

Aug. 20, 1935.

L. S. CHADWICK

2,011,847

VENTILATED HEARTH

Filed May 3, 1932

3 Sheets-Sheet 1

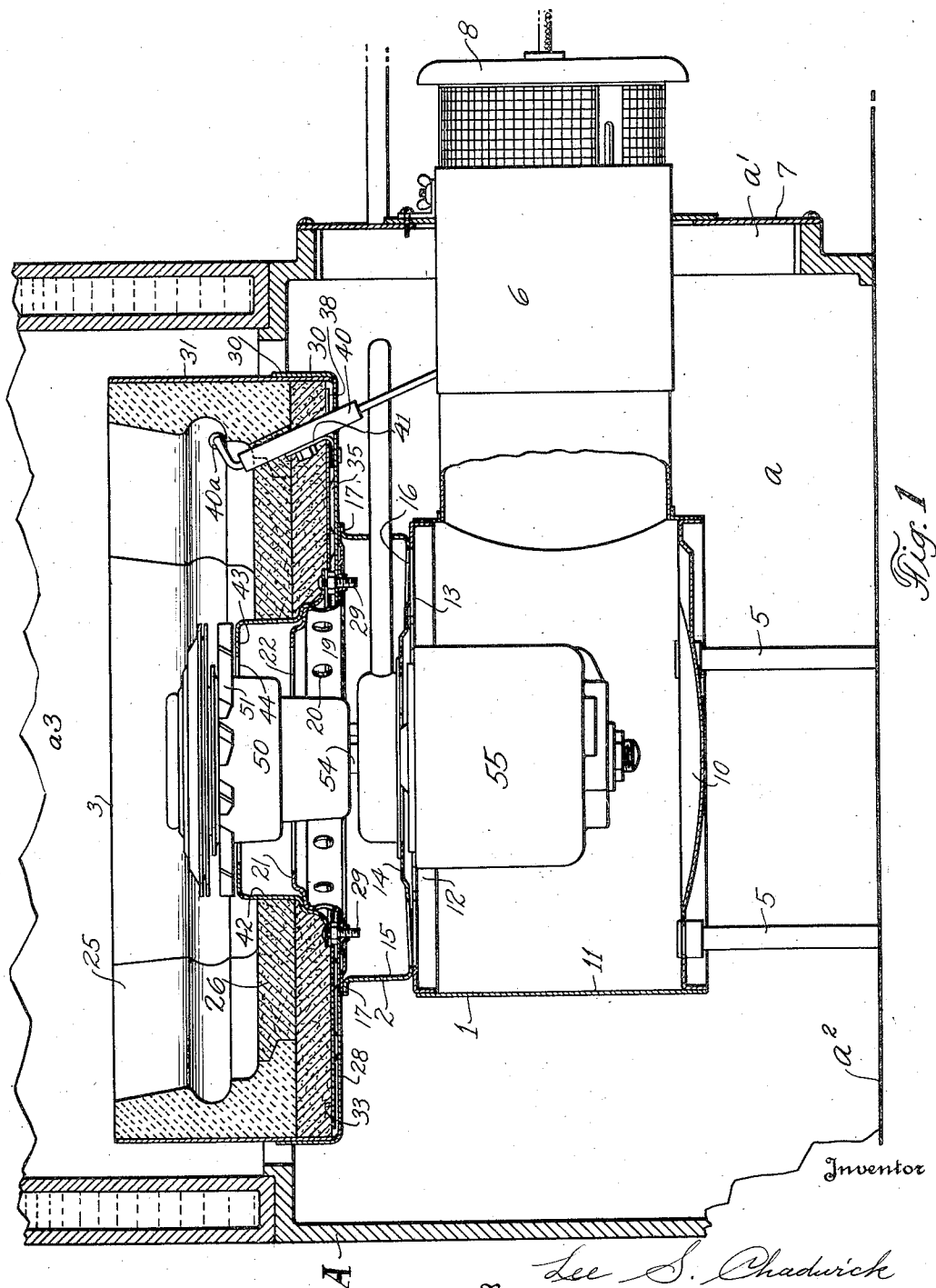


Fig. 1

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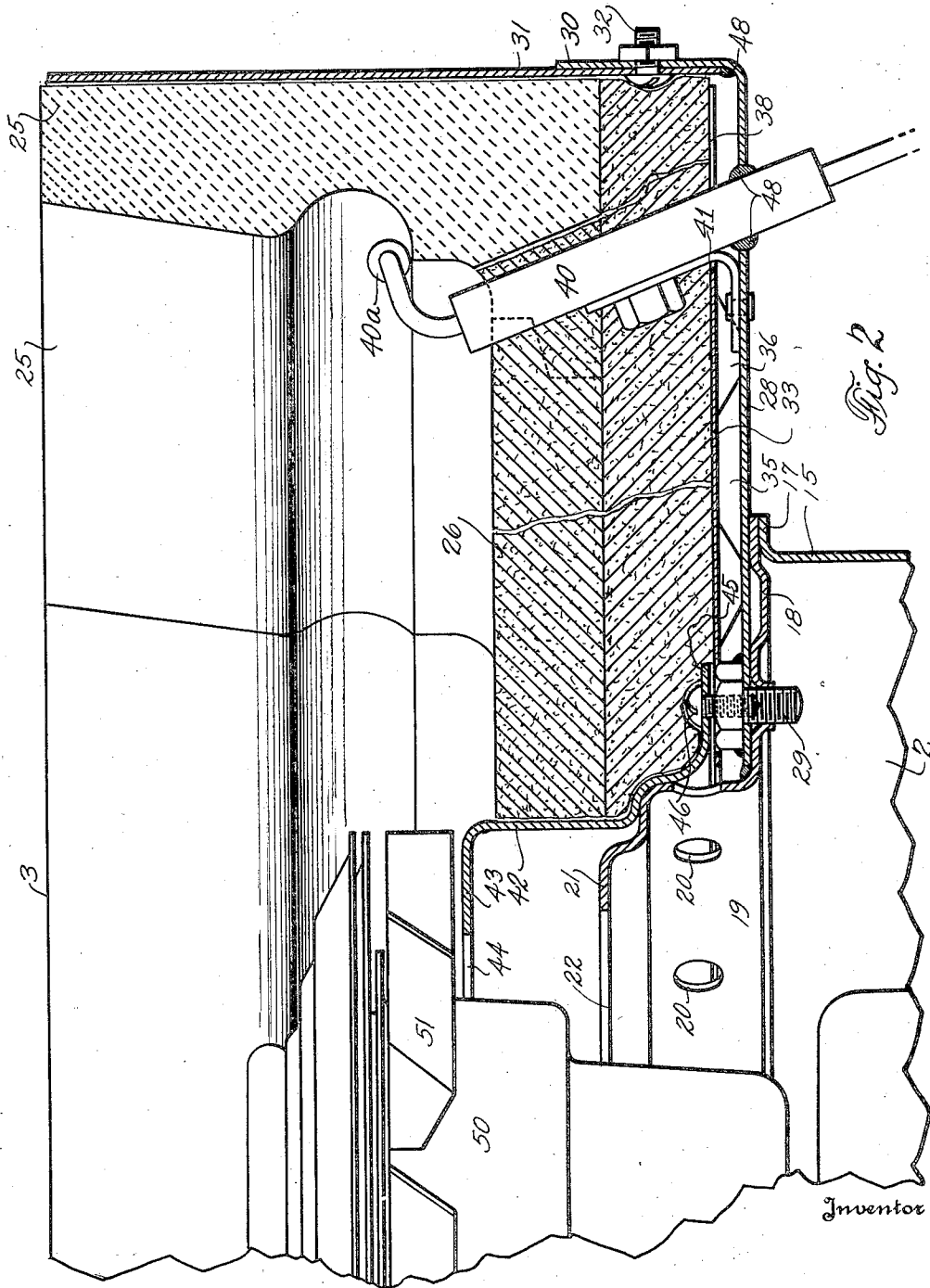
