OFFICE

ERNEST O. HOWLE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO CHARLES H. LITHGOW, OF CHICAGO, ILLINOIS

CHIMNEY CONSTRUCTION

Application filed January 17, 1931. Serial No. 509,321.

This invention relates to chimney construction and particularly to a novel arrangement for preventing acidulous liquids of condensation of chimney gases from eating away the flues and from staining and otherwise damaging the walls of the building.

It has been found that liquids of condensation of stack or chimney gases are deleterious to the stack or chimney and also to the walls surrounding the same. This is especially true where the fuel used is gas as utilized in heating plants for houses, clubs, apartments, buildings, hotels and the like. There is a considerable amount of sulphur present in the gas so that the liquids of condensation from the products of combustion form destructive acids which eat the metallic flues and also damage the masonry to some extent and stain or otherwise damage the walls in which the chimney or stack is built.

The present invention overcomes the objections now present in flue construction where gas is utilized as a fuel.

An object of the present invention is to provide means for preventing deleterious effects to chimneys, flues and building structures from liquids of condensation of stack and chimney gases.

Another object of the invention is to provide an inner flue of vitreous material coextensive with the stack or chimney through which the products of combustion escape to the atmosphere.

Another object of the invention is to provide a sectional inner flue for chimneys which sections are metal, having vitreous coatings on the inner and outer surfaces of the same.

A still further object of the invention is to provide a condensation collecting chamber between the furnace and the flue.

A still further object of the invention is to provide a condensation collecting chamber which is connected at one end with the furnace outlet and at the other end with the stack flue, the chamber, the flue and the connection between the furnace and chamber all being of metal with vitrified inner and outer surfaces so arranged that no metal is exposed to the products of combustion from the furnace.

Another and yet further object of the invention is to provide a condensation collecting chamber having an opening to the atmosphere therein for preventing back draft in the furnace and also serving as a liquid overflow from the chamber.

A still further object of the invention is to provide a chamber between the furnace and flue with the connection between the furnace and chamber inclined downwardly from the furnace to the chamber.

An additional object is to provide a chamber connected to the outlet from a furnace with a collar surrounding the end of the outlet as it enters the chamber, the collar being inclined downwardly to prevent back flow of liquid from the chamber to the furnace.

Another and still further object of the invention is to provide a sectional inner flue for chimneys wherein the sections are so disposed one with respect to another that any liquid condensing in the flue formed of these sections will drip downwardly along the interior of the flue section and be prevented from escape to the exterior of the flue sections.

The above other and further objects of the invention will be apparent from the following description, accompanying drawings and appended claims.

Generally speaking, the invention contemplates an inner flue made of metal sections having the inner and outer surfaces thereof vitrified, which sections are arranged end to end and so disposed that the joints are sealed against escape of liquids therethrough and which flue extends throughout the height of the chimney or stack.

The invention further contemplates the provision of a condensation collecting chamber interposed between the furnace outlet and the flue for collecting liquids of condensation from the flue gases. This chamber likewise is of metal vitrified inside and out.

The invention contemplates also the provision of a vitrified metallic connection between the furnace and chamber so disposed

as to prevent back-flow from the chamber to the furnace, which chamber has therein an opening to the atmosphere for preventing back-draft and also serving as an outlet for liquids.

The term "furnace" is used herein generically and is not to be construed as a word of limitation as it includes all heating appliances such as boilers, hot air furnaces, hot water heaters, incinerators, gas ranges, clothes driers and like appliances.

An embodiment of the present invention is illustrated in the accompanying drawings and the views thereof are as follows:

Figure 1 is a fragmental sectional portion of a brick chimney provided with an inner flue of the present invention illustrating also the condensate collecting chamber and the connection between it and a fragmental portion of the furnace.

