March 14, 1939. C. R. WILLIAMS 2,150,754

FIREPROOF CONSTRUCTION

Filed July 19, 1937 2 Sheets-Sheet 1

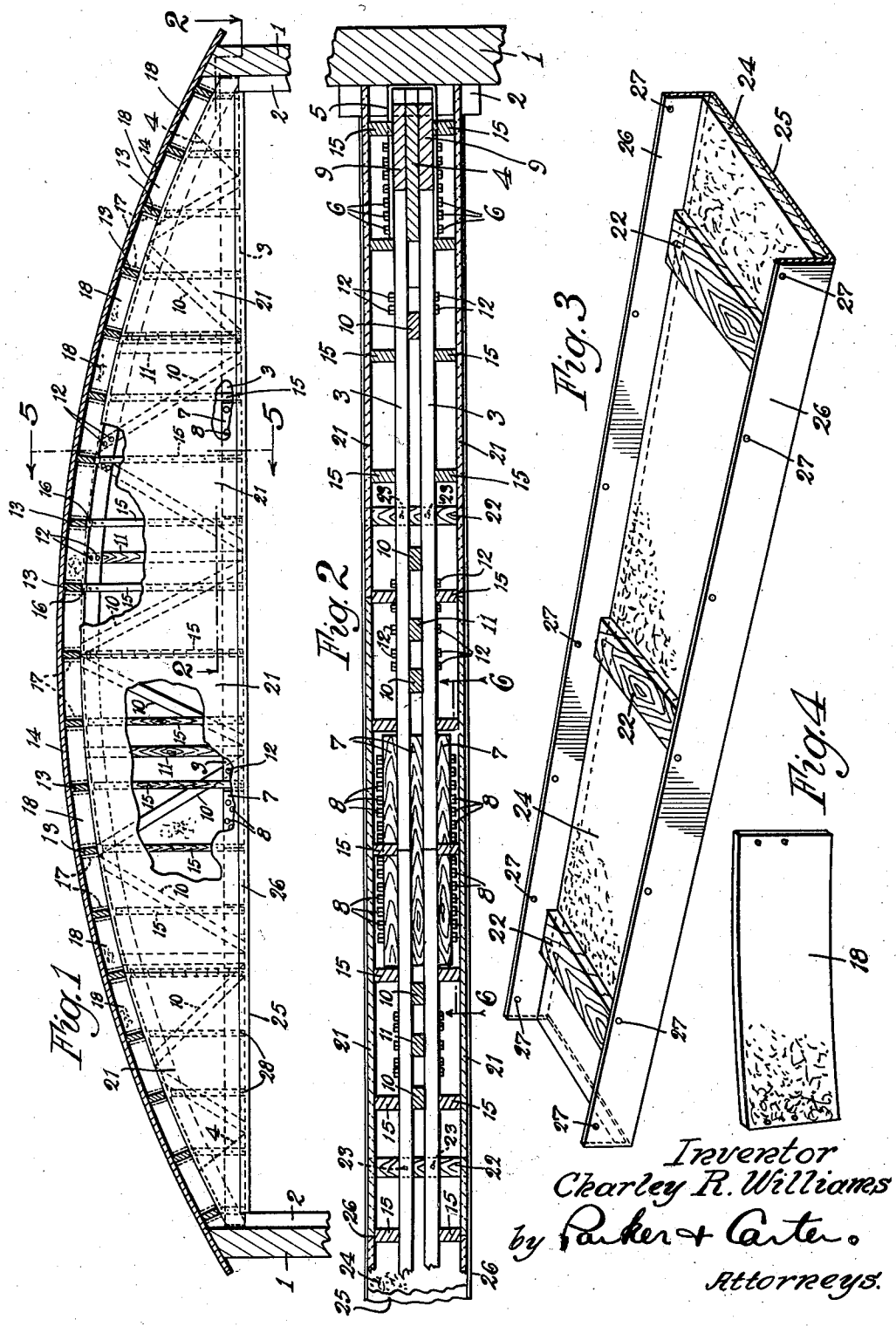


Fig. 1

Fig. 2

Fig. 3

Fig. 4

