June 15, 1965 L. F. DUSING ETAL 3,189,141

FIRE DOOR CONSTRUCTION

Filed April 4, 1960 3 Sheets-Sheet 1

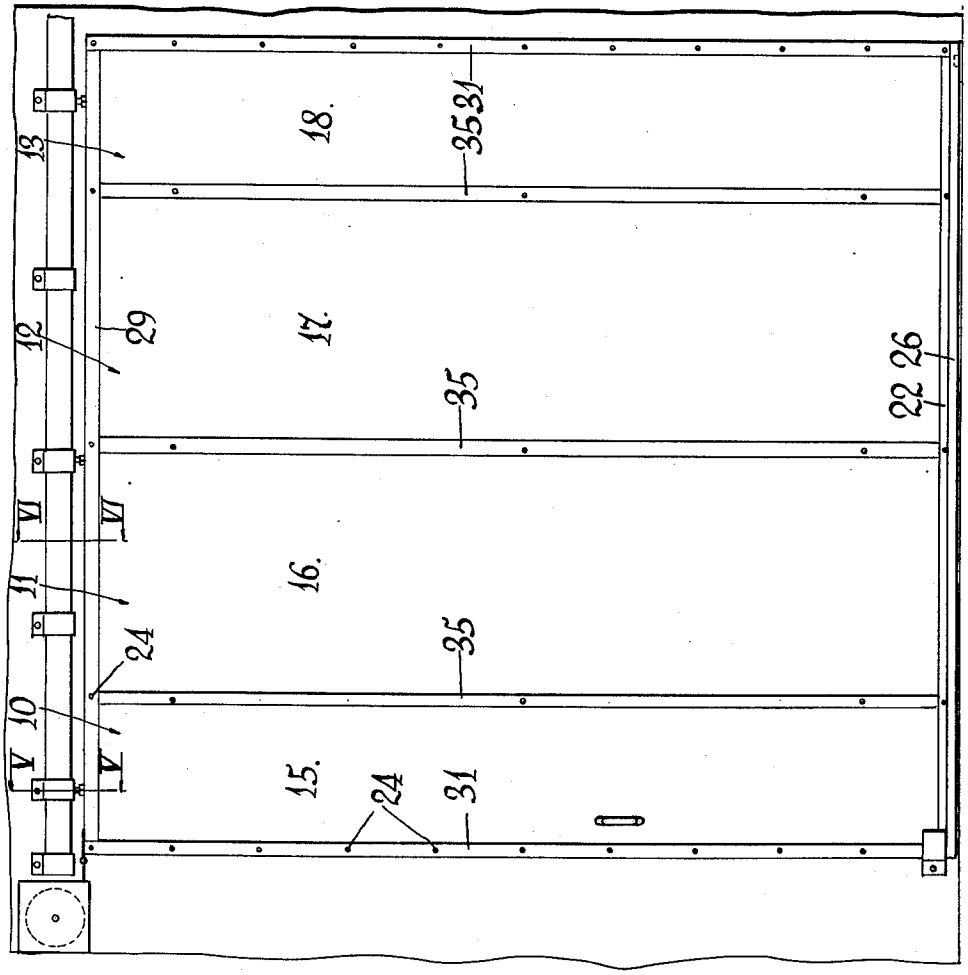

Fig. 1.

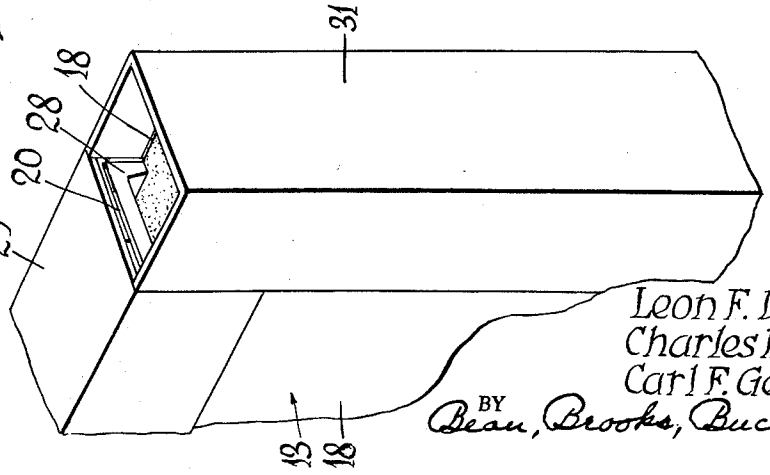

Fig. 2.