Figure 2 is a transverse vertical sectional view through the condensate chamber taken substantially in the plane of line II—II of Fig. 3;

Figure 3 is a top plan view of the collecting chamber with the cover removed;

Figure 4 is a longitudinal vertical section through the collecting chamber taken substantially in the plane of line IV—IV of Fig. 3;

Figure 5 is a top plan view of a collecting chamber with cover removed, with parts broken away, illustrating another form of means for caring for back draft and means for regulating draft through the chamber, whereby collecting chambers of substantially uniform size may be installed in connection with chimneys and flues of various characteristics and the draft through the chambers regulated in accordance with such flue characteristics;

Figure 6 is a vertical sectional view taken substantially in the plane of line VI—VI of Fig. 5;

Figure 7 is a vertical sectional view taken substantially in the plane of line VII—VII of Fig. 5.

A fragmental portion of a furnace A is illustrated in Figure 1. The furnace may be of any desired type of heating appliance, such, for instance, as a steam boiler, hot water boiler, hot water heater, hot air furnace, incinerator, gas range, and the like.

A fragment of a brick chimney is indicated at B and is provided with a flue C. The flue C is lined at D by plaster or any other suitable material.

A collecting chamber 1 consisting in the present instance of an elongated box which is fashioned of metal vitrefied inside and outside, is installed in the chimney.

Figure 2 illustrates a transverse section of the box with the cover applied and the box as there illustrated consists of the metal sides 2, an outer vitrified coating 3 and an inner vitrefied coating 4.

A baffle plate 5 is secured lengthwise in the box and this in turn is made of metal with both surfaces of the same vitrified. Wings 6 and 7 are cut from the metal of the baffle 5 and bent outwardly in opposite direction.

The portion of the baffle 5 in which the opening just described is cut is bent so that one end of the baffle is offset with respect to the other. The depth of the cut as formed by the wings 6 and 7 is less than the depth of the chamber 1 with the lower end of the cut substantially in line with the lowest point of the furnace connection with the chamber. The baffle 5 including the wings 6 and 7 is vitrified throughout as before described so that no metal part of the same is exposed.

The upper margins of the side walls and end walls of the box are out-turned forming ledges 8 to which are attached flanges 9 of the cover 10. The cover 10 is formed of metal vitrified on both sides and with the central portion thereof depressed as may be observed in Figures 2 and 4. The cover 10 extends part way over the chamber and and a supplemental cover 11 overlies the balance of the chamber. The cover 11 is provided with side flanges for engaging portions of the side flanges and one end flange of the chamber 1 and also provided with upwardly offset flange 12 for resting on top of the adjacent edge of the cover member 10. This cover 11 likewise is vitrified so that no metal thereof is exposed to products of combustion.

Figure 4 illustrates the manner in which the covers 10 and 11 are applied to close the box 1. The cover members 10 and 11 are secured to the flanges 8 of the box 1 by bolts 13 passing through said flanges outwardly of the side and end margins of the box. This construction provides a chamber having a baffle therein which chamber and baffle are formed of metal and which metal is vitrified throughout so that no metal portions thereof are exposed.

The chamber is made of metal in the manner just described and then the whole box is dipped in vitreous solution so that there is no opportunity for cracks in vitrified portion of the box when completed.

One end of the box 1 is provided with an opening to receive the furnace connection while the cover 10 is provided with a collared opening for the flue.

A collar 14 is disposed about the furnace opening in the box 1 inwardly of the end of the box and the flange of the collar is inclined downwardly slightly to prevent back flow of liquid from the chamber 1 to the furnace A.

A furnace connection 15 consisting of a metal pipe which is vitrified on its inside and outside communicates with the furnace outlet 16 and a collar 14 within the chamber 1,

thus making the furnace connections between the furnace A and the chamber 1.

A pipe 17 communicates with the interior of the chamber 1 at one end and at the other end is open to the atmosphere for preventing back-draft affecting the furnace. The pipe 17 communicates with the interior of the chamber 1 in a manner so that the lower portion of the communication is below the bottom of the pipe 15 and the collar 14. The pipe 17 thus serves a double purpose in providing an overflow for liquid within the chamber 1 should the liquid accumulate to any considerable height within the chamber. This pipe 17 likewise is of metal and vitrified on the inside and outside.

