April 21, 1942. J. H. HARDY 2,280,579

ROOFING SURFACE

Filed March 25, 1941 3 Sheets-Sheet 1

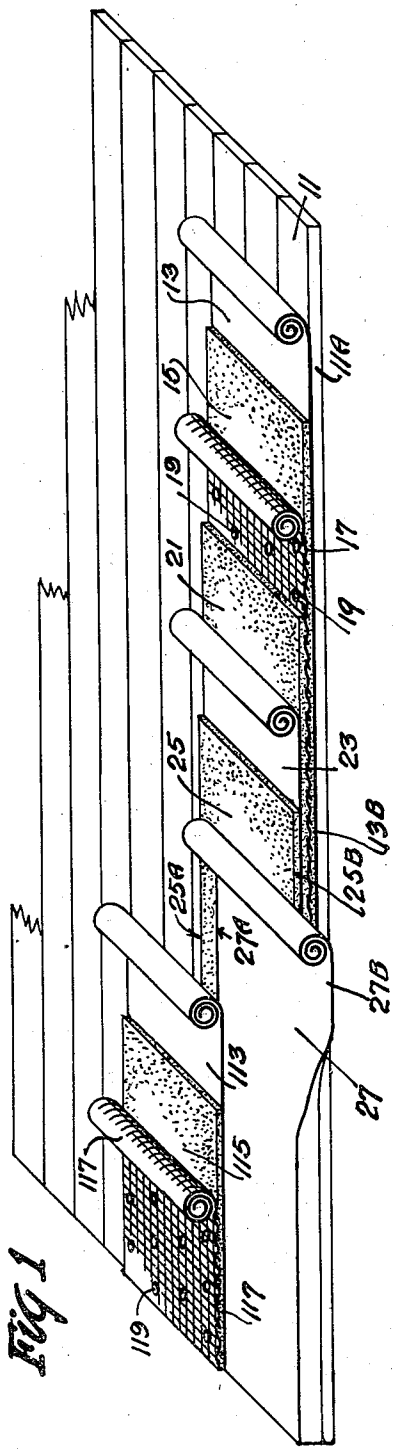


Fig. 1

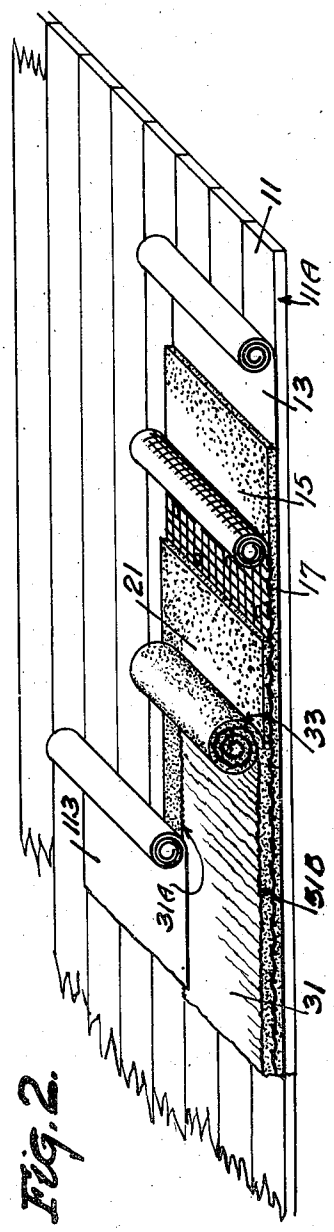


Fig. 2.

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FIG. 3.

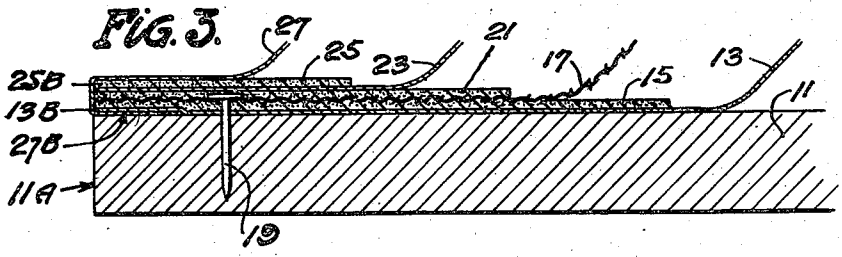


FIG. 4.