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FIRE DOOR CONSTRUCTION

Filed April 4, 1960 3 Sheets-Sheet 2

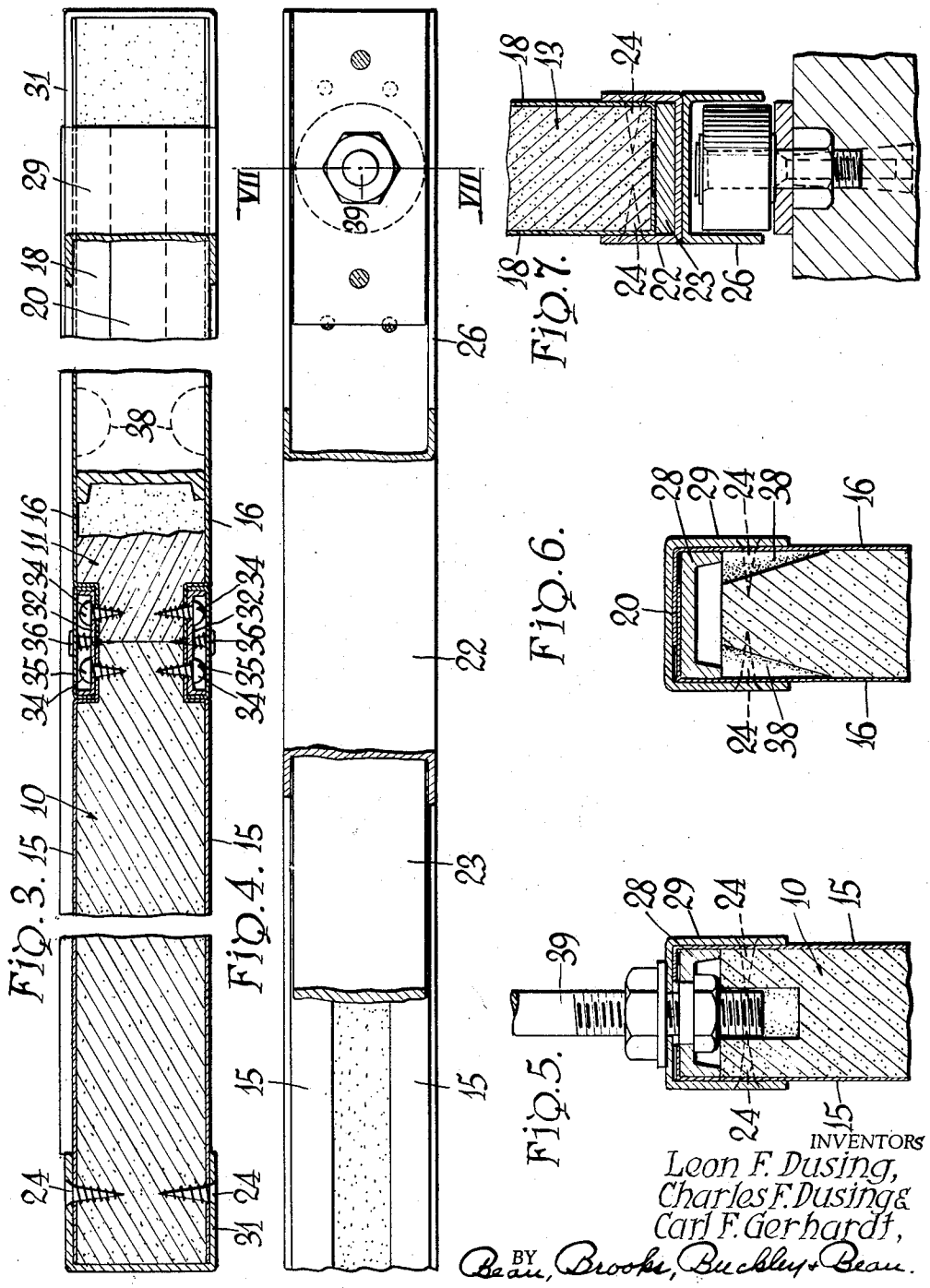

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

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FIRE DOOR CONSTRUCTION

Filed April 4, 1960 3 Sheets-Sheet 3

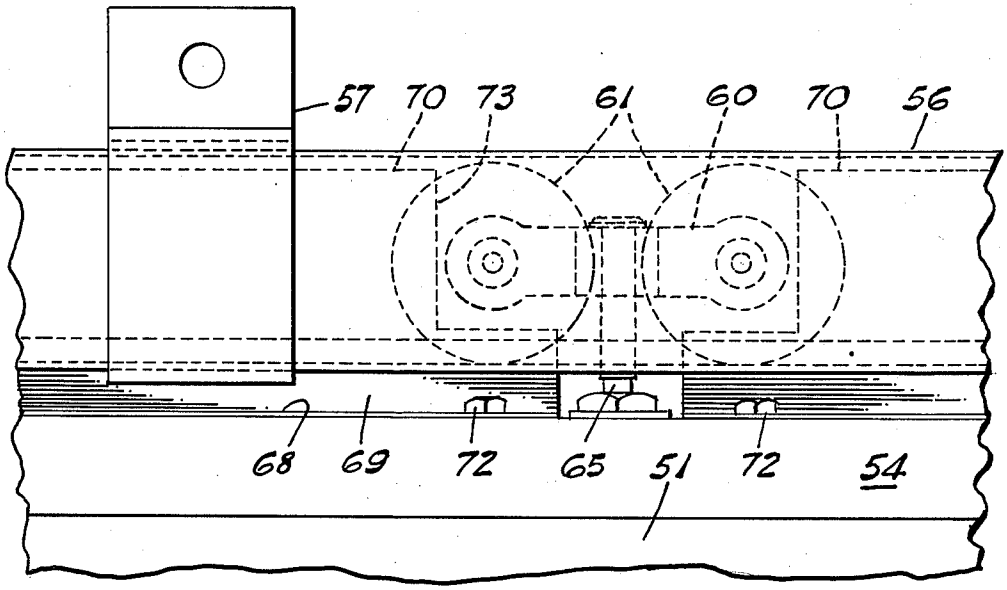

FIG. 8.

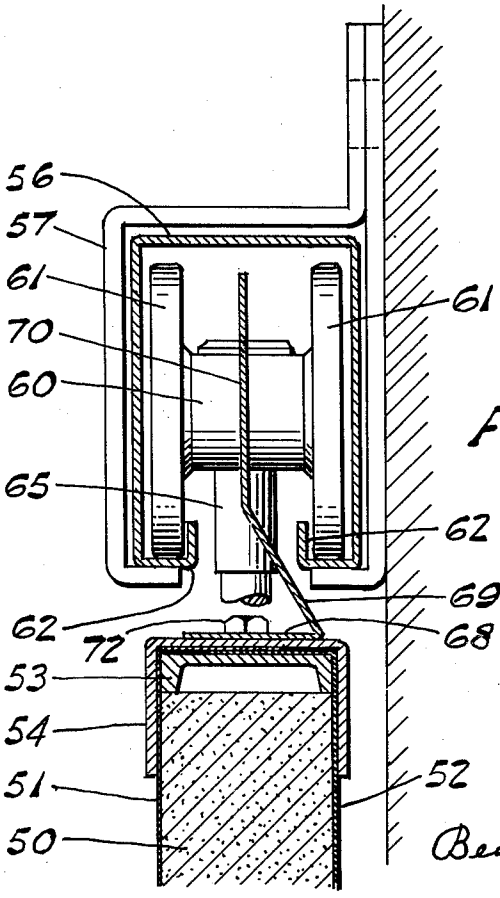

FIG. 9.

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FIRE DOOR CONSTRUCTION

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6 Claims. (Cl. 189—46)

This invention relates to fire doors and particularly to fire doors of the type comprising cast slabs of heat insulating core material faced with sheet metal.

In fire doors of this general type the sheet metal facing is attached to the surfaces of the slabs of core material in various ways, as by use of adhesives, for instance, and it is obviously desirable that the metal facing material lie closely against the core material. Also various framing channels are provided to give the finished door adequate rigidity against deflection or distortion from its normal plane of extent.

