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FIRE-RETAINING ROOF STRUCTURE

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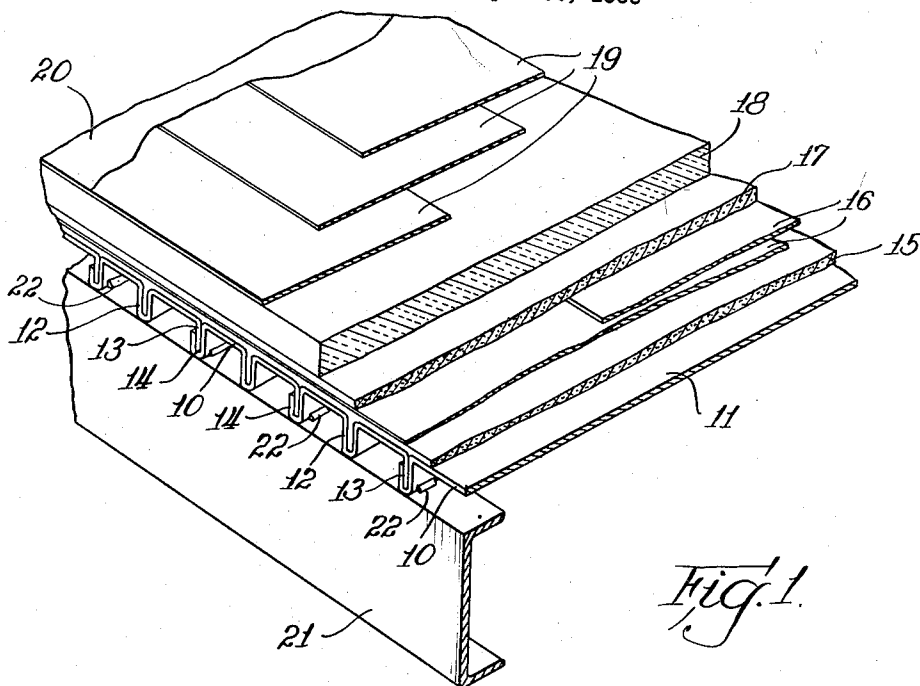
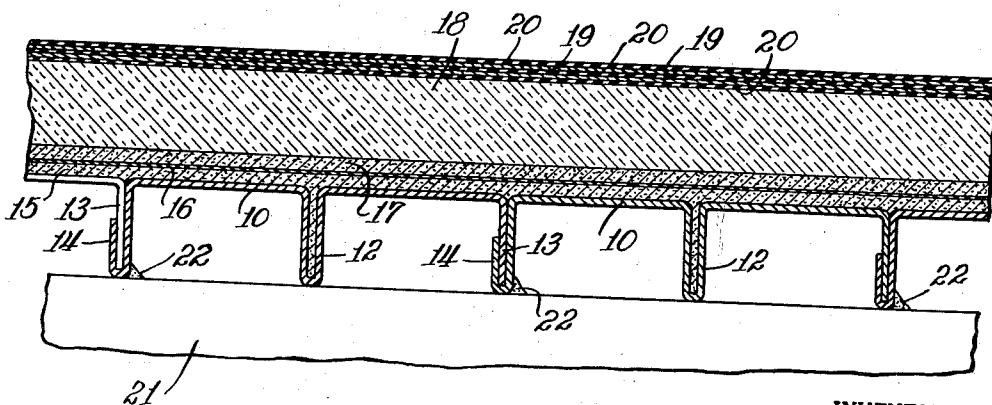


Fig. 1.

Fig. 2.



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FIRE-RETAINING ROOF STRUCTURE

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6 Claims. (Cl. 108—6.5)

This invention relates to a fire-detaining roof structure. One well known type of roof structure, which is widely used on industrial plants and other large buildings, employs a coating of asphalt or other bituminous material for waterproofing the roof. Usually this coating is applied over sheets of roofing paper. Both the asphalt coating and the roofing paper are combustible materials, which can be ignited rather readily and upon being ignited tend to cause the fire to spread rapidly across the roof of the building. This problem is further accentuated by the fact that it is usually not practical to support the roofing paper and asphalt coating on an imperforate fireproof surface. While interlocking steel plates have been used to provide the supporting surface of the roof, the interlocking means employed is such that cracks or openings exist between the plates. Therefore, as a fire spreads across the roof molten and vaporized asphalt can pass downwardly between the metal plates, making it almost impossible to confine the fire to the roof. Further, the heat from any fire beneath the roof is readily conducted through the metal plates to the asphalt coating on top thereof, thereby melting the coating and allowing molten asphalt to seep downwardly between the plates. This may lead to the transfer of a fire from the interior of the building to the roof, or vice versa.