The cover 10 is provided with an upstanding flange or collar 18 likewise of metal vitrified inside and outside for receiving the inner flue so-called, of the present invention.

The inner flue of the present invention is illustrated as consisting of sections of metallic pipe which sections are vitrified inside and outside and arranged one above another in the flue C of the chimney B.

The chamber 1 is inserted in the chimney B during construction thereof, or if it is to be applied to a chimney already built, sufficient number of bricks are removed for insertion of the chamber.

The chamber 1 having been put in place with the covers 10 and 11 applied thereto, the lowermost section 19 of the inner flue is arranged within the collar 18 and the cover member 10.

The illustrated form of the invention discloses lugs 20 secured to the lower end of the section 19 for cooperating with lugs 21 secured to the collar 18 with bolts passing through the cooperating flanges of the lugs, thus securing the section 19 to the collar 18.

The next above section 23 is illustrated as telescoped within the upper end of the section 19. This section likewise is of metal vitrified inside and outside and is provided with lugs 24 cooperating with lugs 25 on the upper end of the lower section 19 for connecting together these sections.

A third section 26 has its lower end telescoped within the upper end of the section 23 and in like manner is supported by similar lugs 24 and 25.

The inner flue is built up of sections in the manner just described to the desired height, as many sections being employed as necessary to bring the upper end of the topmost section even with the upper end of the chimney B.

It will be observed that by arranging the flue sections in the manner just described, any liquid of condensation from an upper section will drain down the inside of the next lower section and eventually all of such liquid will drain down into the collecting chamber 1.

It is within the contemplation of the present invention to construct the sections of the inner flue of uniform diameter throughout attaching the sections together in the manner described or in any other suitable manner for accomplishing the purpose intended.

The chamber 1 as well as the flue sections may be made of sheet metal suitably formed into proper shape and arrangement or may be of cast metal as desired. In any event the metal of which the chamber and flue sections are made is vitrified to completely cover all of the surfaces of such parts for excluding exposure of metal to the liquids of condensation as well as to the flue gases.

The products of combustion pass from the furnace A through the pipe 15 into the collecting chamber 1, thence by circuitous passage to the inner flue consisting of the sections 19, 23, 26 and the like, the gases passing from one side of the baffle 5 to the other side through the opening formed by the wings 6 and 7. The disposition of the wings 6 and 7 in the manner indicated increases the baffling effect so that the furnace gases are subjected not only to expansion by being led into the collecting chamber 1 but also by traveling the circuitous path the heavier suspended matter is precipitated and to some extent any entrained liquid is precipitated.

The gases then pass upwardly through the inner flue and as the same reach the cooler portions of the flue condensation occurs, the liquid resulting from condensation falling back into the collecting chamber 1. The construction of the flue is such that as the liquid of condensation falls downwardly no part thereof escapes to the exterior of the flue, consequently the walls surrounding the chimney B are not damaged or stained nor is any of the metal of the flue harmed in any manner whatsoever.

The inclination of the pipe 15 directs the gases from the furnace A into the chamber 1 in a downward direction so that some of such gases are directed below the bottom of the opening in the baffle, necessitating the rising of these gases to pass through the opening in the baffle to the flue. This also adds to the effectiveness of the baffle for causing precipitation of suspended matter.

This invention lends itself very readily to flue installations where gas is to be utilized as the heating medium for the furnace.

There is usually an intermittent operation of the burner of the gas-fired furnace A when it is controlled by thermostats or similar instrumentalities. Such intermittent burning results in heating and cooling of the chamber and flue.