In constructing fire doors of the prior art with these considerations in mind the usual result is a closely knit more or less unitary door which, however, is subject to the following objectionable potentiality. In the event of exposure to substantial heat, as in case of a fire, either the core material or the adhesive used in securing the metal cladding or facing thereto, or both, may evolve gases or steam which develop internal pressures forcing the sheet metal facing material away from the core material. The ensuing buckling, warping and distortion obviously destroys the integrity and usefulness of the door as such and more particularly as a fire stop.

The present invention provides a cast slab and metal facing type of fire door construction which effectively eliminates the foregoing objection by providing predetermined and built-in egress passages for gases and steam evolved as aforesaid, whereby such gases and steam cannot be trapped in such manner as to force the sheet metal facing material from the core material. Furthermore, the above object is attained in a simple structural manner which provides a fire door which is economical to build and which is rigid and of high strength, entirely apart from and in addition to the qualities which are directly due to the gas and steam escape provisions which are inherent therein.

A further important object of the present invention resides in providing a sliding fire door of this general type which involves a novel upper door structure and wherein the door proper is suspended from hangers or pendent devices in a novel manner which gives firm and rigid suspension support to the door. In general terms this latter object is accomplished by incorporating a rigid horizontal structural member within and along the upper portion of the door in such manner that the usual sheet metal skin facing extends generally about the same and in a preferred form is clamped securely thereto by an outer channel member.

The hangers or pendants engage through the outer channel and through the aforesaid horizontal structural member which, as stated, is of substantial rigidity, and accordingly the suspension support is transmitted to the sheet metal skin of the door at both sides thereof in such manner that the suspension force is distributed with great uniformity along the inner and outer skin surfaces.

A further object of the present invention is achieved by providing flame barrier means extending upwardly from the upper surface of the door proper to within the usual overlying track to prevent the passage of flames in the normally open clearance space between the bottom of such track and the top of the door proper.

Representative embodiments of the principles of the present invention are illustrated in the drawings and described in detail in the following specification but it is to be understood that such embodiments are by way of example only and that fire doors constructed in accordance with the principles of the present invention may assume various forms and that numerous mechanical modifications may be made in the construction without departing from the spirit of the invention, the scope of which is limited only as defined in the appended claims.

In the drawings:

FIG. 1 is an elevational view of a building wall having one form of the door of the present invention mounted in association with a doorway therein;

FIG. 2 is a fragmentary perspective view of an upper corner of the door of FIG. 1;

FIG. 3 is a top plan view of the door of FIG. 1 with portions thereof broken away and with other portions shown in cross section for added illustration;

FIG. 4 is a bottom plan view of the door of FIG. 1, likewise with portions thereof broken away;

FIG. 5 is a fragmentary cross sectional view of an upper edge portion of the door taken approximately on the line V—V of FIG. 1;

FIG. 6 is a fragmentary cross sectional view of a further upper edge portion of the door taken on the line VI—VI of FIG. 1;

FIG. 7 is a fragmentary cross sectional view of a lower edge portion of the door taken on the line VII—VII of FIG. 4;

FIG. 8 is a fragmentary elevational view of an upper portion of a sliding fire door and the overlying track therefor showing one form of flame barrier associated therewith; and

FIG. 9 is an end elevational view partly in cross-section of the upper door and track structure of FIG. 8.

Like characters of reference denote like parts throughout the several figures of the drawings and, referring to FIG. 1, the main body of the fire door set forth herein by way of example is made up of four relatively narrow vertically extending panels designated, from left to right, by the numerals **10**, **11**, **12** and **13**. Each of the panels comprises a slab or core of set cementitious material and each such slab has adhesively secured to its opposite faces a sheet metal facing member, the facing sheets of the several panels **10** through **13** being designated **15** through **18**, respectively. The slabs or core members of the panels **10** through **13** are of non-metallic fire-resistant insulating material of a cast cementitious nature. A preferred core material is one composed chiefly of hydrous calcium silicate available commercially and known in the art as "Kaylo."

The metal facing sheets **15** through **18** extend entirely across the front and rear faces of the several slabs or cores and are coterminous therewith along the vertical side edges of the slabs as may be observed in FIG. 3. At the bottom edges of the slabs the front and rear metal facing sheets **15** through **18** fold partially over the edges of the slab or core member as shown in FIG. 7 and at the top edges the facing sheets fold inwardly in overlapping relationship as shown at **20** in FIG. 6 in such manner as to provide a space between the overlapping flanges and the underlying top edges of the core members or slabs of insulating material.