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Fig. 5

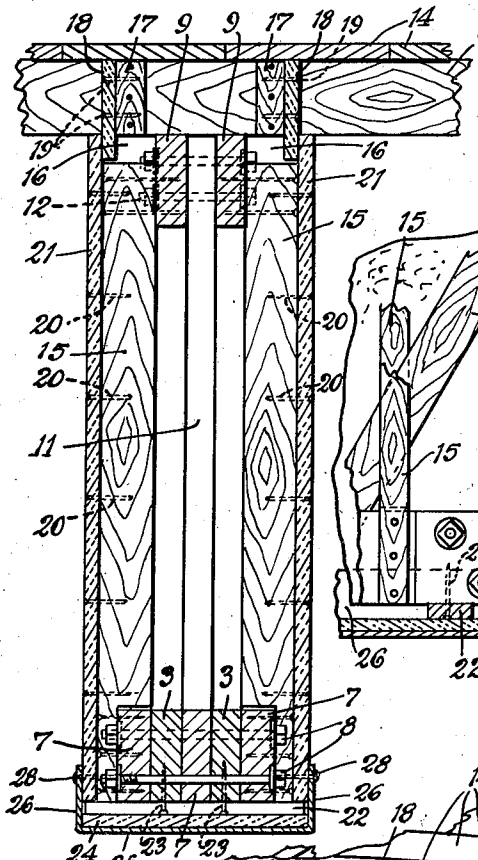


Fig. 6

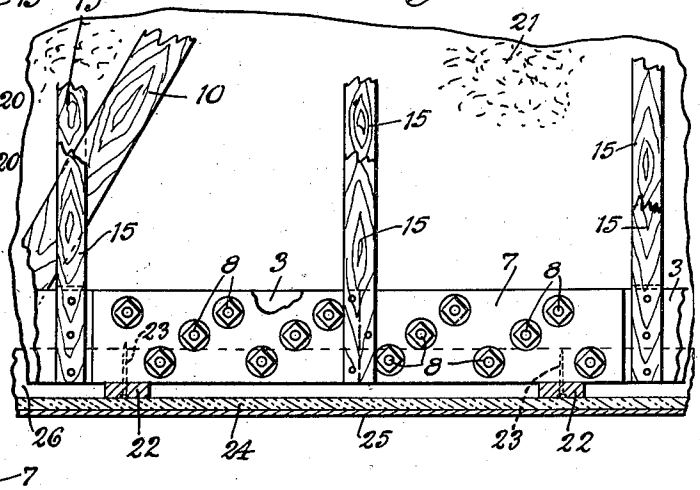
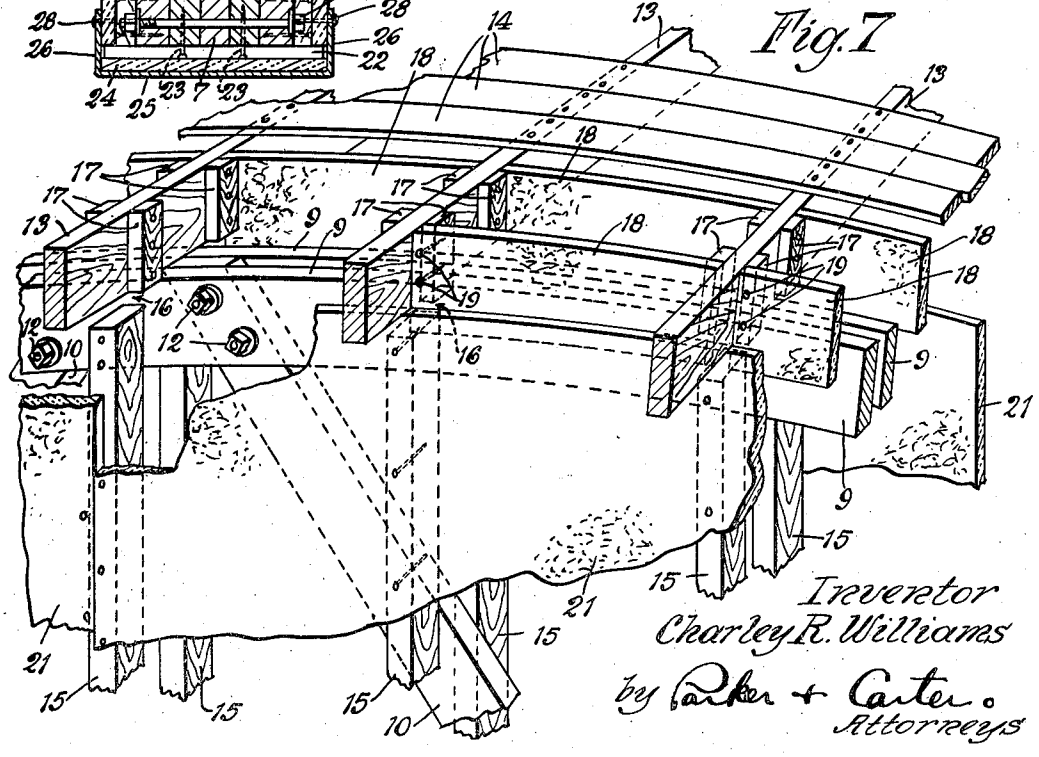