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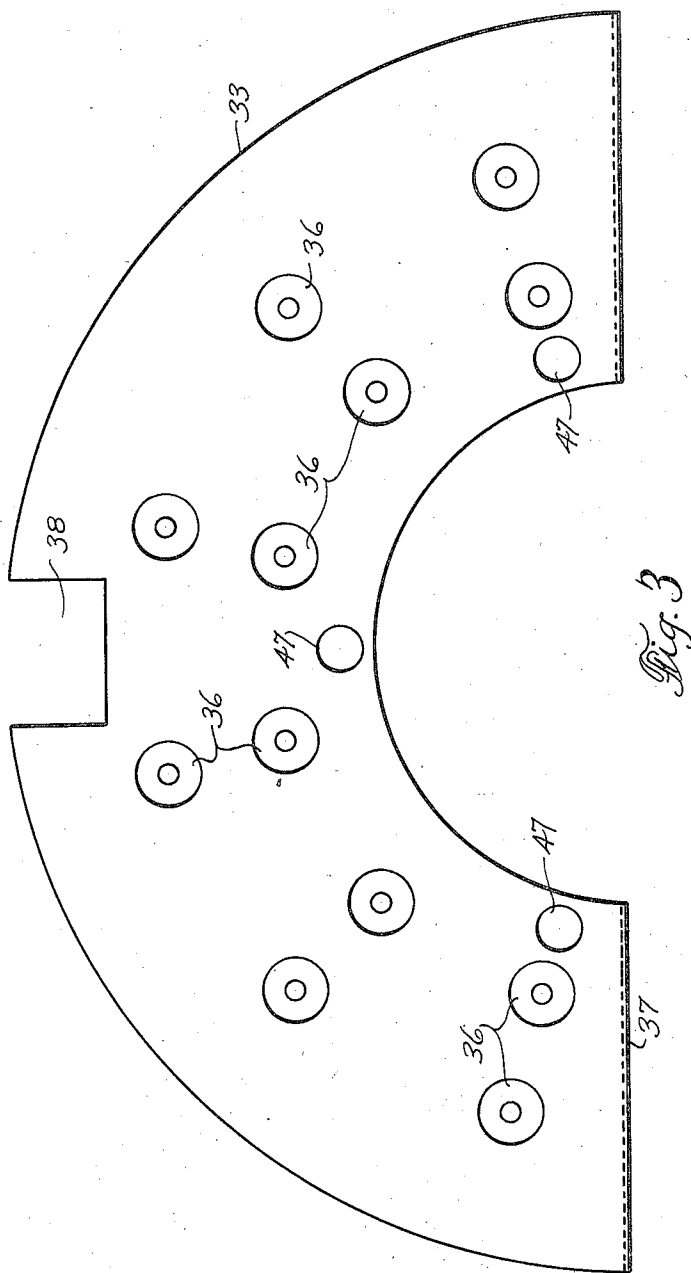