With intermittent operation of the furnace it follows that any liquid collected in the chamber 1 as the flue is cooled is heated when the gas is ignited for a period of burning, as the heat of the incoming gases from the furnace A is greater during burning of the

gas than at any other time. During the period of burning the temperature within the chamber 1 rises and the condensed liquid is vaporized and carried upwardly with the flue gases, and the chamber is emptied of the condensed liquid in this manner.

Should, perchance, it so happen that a considerable amount of liquid accumulates in the chamber 1 and rises to a considerable height the pipe 17 will then serve as an overflow to prevent the liquid from entering the furnace A through the pipe connection 15.

Should back draft occur for any reason, provision of the pipe 17 which, it is to be noted from Fig. 3, is on the same side of the baffle 5 as the flue, would result in such back draft escaping to the atmosphere through the pipe 17 rather than traversing the circuitous path through the baffle 5 and entering the furnace connection 15, in this manner blowing out of the gas pilot light is eliminated.

The provision of the collecting chamber 1 necessarily expands the gases escaping from the furnace A through the pipe 15 so that such expansion precipitates certain of the entrained liquid, should any there be, thereby reducing the amount of condensation occurring in the flue.

Figure 5 illustrates a collection chamber or condensation collector identicated generally at 27. The chamber has a baffle 5 constructed as described with reference to baffle 5 in Figures 1, 2, 3 and 4 and is for the same purpose.

The chamber 27 is provided with a slightly different back draft outlet than is illustrated in Figures 1 and 3. Such outlet consists of an opening 28 in the end of the chamber remote from the flue connection and arranged on the same side of the baffle 5 as the flue connection. A door 29 is hinged at 30 along the upper margin of the opening and is suspended to swing outwardly whenever back draft occurs. Normally the door 29 closes the opening 28.

Whenever back draft occurs, it will blow the door 29 open so as to admit to the atmosphere such back draft and this back draft being on the same side of the baffle 5 as the flue, there will be no effect from such back draft communicating with the furnace to which the chamber is connected thru the connection 15.

It is a well-recognized fact that chimney and flues have different characteristics as to draft, and to compensate for such differences there is provided a compensating means disclosed in the present instance as consisting of a door 31 hinged at 32 along the top of an opening 33 in the side of the chamber 27. The door 31 opens into that part of the chamber lying on the same side of the baffle 5 as the inner flue.

Means are provided for accommodating movement of the door 31 in accordance with the suction created within the chamber 27 by the draft through the flue. The illustrated means comprises a bracket 34 secured by means of rivets 35 to a portion of the chamber 27 adjacent the opening 33 and a rod 36 attached to the outer surface of the door 31 passes thru said bracket and extends beyond the same. A spring 37 surrounds the rod between the bracket 34 and an adjusting nut 38 so that by turning the nut in the proper direction the spring 37 may be compressed or elongated thus stiffening or weakening the checking means in accordance with the suction created within the chamber 27 by the flue draft.

Utilization of such a means at this just described enables the manufacture of condensate collecting chambers of substantially uniform size and the adaptation of such chambers to flues of various characteristics. Proper adjustment of the spring 37 allows inward movement of the door 31 under suction when such suction reaches a predetermined point as determined by the characteristics of the flue.

The chamber 27 and the doors 29 and 31 as well as the door opening are of metal properly vitrified so that the destructive action of the flue gases within the chamber 27 will not affect the metal of which these parts are constructed.

The bottom of the door opening 28 is below the lower margin of the collar 14 with which communicates the furnace connection 15 so that should any liquid accumulate within the chamber 27, such liquid will overflow through the opening 28 without entering the furnace.

It will be observed that this invention is one wherein liquids of condensation from furnace gases are collected in a part of the flue system in a position to be vaporized by increased heat passing through the flue at intermittent intervals as is usual with gas and oil fired furnaces. It is also useful in connection with any type of furnace whatsoever as even where there is a steady burning in the furnace, the condensation to some extent takes place in the flue. depending on the character of fuel being utilized.