Fig. 7



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Patented Mar. 14, 1939

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UNITED STATES PATENT OFFICE

2,150,754

FIREPROOF CONSTRUCTION

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Application July 19, 1937, Serial No. 154,475

13 Claims. (Cl. 108—23)

This invention relates to a fireproof or fire resistant structural member and the process of producing it.

It has for one object to provide a structural member or unit which is formed of a normally combustible material but has associated with it, so as to form part of the unit, a fire resistant exterior portion which may be in the form of a sheathing or covering.

Another object is to provide a method of forming the said structural member. Another object is to provide a fire resistant sheathing or housing which may be applied to an otherwise complete structural member either before that member is used in a building or after it has been so used.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a vertical section through a building in which the present invention is applied to a roof supporting truss;

Figure 2 is a fragmentary horizontal sectional detail on an enlarged scale, taken at line 2—2 of Figure 1;

Figure 3 is a perspective view of the bottom portion of the sheathing with parts in section;

Figure 4 is a side elevation in perspective showing another part of the sheathing;

Figure 5 is a transverse vertical section taken on an enlarged scale at line 5—5 of Figure 1;

Figure 6 is a vertical sectional detail taken at line 6—6 of Figure 2 on an enlarged scale;

Figure 7 is a perspective showing a portion of the roof of Figure 1 with parts broken away, parts omitted and parts in section on a scale enlarged with respect to that used in Figure 1.

Like parts are designated by like characters throughout the specification and drawings.

The invention is shown as applied to a roof truss supporting the roof of a building. Side walls 1 of the building are shown supporting the truss. Internal walls or supporting members 2 may be used and upon them the truss is supported. The invention may be applied to many other forms of structural members besides trusses and is not limited to the particular application shown nor to the particular truss form shown nor to the means of supporting the truss, although one of the more important uses of the invention is that shown in which a wooden truss is rendered fire resistant or fire proof.

As shown, the truss comprises a plurality of straight, longitudinal members 3 between the ends of which a spacing and strengthening member 4 is positioned. A U-shaped end plate 5 may be applied to each end and where applied covers the end and a portion of the side members 3, as shown at the right of Figure 2. Bolts 6 or other suitable attaching means secure the ends of the truss members together and hold the plate 5 in place when the latter is used. In the case of a large truss, the straight members 3 will not run from end to end of the truss and reinforcing and joining members 7 are used to effect a joint between ends of the members 3. Such adjoining members are secured together by bolts 8 and by any other suitable attaching means. The section of Figure 5 is taken at such a joint.

A generally curved top is formed for the truss and is made up of members 9, 9, which at their ends are secured to the members 3 and may be embraced and engaged by the plates 5. A plurality of diagonal bracing members 10 may be installed and these are preferably positioned so that their lower ends lie between the members 3 and their upper ends between the members 9. Such diagonal members are shown generally in Figure 1 and adjacent their lower ends in section in Figure 2 and adjacent their upper ends in perspective in Figure 7. Vertical members 11 may also be applied and connected top and bottom to the upper and lower truss members. At the point of attachment of these members to the top or bottom units of the truss, bolts 12 or other fastening means may be used to hold the parts in place.