Fig. 3

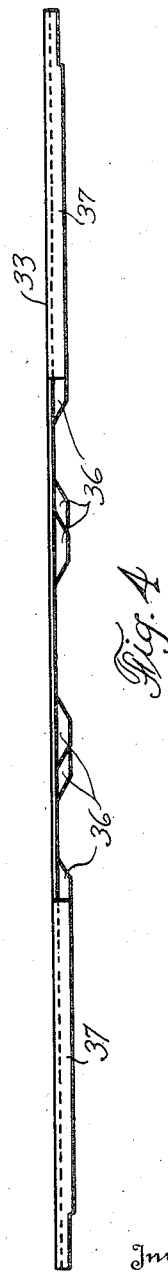


Fig. 4

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UNITED STATES PATENT OFFICE

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VENTILATED HEARTH

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Application May 3, 1932, Serial No. 608,951

2 Claims. (Cl. 158—4)

This invention relates to oil burning apparatus that is intended primarily for use in furnaces, though not necessarily restricted to such an association. According to the embodiment herein disclosed, the apparatus comprises, generally, a hearth, together with a structure for supporting the hearth in the bottom of the combustion chamber or fire box of a furnace at about the usual elevation of the grate which it replaces; and located centrally of the hearth is a suitably driven atomizer of the spinning type, incorporating a fan, for drawing in fuel oil and air and spraying the former mixed with the latter outwardly in a substantially horizontal sheet across the hearth where it is ignited and burns. The present structure is quite similar to the oil burning apparatus disclosed and claimed in a copending application filed jointly by Marc Resek, John A. Dahlstrom and myself, July 27, 1929, Serial No. 381,600; but as will be appreciated from the following disclosure, the instant invention, in its broader aspect, is not limited to this specific type of atomizer, nor to the particular kind of structure described.

The invention, broadly, is a ventilated hearth, combined with suitable means for supplying oil and air in the form of a combustible mixture, and by reason of whose novel construction any vapors generated within a space or recess provided for the purpose, or within incidental crevices or passageways of the hearth structure, are drawn in by the aforesaid means and are entrained and delivered with the air to the zone of combustion. This avoids the undesirable and, in some instances, injurious effect of such vapors exploding or burning beneath the hearth or about the edges thereof and beyond the normal zone of combustion.

In the present embodiment, as in the structure disclosed in the above mentioned application, the portion of the hearth that is directly exposed to the intense heat of the fire is made of refractory material, such as fire clay or brick or hearth cement, that is more or less fragile, while underlying and surrounding said portion is a metal casing constructed of a plurality of parts. The refractory portion of the hearth, as herein-after more fully explained, consists of a rim of fire clay or brick segments and of superposed layers of hearth cement. When the burner is assembled the said layers adhere to contacting parts of the metal casing, but after the burner has been in use for a very short time said layers pull away from such parts, due to the heating and cooling of the hearth cement, and not infre-

quently cracks occur all the way down through the layers. These conditions are indicated in the larger sectional detail of the drawings, as will presently appear. According to my present invention, all cracks, joints and openings of said casing are preferably cemented or otherwise tightly sealed, insofar as such is possible, and a space of appreciable capacity is desirably provided between the underneath side of the refractory portion of the hearth and the supporting casing, which space communicates freely with the duct or passageway through which air is delivered to the zone of combustion. If, in the use of the burner, oil gains access to the aforesaid space and is vaporized by heat transmitted to it through the refractory or metallic portions of the hearth, the suction of the air supplying means will draw additional air in through the cracks and crevices between the refractory portion of the hearth and the hearth casing and through any cracks which may have occurred in the refractory body itself and through the aforesaid space, sweeping the vapors from said space and delivering them with the air to the zone of combustion, as above described.

Aside from the fundamental purpose of providing a ventilated hearth of the general character set forth, the invention has as further objects the provision of a construction that is simple, efficient, economical and convenient of assembly.

Other objects and advantages will appear as I proceed to describe the invention in detail by reference to the accompanying drawings, wherein Fig. 1 is a central vertical section from front to rear through oil burning apparatus incorporating the invention and through the adjacent parts of a furnace in which the apparatus is installed, the fuel atomizer and fan, and the motor by which they are driven, being shown in elevation; Fig. 2 is a fragmentary detail showing a part of Fig. 1 on a considerably enlarged scale, and indicating the way in which the hearth cement portions of the structure pull away from the metal parts thereof, and Figs. 3 and 4 are a plan view and edge elevation, respectively, of one section of the spacer through which the refractory portion of the hearth is sustained above and in properly spaced relation to the bottom of the hearth casing.

The furnace in which the apparatus is shown installed, and of which only the lower portion is included in Fig. 1, is of standard type and construction and is designated generally by the reference character A. Access is had to the ash pit *a* through the usual opening *a'*, and the bottom of

the ash pit is shown as formed by the floor a^2 . Situated above the ash pit is the combustion chamber or fire box a^3 .