It is therefore an object of this invention to provide a fire-detaining roof structure which overcomes the problems just discussed, while at the same time permitting combustible waterproofing materials to be employed in forming the roof. A more specific object is to provide a roof structure which tends to confine a roof fire to the vicinity of the roof by preventing the bituminous materials used to waterproof the roof from passing downwardly through the roof to the interior of the building while a fire is burning across the roof. Another specific object is to provide in a roof structure of the character described means for limiting the transfer of heat in both directions. Further objects and advantages will become apparent as the specification proceeds.

This invention is shown in an illustrative embodiment in the accompanying drawing, in which

Fig. 1 is a fragmentary perspective view of a roof structure constructed in accordance with this invention, showing the various layers partially broken away to expose the lower layers; and Fig. 2, a longitudinal sectional view of the roof structure of Fig. 1, showing the various layers in superposed relation.

The fire-detaining roof structure of this invention is characterized by a plurality of metal plates arranged to provide an extended upper surface for receiving waterproofing material, combustible waterproofing material including a coating of bituminous material over this extended upper surface, and fireproof material between the combustible waterproofing material and the extended upper surface. Preferably, the fireproof material should include at least one layer of metal foil between two layers of mineral cement.

Turning to the specific illustration given, there is shown

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in Figs. 1 and 2 a roof structure formed of a plurality of edge interlocking metal deck plates 10 which are arranged side by side to provide an enlarged upper surface 11. In the illustration given, plates 10 are provided centrally with a longitudinally-extending, U-shaped channel 12 for supporting and stiffening the plates. Along one longitudinal edge plates 10 are provided with a downwardly-turned flange 13 and along the other edge with a U-shaped channel 14. As shown in the drawing, channels 14 are adapted to receive the flanges 13 of the adjacent plates, thereby interlocking the plates. However, this interlocking arrangement does not provide a liquid or gas-tight seal, and liquids or gases can move through the cracks between the plates.

Immediately above surface 11 there is provided a layer 15 of a fireproof cement or mineral adhesive. On top of layer 15 there is provided a layer of metal foil 16. Preferably, aluminum foil is employed for this purpose and the sheets of aluminum foil are overlapped up to 50% to provide layer 16, as indicated more clearly in Fig. 1. Above layer 16 there is provided another layer 17 of mineral cement, which is preferably of the same fireproof adhesive material as layer 15.

If desired, there can also be provided a layer 18 of suitable insulating material. In fact, the roof structure of this invention is particularly suitable for use with roofs employing conventional insulating material and the aluminum foil can be pre-adhered thereto to avoid handling of foil in the wind if desired. Above layer 18 there is provided a layer 19 of roofing paper, which is preferably formed by overlapping sheets of roofing paper, as indicated more clearly in Fig. 1.

A coating of bituminous material 20 is applied over the layer 19, that is, over the roofing paper in accordance with the usual practice. It will be understood that any bituminous material suitable for use in waterproofing roofs can be employed, such as the various roofing asphalts, tars, pitches, etc. All of these bituminous materials are combustible or contain combustible ingredients and therefore usually present the problem to which this invention is directed.

Deck plates 10 can be mounted in any suitable manner on the supporting structural steel of the building. For example, in the illustration given, the U-shaped edge flanges 14 are welded to the upper flange of I-beam 21, as indicated at 22. Alternatively, in accordance with well known practice, suitable clips can be employed for connecting the deck plates to the supporting structural steel members. It will be understood, of course, that this type of construction is not limited to flat roofs but can also be employed with pitched or arched roofs.

It is believed that the method of practicing this invention will be apparent from the foregoing description. All that is required is that a roof structure be installed to provide fireproof material of the character described between the combustible waterproofing and insulating materials, and the upper surface of the supporting metal plates. As already described, the fireproof material preferably consists of a layer of metal foil between two layers of fireproof mineral cement. Various specific formulations can be used for the mineral cement, such as the following formulation:

Ingredients:	Approximate percent by weight
Magnesium oxide-----	35
Silica -----	50
Magnesium sulphate-----	10
Asbestos -----	5

It will be understood that the above ingredients will be combined in a finely ground condition, and mixed with water in an appropriate amount to prepare the

adhesive mixture. When the mineral cement is applied to the upper surface 11 provided by plates 10, as illustrated in Figs. 1 and 2, it tends to fill the cracks between plates 10, thereby sealing surface 11. Having the metal foil layer 16 between mineral cement layers 15 and 17 provides a further liquid-tight and gas-tight barrier unaffected by heat between surface 11 and the combustible roofing materials 18, 19 and 20.

As already suggested, not only are layers 15, 16 and 17 fireproof, but they combine to provide a barrier against the downward movement of the bituminous material 20 to points beneath the roof. This has the advantage of tending to confine a roof fire to the vicinity of the roof so that it will rapidly move across the roof and burn itself out without the fire being propagated downwardly through the roof. The metal foil layer 16 also has the function of minimizing the transfer of heat radiations through the roof structure in case of either a roof fire or a fire within the building. In other words, the metal foil layer acts as a reflector for the radiant heat, thereby tending to prevent it from being conducted through the roof in either direction. Moreover it is found that with the translucent cement, sun rays are reflected during summer time and heat in the building is conserved during the winter time.