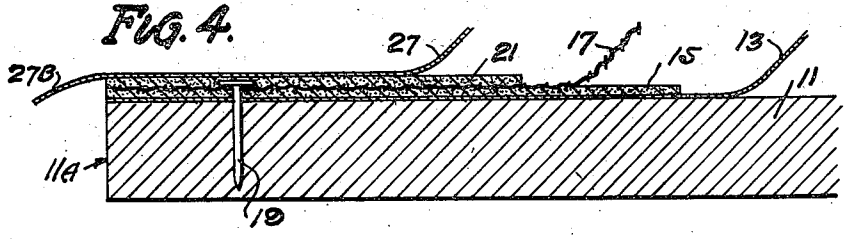


FIG. 5.

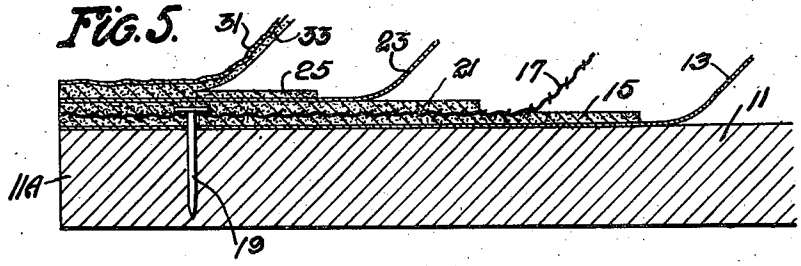
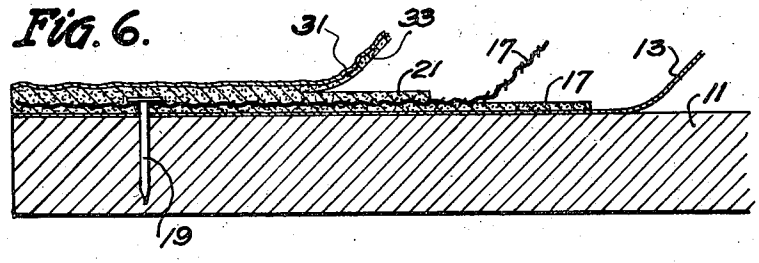


FIG. 6.



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Fig. 7.

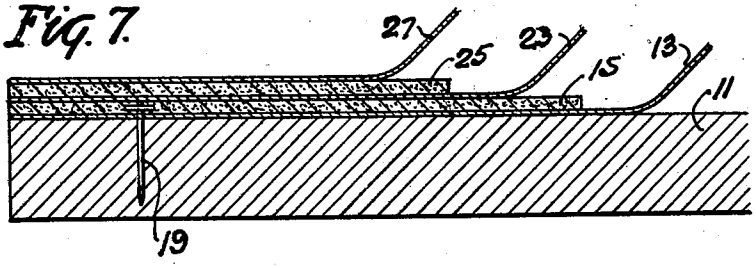


Fig. 8.

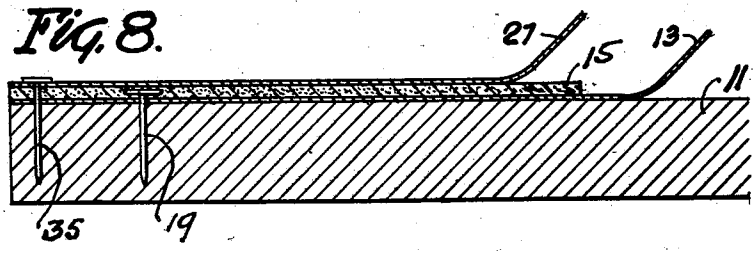


Fig. 9.