While the particular form of truss shown has been described in some detail, the invention is not limited to this truss and many other forms of truss detail and construction may be used where the housing or sheathing of the present invention is to be applied and the details of the form thus shown have been described to illustrate the interrelation between the truss generally and the sheathing which forms the more particular subject of the invention.

As shown, roof beams 13 rest upon and are supported by the trusses and upon them are positioned and supported roof planks or other covering members 14.

Where the structure of the present invention is to be applied to a truss of the type shown, it is preferable to provide in addition to the truss spacing and attaching members of such size and thickness that the fire resistant sheathing may be applied without serious bending or distortion. For this purpose preferably vertical spacers 15

are secured by nailing or otherwise to the exterior of the truss. As shown particularly in Figures 5 and 7, these spacers need not extend to the top of the truss and normally a space 16 is left between the top of each spacer and the top of the truss or the bottom of the roof beam 13.

Since it is desirable to have a fire resistant sheathing or covering extending clear to the ceiling, that is to say, above the top of the truss proper, spacing and attaching cleats 17 may be secured to the roof beams 13, as shown in detail in Figures 5 and 7. To these are secured members 18 which are formed of heat resistant or fire proof material. As shown in the detailed sectional view of Figure 5, two such members are applied between each pair of roof beams 13 and define the two sides of the composite truss and fire resistant construction member. These members 18 extend downwardly toward the top of a spacer 15 and into the space 16 which is left between the top of the member 15 and the lower edge of the roof beam 13. These members 18 are preferably fastened in place by nails or screws 19 which are normally made of copper or other corrosion-resistant material.

Secured to the spacers 15 by nails or other fasteners 20, also preferably of corrosion-resistant material such as copper, are the side sheathing members 21. These extend normally from the lower edges of the roof beams 13 to the bottom of the truss and thus furnish complete enclosure and sheathing for both sides of the truss. As shown particularly in Figure 5, the upper edges of the members 21 overlap with the lower edges of the members 18 and thus prevent the occurrance of any gap between the two through which fire or heat might readily penetrate.

Spacers 22 are provided for the bottom of the truss and as shown in Figures 5 and 6, may be secured to the truss by fastening means such as nails or screws 23, preferably of corrosion-resistant material such as copper, and below these one or more sheets or strips of fire resistant material 24 are positioned. These strips of material may be secured to the spacers 22 in any desired manner or may be mounted in the bottom of a trough-like member 25 which has upturned side flanges 26 perforated as at 27 to receive nails or screws or other fastening members 28. For some purposes it is not necessary to secure the spacers directly to the bottom of the truss but they and the strip 24 may be mounted in or secured to, or supported by the trough 25. After these spacers and the strip 24 are mounted they are within or are enclosed or surrounded by the trough 25 and the sides or flanges 26 of the trough overlie the lower edges of the sheathing members 21, thus closing the bottom of the sheathing structure and surrounding it on its lower edge in addition to the heat resistant member 24, with a metal strengthening and reinforcing unit which serves not merely to enclose the parts but to hold them together.

The construction shown in the drawings and described above provides about the truss or other structural member to which the sheathing may be applied a fire resistant sheathing which completely encloses the truss or equivalent member and is preferably spaced away from the structural members of the truss. Thus not only is the fire resistant housing provided which directly holds heat and fire away from the structural members, but this housing is itself spaced away from them so that an air space is provided within the total housing and between the members which make up the housing and the truss itself, which serves as a further fireproofing or fire resistant feature.

Where the truss is to be made up as a unit before installation, the fire resistant enclosure of the present invention may be applied to the truss before it is built into a building or if it is desired to build the truss into the building first, that may be done and the fire resistant covering applied thereafter to the truss while it is in place in the building. Thus it is useful both for new and for old constructions. Although the invention is shown as applied to a wooden and, therefore, inflammable truss, it might be used for the protection of metal or other relatively non-inflammable trusses or building units. The greatest need, however, occurs in connection with wooden trusses and hence, although the invention is not limited to that use, it is shown in that connection.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of the parts without departing from the spirit of the invention and I wish, therefore, that my showing be taken as in a sense diagrammatic.