The oil burning apparatus consists of three major parts which may be designated as follows: the lower or bottom unit assembly 1, the upper or top unit assembly 2, and the hearth 3. The structure comprising these major parts is supported a suitable distance above the floor a^2 by legs 5, with the hearth 3 disposed in the lower portion of the fire-box or combustion chamber a^3 . An air supply conduit 6 opens into, and extends forwardly from, the bottom unit assembly 1 through an opening in a plate 7 that closes the ash pit opening a' . A damper 8 is adjustably connected to the front of the air supply conduit and by means of this the amount of air admitted to the apparatus may be controlled.

The unit assembly 1 is made up of a bottom wall 10, a peripheral wall 11, and a top wall 12, having relatively large openings 13. The top unit assembly 2 includes a pan-like housing whose body portion is drawn from sheet metal to form a bottom 14 and a side wall 15, the former wall being provided with openings 16 that register with the openings 13 in the top of the unit assembly 1. The upper edge of the side wall 15 is flanged outwardly at 17, and suitably secured thereto is the periphery of a top 18, the central portion of which is offset upwardly to form a cylindrical extension 19, having openings 20. Said extension has formed integral with it an annular wall 21 that surrounds an opening 22.

As previously explained, the hearth comprises a portion that is made of suitable refractory material, such as fire clay, brick and/or hearth cement, and a metallic casing within which the refractory portion is contained. The refractory portion or body includes a rim 25, and a flat bottom wall or bed 26. The former is preferably made up of segmental sections, as indicated in the drawings, and may consist of fire clay or brick, while the bottom wall or bed may consist of superposed layers of hearth cement. The metallic casing, or receptacle as it may aptly be termed, includes a bottom plate 28 that rests upon the top 18 of the unit assembly 2 and surrounds the wall 19 thereof and is shown as connected to the top 18 by screws 29. The bottom plate 28 is provided with an upstanding peripheral flange 30 within which is disposed a band 31 that encircles the rim 25 of the refractory portion of the hearth, and said band is shown as secured to the flange 30 by bolts 32. A spacer 33, made up of segmental parts, one of which is shown in detail in Figs. 3 and 4, is interposed between the bottom plate 28 and the refractory portion of the hearth, so as to provide a space between the underneath side of such portion and the bottom plate which space communicates with the passageway enclosed by the wall 19 through the openings 20 formed therein. Such space is designated 35. It will be noted that the sections of the spacer 33 are provided with depressions 36 that serve as legs to space the body portions of said sections above the bottom plate 28 of the hearth casing, and the ends of said segmental sections are turned downwardly to form supporting flanges 37 that prevent deformation of the spacer in the region of the joint between its sections. At one side, the spacer 33 is notched at 38 for the accommodation of electrical ignition means 40 where the latter is extended upwardly through aligned openings in the refractory portion and metal casing of the hearth, said

means being connected to the bottom plate of the hearth casing by a bracket 41. It is obvious that, while the hearth receptacle is rendered as nearly air tight as practicable, as by cementing the joints thereof, it would be practically impossible to prevent leakage of oil and air downwardly through the refractory body and the cracks between it and the adjacent metal parts and between the disconnected adjacent ends of the segmental sections of the spacer 33 into the space 35, such results being obvious from the character of the construction and the nature of the refractory material, as well as the difference in coefficient of expansion between such material and the metal parts. In fact, the possibility of such leakage is presupposed in the very conception of the invention. It should be explained that the spacer 33 is of considerably less area than the bottom wall of the hearth casing, and that the downward ends of the segmental sections whereof the spacer is formed are preferably spaced from one another so that openings of ample size are left about the margins of the spacer and between the segmental sections thereof to allow for free drainage of oil to the space 35.