The gist of the present invention resides in the provision of a vitreous inner flue so designed as to prevent escape from any liquid of condensation to the outside of the flue, together with a collecting chamber for the collection of the condensate in the path of passage of the flue gases from the furnace to the flue whereby such condensate is subjected to the heat of such gases for vaporization and removal.

The invention has been described herein more or less precisely as to detail, yet it is to be understood that the invention is not to be limited thereby as changes may be made in the arrangement and proportion of parts and equivalents may be substituted without

departing from the spirit and scope of the invention.

The invention is claimed as follows:

1. In combination, a furnace having an outlet for spent hot gases, a chimney, a casing connected between said outlet and said chimney providing a chamber to receive and collect condensate from said chimney, and means in said casing to direct the flow of hot gases through said casing to cause evaporation of the condensate.

2. In combination, a furnace having an outlet for spent hot gases, a chimney, a casing having an inlet connected to the furnace outlet and having an outlet connected to said chimney, said casing providing a chamber to receive and collect condensate from said chimney, said casing having another outlet positioned adjacent the aforesaid inlet, and baffle means in said casing to direct the flow of hot gases through said casing to cause evaporation of the condensate, said baffle means also being means to direct down-draft from said chimney to said last mentioned outlet.

3. A flue construction for connection between the spent-gas outlet of a furnace and a chimney, said construction comprising an elongated casing having an inlet at one end for connection to the spent-gas outlet of the furnace and having an outlet at the other end for connection to a chimney, the outlet being above and at an angle to the inlet of the casing, said casing providing a chamber to receive and collect condensate, said casing having an outlet on one end adjacent the inlet for spent gases, baffle means in said casing in the path taken by gases therethrough to deflect the gases to cause evaporation of condensate which has collected in the casing, said baffle means also providing means to direct down-draft from the chimney through said casing to the last mentioned outlet, and a door hinged on said casing opening outwardly thereof, said door being arranged to normally close said down-draft outlet.

4. A flue construction for connection between the spent-gas outlet of a furnace and a chimney, said construction comprising a casing having an inlet at one end for connection to the spent-gas outlet and having an outlet at the other end, spaced above and at an angle to the inlet, for connection to a chimney, said casing providing a chamber to receive and collect condensate from the chimney, baffle means in said casing in the path of gases therethrough to deflect the gases to cause evaporation of condensate collected in the casing, said casing having an interior area greater than that of its inlet whereby hot gas entering said casing passes therethrough with diminished velocity.

5. A device for connection between the spent-gas outlet of a furnace and a chimney for the collection of condensate from the chimney and subsequent evaporation of the condensate, said device comprising a casing having an inlet for connection to a furnace and an outlet for connection to a chimney, the inlet and the outlet being positioned a substantial distance above the bottom of said casing whereby space is provided therein to receive and collect condensate, baffle means in said casing adapted to cause a reversal of the direction of flow of gases therethrough, said casing having its surfaces exposed to the gases and condensate of vitrified material.

6. A flue construction for connection between the spent-gas outlet of a furnace and a chimney, said construction comprising an elongated casing having an inlet at one end for connection to the spent-gas outlet of the furnace and having an outlet at the other end for connection to a chimney, said casing providing a chamber to receive and collect condensate, said casing having an outlet on one end adjacent the inlet for spent gases, baffle means in said casing in the path taken by gases therethrough to deflect the gases to cause evaporation of condensate which has collected in the casing, said baffle means also providing means to direct down-draft from the chimney through said casing to the last mentioned outlet, a door hinged on said casing, opening outwardly thereof, to normally close the down-draft outlet, said casing also having an inlet for air positioned adjacent the down-draft outlet, and a door hinged on said casing, opening inwardly thereof, and being balanced against atmospheric pressure to normally close the air inlet.

In testimony whereof I have hereunto subscribed my name at Chicago, Cook County, Illinois.

ERNEST O. HOWLE.