July 4, 1939. R. H. SMITH 2,164,790

HEAT-INSULATING ROOF

Filed March 26, 1937 2 Sheets-Sheet 1

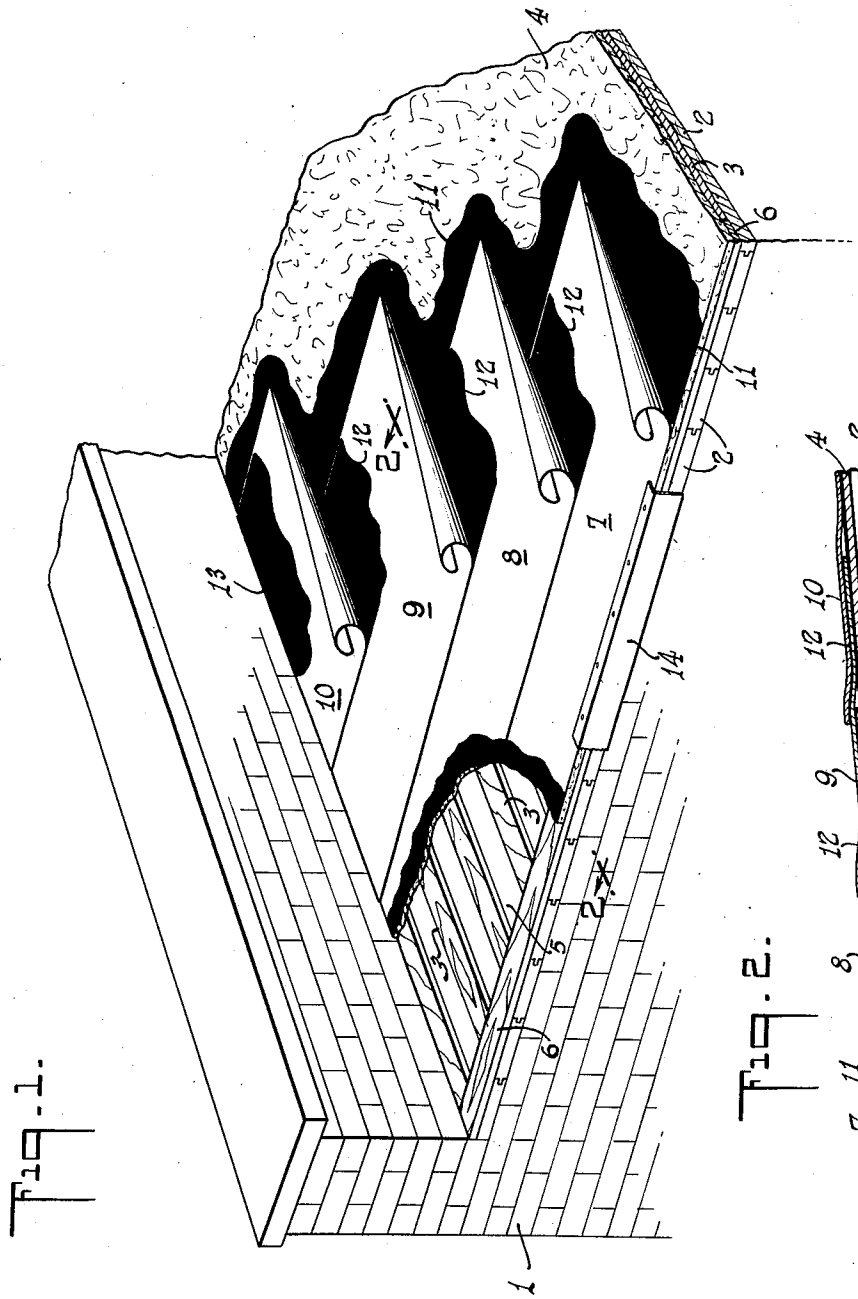


Fig. 1.

Fig. 2.

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Fig. 3.

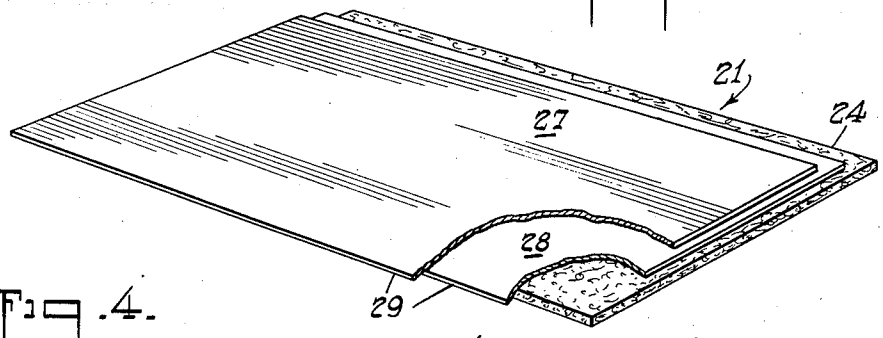


Fig. 4.