In assembling a door a longitudinal bottom channel member **22** is reinforced against longitudinal warping or distortion by placing therein a longitudinal bar **23** as shown in FIG. 7 and then the lower edges of the several metal faced panels **10** through **13** are slipped into the channel **22** and secured by sheet metal screws **24** which thread into the sheet metal facing members **15** through **18** of the panels. Bottom channel **22** has welded to its under surface a downwardly facing tracking channel **26**

which serves with the usual guide roller to guide the lower portion of the door in opening and closing movements, the door being of the sliding type in the illustrative instance set forth herein.

At the upper end of the door a reinforcing bar channel member **28** is slipped into place in the aforesaid vertical space between the overlapping top flanges of the sheet metal facing members **15** through **18** and the underlying top edges of the core members or slabs and a top framing channel **29** is assembled over the assembly thus provided in the manner clearly illustrated in FIG. 6 and channel **29** is likewise secured to the metal facing sheets **15** through **18** by sheet metal screws **24**.

The framing of the door is completed by a pair of vertical channel members **31** which are slipped over the outer vertical edges of the end panels **10** and **13** and likewise attached thereto by sheet metal screws **24** as shown in FIG. 3. The top and bottom channel members **29** and **22** are of such length that they extend between the inner edges of the side channel members **31** and thus leave openings at their upper ends which give access to the space beneath the reinforcing channel member **28** as clearly shown in FIG. 2.

The several panels **10** through **13** are connected along their abutting edge portions in a manner which will now be described with particular reference to FIG. 3. The raw unfaced edges of the slabs or cores of panels **10** through **13** abut as shown in FIG. 3 and are marginally recessed or rabbetted at their opposite faces as there shown, the facing sheets **15** through **18** being offset as shown to follow the marginal recesses of the core members. A vertical channel member is disposed in each of the recesses thus formed, such channels being designated **32** in FIG. 3 and sheet metal screws **34** secure the same against the underlying portions of the facing sheets **15** through **18**. The joint thus formed is finished off by further vertical channel members **35**, the flanges of which embrace the channels **32**, and sheet metal screws **36** secure the finish channels **35** to the channels **32**.

Extending across the tops of the several slabs or core members of the panels **10** through **13** are a series of edge notches **38** which are semi-circular or, more strictly speaking, semi-conical, in the illustrated instance. When extreme heat causes the adhesive at the interfaces between the core members or slabs of the panels and the facing sheets **15** through **18** to give off steam or gas, such steam or gas can pass upwardly into the space beneath reinforcing channel member **28**, either directly or, in view of the retaining effect of top framing channel **29**, through the notches **38**, without causing any considerable bulging of the facing sheets **15** though **18**. The same is true of gases or steam which may evolve from the bodies of the slabs or core members themselves upon extreme heating.

Steam or other gases thus reaching the longitudinal space beneath channel **28** are free to pass therealong to the upper corners of the door where egress is freely available as clearly illustrated in FIG. 2.

FIG. 5 illustrates the manner in which a conventional sliding door adjustable hanger **39** may be associated with the upper edge of the door by clamping engagement with the reinforcing channel **28**, the overlapping facing sheet portions, and the top framing channel **29**. The nut means attaching the hanger screw **39** to the door proper provides for vertical adjustment of the door in the usual manner.

It will further be noted that the adjusting nut means at the lower end of the hanger screw or pendant **39** clamps the inner rigid channel **28** to the outer framing channel **29** with the overlapping upper edges of the facing sheets **15** through **18** securely clamped therebetween continuously along the upper edges of the door. Thus the substantial rigidity of the reinforcing channel **28** is imparted to the upper edges of the facing sheets **15** through **18** and the top framing channel **29** whereby the entire upper edge structure of the door is thus unified and stiffened to provide a very rigid and stable upper door structure from which the remainder of the door is securely and rigidly suspended.

Reference will now be had to the embodiment of the invention illustrated in FIGS. 8 and 9. It is to be understood that the door structure per se is the same in FIGS. 7 and 8 as in the preceding embodiment and that FIGS. 7 and 8 differ from the previously described structure only in providing a flame barrier or flame shield structure which is fixed to the top of the door and extends upwardly into the stationary track from which the door is suspended.