Surrounding the wall 19 of the top unit assembly 2 is a sleeve extension 42 having, at its upper end, an inwardly directed flange 43 that surrounds an opening 44, and, at its bottom, an outwardly flaring flange 45 that overlies the inner edge portion of the spacer 33 and is held in place by screws 46 that are tapped into the upper ends of the previously mentioned screws 29, the spacer 33 having openings 47 through which the heads of the screws 29 are exposed. 48 designates deposits of furnace cement or the like which seal all cracks, joints and openings of the hearth casing. If any air is admitted to the space 35, therefore, when such space is subjected to suction, it has to find its way to said space downwardly between the rim 25 of the refractory portion of the hearth and the band 31 of the casing, or through cracks or interstices in the refractory material and any unsealed joints of the hearth receptacle or between parts of the refractory material and parts of said receptacle other than those just mentioned.

50 designates the fuel atomizer which incorporates a fan 51 made up of blades so inclined that when the atomizer is rotated in the normal direction air will be drawn inwardly through the lower unit assembly 1, openings 13 and 16, the upper unit assembly 2, the passageway defined by the wall 19 and sleeve extension 42, and whirled outwardly with the atomized fuel toward the rim of the hearth across the bottom wall or bed 26 thereof. I may explain at this point that at the time the apparatus is started in operation the resistance element 40^a of the electric ignition means 40 is supplied with current which heats it to incandescent, thus enabling it to ignite the fuel.

The atomizer 50 is secured to the upper end of the shaft 54 of an electric motor 55 that is suspended from the top wall 12 of the unit assembly 1, and current is supplied to said motor through conductors (not shown).

It will be clear from the foregoing description that any oil from the atomizer which finds its way into cracks or crevices in the refractory portion of the hearth or through such cracks or crevices to the space 35 will be vaporized by heat transmitted to it from the region of combustion above through the refractory or metal parts of the hearth, and such vapors will be

drawn through the openings 20 into the column of air rising through the passageway defined by the wall 19 and the sleeve extension 42 and, with the air, whirled outwardly into the zone of combustion. Therefore, besides avoiding the occurrence of minor explosions and promiscuous burning of vapors generated from the surplus oil that finds its way into cracks, crevices and recesses of the hearth structure, it recovers the surplus oil and conducts the vapors generated therefrom to the zone of combustion where they serve a useful purpose, increasing in some degree the efficiency of the burner and in like measure promoting economy.

Having thus described my invention, what I claim is:—

1. Oil burning apparatus comprising an upstanding tubular wall enclosing a passageway, said wall having openings, a shallow metallic receptacle surrounding said wall, a spacer comprising metal plates having downwardly extending parts bearing on the bottom of the receptacle, said spacer being of lesser area than said bottom, a body of refractory material resting on the spacer, the recess thus formed between the underside of said body and the receptacle communicating with the aforesaid passageway through said openings, there being crevices due to the characteristic rough surface of the refractory material between the body and the adjacent metallic parts through which oil may drain to said recess from above said body, and fuel delivery and air impelling means situated in operative relation to the body and functioning to project oil above the same and induce a draft through said passageway.

2. Oil burning apparatus comprising a horizontal wall and a vertical, cylindrical wall rising therefrom and having openings, a fuel atomizer and fan rotatably supported substantially centrally of and a substantial distance above the upper end of said cylindrical wall, means for driving said atomizer and fan, a sleeve extension applied to and rising from said vertical wall and having its upper end disposed adjacent the atomizer and fan, said vertical wall and sleeve extension defining a passageway, an annular plate surrounding the vertical wall and bearing upon and being attached to the aforesaid horizontal wall, said plate having an upstanding peripheral flange, a hearth band connected to and rising from said flange a substantial distance above the plane of the atomizer and fan, a spacer disposed upon and of lesser area than the annular plate, the foregoing elements being of metal, and a body of refractory material resting upon the spacer and comprising a rim portion adjacent the aforesaid band and a relatively flat bed portion extending inwardly from the rim to the aforesaid sleeve extension, the characteristic relatively rough surface of the refractory material providing crevices between said body and the adjacent metal parts, the recess effected by the aforesaid spacer between the refractory body and the annular plate communicating through the aforesaid openings with the said passageway and through said crevices with the space above the body.

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