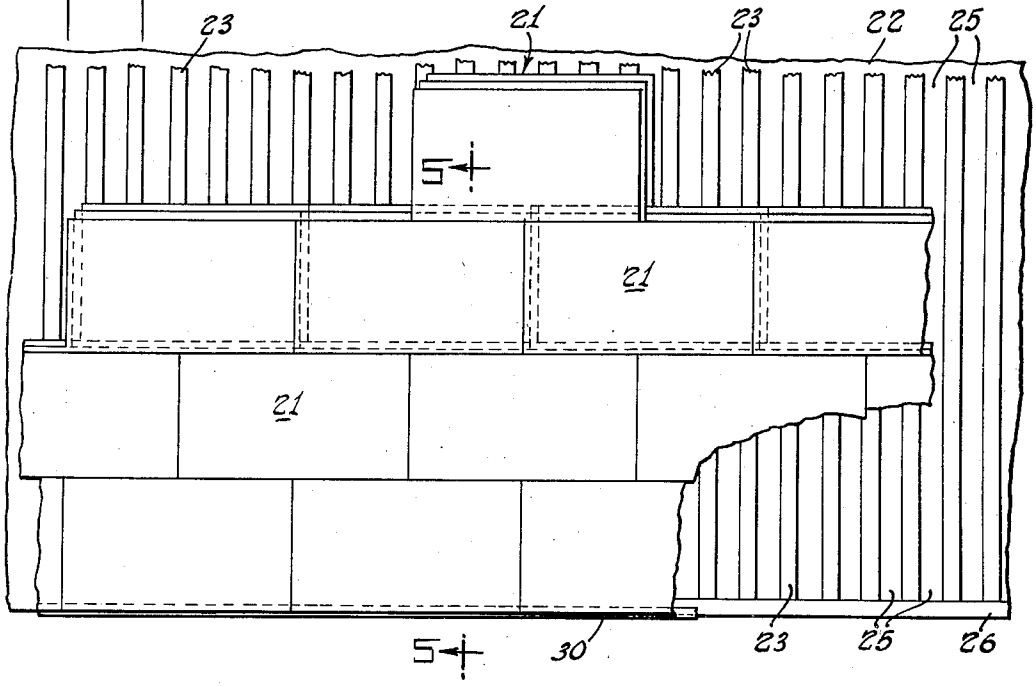


Fig. 6.

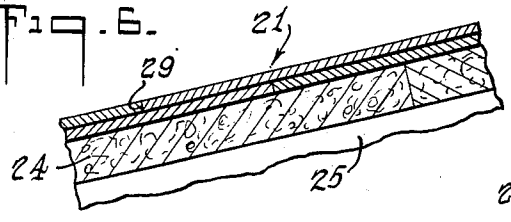
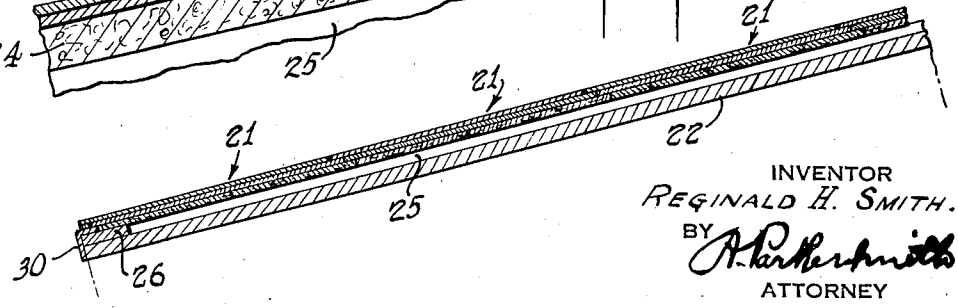


Fig. 5.



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Patented July 4, 1939 2,164,790

UNITED STATES PATENT OFFICE

2,164,790

HEAT-INSULATING ROOF

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Application March 26, 1937, Serial No. 133,098

6 Claims. (Cl. 108—6)

This invention relates to roofing generally, but is more specifically designed for use with prepared roofing, that is to say roofing composed of a fabric prepared and usually saturated with a waterproofing compound in the factory and sold in rolls or in sheets to be applied to wooden roofs.

Such roofing, whether made of asbestos or other fibrous material, is generally saturated with tar or asphaltic composition and frequently given an outer waterproofing surface of the same character which, being black, absorbs heat from the sun's rays.