While in the foregoing specification this invention has been described in relation to a particular embodiment thereof and specific details of this embodiment have been set forth, it will be apparent to those skilled in the art that this invention is susceptible to other embodiments and that many of the details set forth herein can be varied widely without departing from the basic concept of the invention.

I claim:

1. A roof structure comprising a plurality of edge interlocking metal plates arranged side by side with cracks therebetween to provide an extended upper surface for receiving waterproofing material, a layer of fireproof mineral cement immediately above said extended upper surface sealing the cracks in said surface, a continuous layer of aluminum foil on top of said cement layer, a second layer of fireproof mineral cement on top of said aluminum foil layer so that said aluminum foil layer is sandwiched between said two layers of mineral cement, combustible roofing insulation above said second layer of mineral cement, and combustible waterproofing materials above said insulation, said waterproofing materials including at least one layer of roofing paper and a coating thereabove of a combustible bituminous material.

2. A roof structure adapted to serve as a barrier to fires comprising a plurality of metal plates having edges thereof in overlapping relationship to provide an extended upper surface, a layer of fireproof cement immediately above said extended upper surface continuously thereacross, a layer of metallic foil, superposed continuously over said layer of fireproof cement, a second layer of fireproof cement continuously overlying said layer of metallic foil whereby said layer of metallic foil is sandwiched between said two layers of fireproof cement, a blanket of roofing insulation disposed in overlying relationship upon said second layer of fireproof cement and continuously extending waterproofing materials disposed upon said blanket of roofing insulation to provide a waterproofed fire barrier effective against both radiant heat and heat of conduction.

3. A roof structure adapted to serve as a barrier to fires comprising a plurality of edge interlocking metal plates arranged side by side with cracks therebetween to provide an extended upper surface, a layer of fireproof cement immediately above said extended upper surface sealing the cracks in said surface, a layer of metallic foil superposed continuously over said layer of fireproof cement, a second layer of fireproof cement continuously overlying said layer of metallic foil whereby said layer

of metallic foil is sandwiched between said two layers of fireproof cement, a blanket of roofing insulation disposed in overlying relationship upon said second layer of fireproof cement and continuously extending waterproofing materials disposed upon said blanket of roofing insulation to provide a waterproofed fire barrier effective against both radiant heat and heat of conduction.

4. A roof structure adapted to serve as a barrier to fires comprising a plurality of edge interlocking metal plates arranged side by side with cracks therebetween to provide an extended upper surface, a layer of fireproof cement immediately above said extended upper surface sealing the cracks in said surface, a layer of metallic foil superposed continuously over said layer of fireproof cement, a second layer of fireproof cement continuously overlying said layer of metallic foil whereby said layer of metallic foil is sandwiched between said two layers of fireproof cement, a blanket of roofing insulation disposed in overlying relationship upon said second layer of fireproof cement and continuously extending waterproofing materials disposed upon said blanket of roofing insulation to provide a waterproofed fire barrier effective against both radiant heat and heat of conduction, said waterproofing materials including at least one layer of roofing paper and a coating thereabove of bituminous material.

5. A roof structure comprising a plurality of edge interlocking metal plates arranged side by side with cracks therebetween to provide an extended upper surface for receiving waterproofing material, a layer of fireproof mineral cement immediately above said extended upper surface sealing the cracks in said surface, a continuous layer of aluminum foil on top of said cement layer, a second layer of fireproof mineral cement on top of said aluminum foil layer so that said aluminum foil layer is sandwiched between said two layers of mineral cement, combustible roofing insulation above said second layer of mineral cement, and combustible waterproofing materials above said insulation, said waterproofing materials including at least one layer of roofing paper and a coating thereabove of a combustible bituminous material, said layer of roofing paper being formed of overlapping sheets held securely by said bituminous material.

6. A roof structure adapted to serve as a barrier to fires comprising a plurality of rigidly supported roof plates arranged side by side with cracks therebetween to provide an extended upper surface, a layer of fireproof material supported on said surface and sealing said cracks, and a covering of waterproofing material over said fireproof material, said fireproof material including a continuous layer of metallic foil extending continuously across said upper surface, a fireproof cement between said foil and the roof plates for adhering said foil to said upper surface, a fireproof cement between said foil and said waterproof covering for adhering the covering to the foil, said waterproof covering including a blanket of roofing insulation adhered by said cement to the foil, and disposed in overlying relationship upon said layer of fireproof material, and continuously extending waterproofing materials disposed upon said blanket of roofing insulation to provide a waterproofed fire barrier effective against radiant heat and heat of conduction.

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