Referring particularly to FIG. 9, a slab or core member **50** having sheet metal facing members **51** and **52** is associated at its upper end with a rigid channel **53** and an outer framing channel **54** in the same manner as in the previously described embodiment. A conventional supporting track **56** in the form of a downwardly opening channel is supported above the door opening by a plurality of bracket members **57**.

A carriage **60** is provided with spaced pairs of rollers **61** which bear within track formations **62** at the lower portion of channel **56** and a hanger screw or pendant **65** extends downwardly from carriage **60** and through the channels **53** and **54** to the door structure, again in the same way as in the previous embodiments.

A series of flame barrier or shield members are attached to the top surface of the door. In the present instance each such member comprises a base flange **68**, an oblique portion **69** and a vertical flange **70**. The several base flanges **69** are attached to the top of the door structure by screws **72** and the upper portions of the flame barrier members may be notched as indicated at **73** in FIG. 8 to clear the carriage members **60**.

It will be seen from the foregoing that the upwardly extending portions of the flame barrier members close the major portion of the clearance space normally present between the top of the door proper and the bottom of the track **56** against direct air flow and direct passage of heat or flames.

We claim:

1. In a fire door, generally rectangular slab means of insulating material extending substantially the height of the door, sheet metal facing members attached to the opposite faces of said slab means, top framing channel means forming a longitudinal passage along the top of said door directly above the slab material, said longitudinal passage being open to the atmosphere at at least one end of said door, and notches along the upper edges of said slab means extending downwardly below said top framing channel means to permit escape of gas from between the facing sheets and the slab means to said longitudinal passage.

2. In a fire door, a plurality of generally rectangular slabs of insulating material in side by side relation, each slab extending substantially the height of the door, sheet metal facing members attached to the opposite faces of each slab, top framing channel means forming a longitudinal passage along the top of said door directly above the slab material, said longitudinal passage being open to the atmosphere at at least one end of said door, and notches along the upper edges of said slabs extending downwardly below said top framing channel means to permit escape of gas from between the facing sheets and the slabs to said longitudinal passage.

3. In a fire door, generally rectangular slab means of insulating material extending continuously substantially the height of the door, sheet metal facing members attached to the opposite faces of the slab means and continuing upwardly beyond the slabs to define a longitudinal passage along the top edge of the door, and top framing channel means adapted to close the upper side of said passage, said longitudinal passage being open to

the atmosphere at at least one end of said door, and notches along the upper edges of said slab means defining passages leading downwardly from the top surfaces of the slab means to points below said top framing channel means for escape of gas which may evolve at the interfaces between said slab means and said facing members.

4. In a fire door, a plurality of generally rectangular slabs of insulating material in side by side relation, each slab extending continuously substantially the height of the door, sheet metal facing members attached to the opposite faces of each slab and continuing upwardly beyond the slabs to define a longitudinal passage along the top edge of the door, top framing channel means adapted to close the upper side of said passage, said longitudinal passage being open to the atmosphere at at least one end of said door, and notches along the upper edges of said slabs defining passages leading downwardly from the top surfaces of the slabs to points below said top framing channel means for escape of gas which may evolve at the interfaces between said slabs and said facing members.

5. In a fire door, generally rectangular slab means of insulating material extending continuously substantially the height of the door, sheet metal facing members attached to the opposite faces of the slab means, and top framing channel means having downwardly extending flanges adapted to embrace the upper portions of said facing members and spaced above the upper ends of said slab means to form a longitudinal passage open to the atmosphere at at least one end of said door, said passage being defined along its lower side by the upper surfaces of said slab means, and notches along the upper edges of said slab means extending downwardly beneath the lower edges of the flanges of said top framing channel to provide fluid communication to said longitudinal passage for gas which may evolve at the interfaces of said slab means and said facing members.

6. In a fire door, a plurality of generally rectangular slabs of insulating material in side by side relation, each slab extending continuously substantially the height of the door, sheet metal facing members attached to the opposite faces of each slab, and top framing channel means having downwardly extending flanges adapted to embrace the upper portions of said facing members and spaced above the upper ends of said slabs to form a longitudinal passage open to the atmosphere at at least one end of said door, said passage being defined along its lower side by the upper surfaces of said slabs, and notches along the upper edges of said slabs extending downwardly beneath the lower edges of the flanges of said top framing channel to provide fluid communication to said longitudinal passage for gas which may evolve at the interfaces of said slabs and said facing members.

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