Whatever the particular character of roofing employed it is important in hot weather to protect the building space beneath the roof as much as possible from excessive heat and in cold weather it is equally important to prevent as much as possible the conduction through and radiation from the roof of the artificially generated heat within the building. Also, in case of buildings which are air conditioned such heat protection also conduces to economy in operation of the air conditioning cooling apparatus which is always functioning in hot weather, and of the air heating devices which are operating in winter.

According to my present invention I propose to effect this heat insulation by employing an imperforate roof decking and interposing between said decking and the upper surfacing layer of waterproof material an intermediate layer of considerably higher heat insulating quality such as any of the light weight composition boards or porous material used for sound deadening the walls of buildings.

Also to further build up the air cell feature of the structure I preferably place a plurality of widely separated spacing members such as wooden lath, battens or furring strips between said decking and said layer of insulating material, evenly distributing said spacing members so that a plurality of fairly small closed air spaces will be created between them, the edges of the heat indulating layer being connected with the roof decking or the building wall so that no circulation of external atmosphere can be created through said spaces.

Preferably these spacing members should be elongated strips which will extend across the roof deck parallel one to another.

The best form of structure embodying my invention at present known to me, together with one modification thereof, are illustrated in the accompanying two sheets of drawings in which

Fig. 1 is a perspective view of a portion of a building and its prepared roofing being applied from rolls, with parts broken away and others shown in section, and

Fig. 2 is a fragmentary cross section on line 2—2 of Fig. 1.

Fig. 3 is a perspective view with parts broken away, of a modified form of the invention in which the roofing may be made up in slabs as units in the factory and laid like shingles on the job.

Fig. 4 is a fragmentary plan view of a roofing so laid.

Fig. 5 is a fragmentary section on line 5—5 of Fig. 4, and

Fig. 6 a detail thereof enlarged for greater clearness.

Throughout the drawings like reference characters indicate like parts. Referring to Figs. 1 and 2 portions of the walls of a brick building are indicated at 1, together with the flat deck 2 of wood on which are placed parallel wooden laths or battens 3, 3, supporting the superposed layer 4 of self-sustaining, heat insulating material such as asbestos board, Celotex, or some other cheaper type now on the market.

5, 5 indicate the air spaces formed between the roof deck, battens and material 4, and these are closed by end strips such as indicated at 6, or by the adjacent walls of the building structure or in any other convenient way.

7, 8, 9, 10 indicate rolls or partly unrolled strips of prepared roofing fabric of waterproof character which are usually cemented to the insulating layer 4 by hot asphalt or other material and have widely overlapping edges similarly fastened together to form water-tight joints. 11 indicates the layer of hot asphalt or other cement that is swabbed onto the insulating board 4, and 12, 12 indicate films of similar material which may be applied over the surface of each strip 7, 8, 9 or 10 as they are placed in position, while 13 indicates a top, finishing coating of hot asphalt usually given the completed roof.

After each such operation the workman quickly presses down the overlapping edge portion of the next strip or roll of roofing upon such area of softened cement before it has a chance to cool. In case an edge of the roofing is exposed as indicated in Figs. 1 and 2, it should be protected by a flap of waterproof fabric 14, which should extend down along the side edges of the end strip 6 and decking 2, as best shown in Fig. 2.

Referring to Figs. 3 to 6, the invention is there shown partly embodied in preformed sheets or

slabs like large shingles, indicated generally at **21**, which can be made up in the shop and sold and shipped in crates for storage or use on the job. These can be of any desired size within the limits of convenience in handling.

22 indicates the imperforate roof decking which is shown slightly inclined in Figs. 5 and 6, as the shingle feature fits into that type of roof structure nicely. These composite slabs **21** can, however, be used equally well on flat roofs. **23**, **23**, indicate the furring strips like **3**, **3**, in Figs. 1 and 2. The base layers of insulating board are shown at **24**, **24**, and **25**, **25**, indicate the closed air spaces between them and the roof decking. **27** and **28** indicate two sheets of commercial, prepared roofing which are stuck together and to insulating board sections **24** in the shop by the usual hot asphalt films, or by other waterproof cementing material. The sheets **27**, **28**, in each section or shingle are slightly offset when thus stuck together so as to form projecting, overlapping flaps as indicated at **29**. Consequently, when the shingles are laid, as best shown in Fig. 4, these uniformly arranged projecting flaps overlap and break joints at all seams between sections. The composite slabs or sections **21**, **21**, should be laid like shingles as shown, the projecting parts on two sides of each being swabbed with hot asphalt before the overlapping flaps of the adjacent shingles are pressed down on them. The units **21**, **21**, being thus fastened together in one single sheet of roofing, usually do not need any other fastening to the roof deck **22**, but may be tacked down or cemented to furring strips **23**, if desired. Strip **26** and flap **30** shown in Figs. 4 and 5 respectively serve the same purposes as those **6** and **14** shown in Figs. 1 and 2 and previously described.