In particular the side sheathing members might be of almost any desired shape to fit the structural member or unit to which they are applied and instead of having separate members spaced between the roof beams or rafters, the side sheathing member might be made to fit the contour of the roof and notched or shaped to embrace or fit around the roof beams. It is ordinarily simpler to have the separate members for filling in the spaces between the roof beams, but it is within the contemplation of the invention to use either or both constructions.

The fire resistant covering of the present invention is arranged to be light so that it adds only very slightly to the total weight of the truss and the vertical spacers being secured as they are to the top and bottom members of the truss, further stiffen and strengthen it with the result that the added strengthening to the truss as as whole, because of the association with it of the fire resistant sheathing, more than compensates for the slight addition in weight and in no way detracts from the light weight and other advantages of wooden trusses and particularly trusses of the bowstring type, which is the type here illustrated, although the invention is in no sense limited to such trusses.

The covering may be of any desired material and may be painted any desirable color, or may have applied to it a coating of further insulating or fire resisting material such as asbestos or anything else desired. The use of a light colored paint, whether it be fireproof or not, has the advantage of creating a light reflecting surface, where this may be necessary, as in factories and industrial buildings of many sorts particularly and, of course, adds this reflecting surface where in the ordinary bowstring or open truss there is no reflecting surface.

The most important advantage of the covering is, of course, that of preventing, retarding and confining the spread of fire. In the case of trusses of the general type shown as now constructed, fire readily spreads from one end of the building to the other through the latticework formed by the trusses. This latticework being formed of wood, readily ignites and adds fuel to the fire with the result that in practice in a large

percentage of fires occurring in buildings where the roof is supported by wooden trusses, the fire spreads readily and the roof trusses burn quickly and weaken to the point where the entire roof falls with resultant serious damage to the side walls which are frequently pushed outward when the arc of the truss in falling creates pressure at the ends, and serious damage results also to the contents of the building because the falling of the roof not merely tends to crush or destroy the contents but also adds fuel to the fire already burning in the building. The provision of the fire resistant coating or sheathing about the truss insulates it from the heat of the fire so that the truss members themselves are less likely to become heated to the point of combustion, and also furnishes a mechanical shield from the flames should they come high enough otherwise to contact the truss members and since the spaces otherwise left open in a truss of the type shown are completely closed in by the sheathing members, the sweep of fire along the roof of the building is resisted and the enclosed trusses thus form in effect a series of fire walls, depending from the roof. These so-called fire walls confine superheated air rising from a flame within the building and not merely prevent the spread of flames but prevent the spread and movement of this superheated air and confine and isolate it and this occurs even though the roof beams or planks should burn because in this confined zone they burn out and permit the escape of the superheated air, and when this occurs the damage can be reduced and restricted as compared to that which occurs under present conditions with open wooden trusses since the tendency of the heat or flames or both to spread from end to end of the building, igniting the entire roof as they travel along, is greatly resisted or entirely prevented, and even though the heat be sufficient under normal conditions to ignite such a truss, experience has shown that with the construction of the present invention very considerable charring of the covering material may occur without any ignition or charring of the truss members themselves and without any reduction in their strength, and the cost of replacing the fire resistant coating is infinitely less than that of replacing a truss or a part of the roof.

The invention therefore contemplates not merely the production of a fire resistant structural member, but the association in a building of a plurality of such members to form in effect first, relatively fireproof trusses or structural members, and, second, a plurality of fire walls which serve to prevent spread of heat and flames, serve to isolate heat and flames, and consequently to isolate the total resultant damage.