More than two sheets of the waterproof fabric may be used, all being offset as shown in the case of **27** and **28**.

This form of the invention has the advantage that the cementing together of these sheets in the shop can be done by experienced workmen under close supervision, while in the ordinary laying of superposed rolls of roofing in the manner shown in Fig. 1, close inspection is not always possible and the workmen there employed are apt to hurry the job and apply the cementing films very unevenly, so that blisters and curling of the edges of the sheets subsequently develop.

The roof as a whole in either modification forms an air-cell structure, as clearly shown, of high heat insulating properties.

The use of my invention in re-roofing old buildings develops an especial advantage where there are sagging sections of the roof decking. The furring strips **3** or **23** can then be built up over these depressions so that their upper surfaces will all lie in one and the same plane, and the re-roofed structure then looks as good as new. No puddles will form on it, and the exact alignment of all units ensures watertight joints between them.

Another advantageous feature of the invention over prior suggestions of the mere use of continuous layers of heat-insulating material (such as hair felt) results from the fact that such fabrics absorb and hold moisture like sponges, while my construction has a major portion of the space between the deck and the top surface layer formed by relatively large air chambers which are good moisture insulators.

Various changes could be made in the details of construction illustrated and described without departing from the underlying principle of the invention so long as the resulting product is a built-up structure having an imperforate roof decking for its base, an air-tight waterproof upper surfacing layer and an intermediate layer of heat insulating material containing a plurality of closed air cells.

Having described my invention, I claim:

1. In a roof structure the combination, with a continuous imperforate supporting decking and a top surfacing layer of waterproof fabric, of an intermediate formation of high heat insulating characteristics comprising an upper layer of light-weight, non-heat-conducting fabric and a multiplicity of widely separated spacing members evenly distributed between said heat insulating layer and said decking, and in which the edges of said waterproof fabric and said decking are connected together by substantially air-tight closure, the multiplicity of closed air cells so produced between said decking and said insulating layer being uniformly distributed throughout a zone coextensive with a major portion of the area of said decking and constituting a proportion of the volume of space between it and said top surfacing layer sufficient to contribute substantially to the heat insulating properties of the roof structure as a whole.

2. A roof structure such as defined in claim 1 in which said spacing members are relatively thin battens substantially parallel one to another and each extending across the roof all the way between one sealed edge of said waterproof fabric and its opposite sealed edge.

3. A roofing structure such as defined in claim 1 which is partly formed of a plurality of rectangular sections, each of which is composed of a slab of heat insulating material and a plurality of said layers of waterproof fabric cemented one to another and to said slab.

4. A roofing structure such as defined in claim 1 which is partly formed of a plurality of rectangular sections arranged wholly in the same plane, each of which is composed of a slab of heat insulating material and a plurality of said layers of waterproof fabric cemented one to another and to said slab, all of said elements being of uniform dimensions laterally and being offset slightly one from another all in the same direction so that when assembled side by side on said deck the projecting edges of the waterproof fabric of one section will overlap exposed edge portions of contiguous sections; whereby, when said overlapping and exposed edge portions are cemented together, a continuous, waterproof, heat-insulating roof covering is formed, all joints in which are of the overlapping type.

5. A built-up roofing comprising an imperforate deck, an air space formation bottoming on the deck, spaced-apart battens dividing the air space into separate chambers, and an outer layer of built-up shingles serving as a covering closure for the air chambers, each built-up shingle consisting of a stiff rectangular base slab of light weight material of high heat insulating characteristics, and a plurality of sheets of more flexible but tough, waterproof fabric of the same surface dimensions cemented together one over another with two of the contiguous edge portions of each such fabric sheet projecting beyond those of the slab and of any other sheet beneath it; whereby, when a plurality of such shingles are assembled side by side and end to end upon a suitable supporting structure, they lie wholly within the same plane, all said adjacent fabric

edges overlap one another or edge portions of said slab, so that when cemented together in that position they will form slightly flexible, tough binding means uniting all said shingles in a unitary, waterproof sheet free of surface inequalities.

6. A built-up roofing as defined in claim 5, in which the base slabs of the shingles rest on the spaced battens and the latter are supported on the imperforate deck, the intervening air spaces formed between the deck and the superposed layer of shingles being closed by joining the edges of the base slabs adjacent the batten ends to the deck by substantially airtight means.

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