The device illustrated may be used without complete coverage of the sides of the truss. For example, the trough-like construction of Figure 3 may be used alone or it may be used with side portions which extend only partly upward along the sides of the truss. So long as the bottom member of the truss remains intact, the danger of collapse of the roof is greatly reduced and the use of the member of Figure 3 with or without partial side shielding is, therefore, useful. The device shown in Figure 3 may be made up in regular lengths and applied to trusses already in position or to trusses at the time of manufacture and while not giving them full fire resistant protection, nonetheless gives important fire resistance to that portion of the trusses which it is most necessary to preserve.

I claim:

1. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material and a trough-like member covering the bottom of the truss and engaging and covering the bottom edges of the side sheets.

2. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material and separate sheets of fire resistant material positioned partially above said side sheets with their lower edges overlapping the upper edges of said side sheets and positioned inside of said side sheets, and a trough-like member covering the bottom of the truss and engaging and covering the bottom edges of the side sheets.

3. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material, a sheet of fire resistant material positioned along the bottom of said truss, and a trough-like member covering the bottom of the truss and engaging and covering the bottom edges of the side sheets and said bottom sheathing member.

4. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material and separate sheets of fire resistant material positioned partially above said side sheets with their lower edges overlapping the upper edges of said side sheets and positioned inside of said side sheets, a sheet of fire resistant material positioned along the bottom of said truss, and a trough-like member covering the bottom of the truss and engaging and covering the bottom edges of the side sheets and said bottom sheathing member.

5. In combination with a truss having top and bottom members, a fire resistant enclosure therefor, comprising spacing members secured to said truss, side sheathing members of fire resistant material secured to said spacing members, a bottom sheathing member for the bottom of said truss, spacers interposed between said bottom sheathing member and said truss, a metallic trough-like member having upwardly extending flanges positioned along the bottom of said truss, enclosing said bottom sheathing member and said bottom spacers and extending upwardly beyond the bottom edges of said side sheathing members.

6. In combination with a truss, a fire resistant enclosure therefor comprising side and bottom sheathing members of fire resistant material positioned about said truss, and spacers secured to said truss between it and the said sheathing members, and an additional bottom enclosing member formed of metal and provided with side flanges, said last mentioned enclosing member overlying said bottom sheathing member and the lower edges of said side sheathing members.

7. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material and

a member covering the bottom of the truss and engaging the side sheets.

8. In combination, a load carrying roof truss and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss, including side sheets of fire resistant material, a sheet of fire resistant material positioned along the bottom of said truss, and a member covering the bottom of the truss and engaging the side sheets and said bottom sheathing member.

9. In combination a load carrying roof truss comprising upper and lower members and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss including a part extending along the bottom of said truss, parts extending along the sides of said truss and extending upwardly beyond the upper edge of each member of said truss.

10. In combination, a load carrying roof truss comprising upper and lower members and means for rendering it fire resistant, said means comprising an enclosure of fire resistant material for the sides and bottom of said truss including a part extending along the bottom of said truss, parts extending along the sides of said truss and extending upwardly beyond the upper edge of each member of said truss, said upwardly extending parts being indented along their upper edge to inter-fit with structural members with which the truss is adapted to cooperate.

11. In combination, a load carrying roof truss and means for rendering it fire resistant, said truss comprising a longitudinal bottom member and other structural members above said bottom member, said means comprising an enclosure of fire resisting material for said longitudinal bottom member, which enclosure includes parts underlying the bottom of said longitudinal member and parts extending upwardly along the side of said longitudinal member and comprises a trough-like structure formed of fire resisting material and underlying the bottom of the truss and extending upwardly along the sides of the truss, said trough-like structure including insulation and a metallic member and means for spacing the metallic member from the truss, the metallic member being positioned outwardly with respect to the insulation.

12. A fire resistant composite member adapted to be secured to a part to be insulated and comprising a trough-like metallic part having upwardly extending flanges shaped for attachment to said part to be insulated, and a body of insulating material surrounded in part by said trough-like member and adapted to hold the trough-like member out of contact with said part to be insulated.

13. A fire resistant composite member adapted to be secured to a part to be insulated and comprising a trough-like metallic part having upwardly extending flanges shaped for attachment to said part to be insulated, and a body of insulating material surrounded in part by said trough-like member and adapted to hold the trough-like member out of contact with said part to be insulated, and additional spacers positioned within the trough.

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