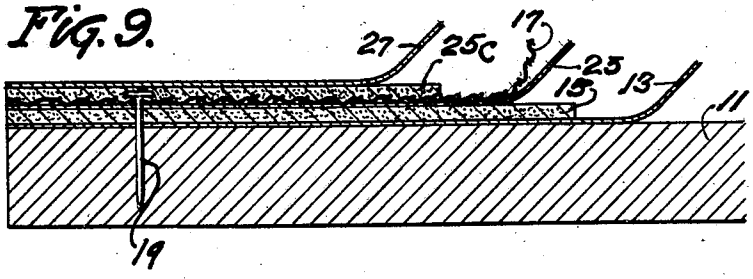
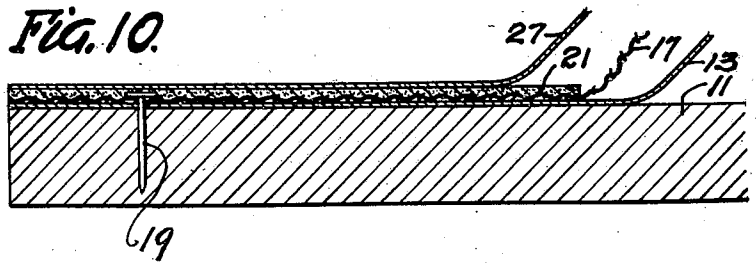


Fig. 10.



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2,280,579

ROOFING SURFACE

James Harris Hardy, Artesia, Miss.

Application March 25, 1941, Serial No. 385,045

22 Claims. (Cl. 108—6)

This invention relates to means for covering the roof or walls of buildings with a protecting surface and particularly to a surfacing structure in which cement mortar or concrete forms the exposed surface.

In the construction of building roofs and walls, concrete as a surfacing material has long appeared to be an advantageous low priced and long lived covering, provided the thickness of the material could be reduced to a point where the weight would not be excessive and the amount of material used could be kept down to an economical basis.

Among the obstacles encountered, however, are the very great difficulty of curing extremely thin slabs of concrete and the almost insurmountable difficulty of preventing the cracking of such slabs under curing and subsequently under expansion and contraction. In an endeavor to get away from this, shingle types of construction have been indicated, but here the necessity of even less thickness and the corresponding difficulty of curing has become even greater. Close fitting of the shingle surfaces where cured shingles are laid, because of the stiffness and inherent rigidity of the material, has also proven to be almost impossible, and the securing of the shingles has proven to be very difficult because of breaking the shingle in endeavoring to firmly seat and hold it down.

In a previous Patent No. 2,193,233 issued to me endeavor was made with notable success to meet the situation, but even so the resulting structure was inherently relatively massive and expensive. Supplementing this, further endeavor is disclosed in my now allowed pending application, 340,421, of which the instant application is a continuation in part.

In both of these structures, however, difficulty has been found in firmly securing the eave edge of the shingle, resulting in some cases in edge curling during curing, and even when this does not occur, leaving them open to the common fault of all shingle structures in general, that the eave edges are not firmly held down, with the concomitant result that dislodging wind may find entrance and snow and rain blow in.

The objects of the present invention are:

To build a concrete roof or wall using a minimum of material and of economical cost; which will be securely attached to the sub-surface structure; which will be securely attached over substantially its entire area, including exposed surfaces and exposed edge portions, and particularly eave edge portions; which will conform closely to the sub-surface structure and to structures overlying the same; which will substantially reduce and compensate for expansion and contraction strains and random cracking incident thereto; which will provide ample protection against leakage where cracks do occur; and which will satisfactorily and economically accomplish the curing of the material.

The means by which the foregoing and other objects are accomplished and the manner of their accomplishment will readily be understood from the following specification on reference to the accompanying drawings, in which:

Fig. 1 is a perspective view showing diagrammatically the sequence of steps in building the preferred form of surface structure.

Fig. 2 is a similar perspective view showing a modified form.

Figs. 3, 4, 5 and 6 are respectively transverse sections on a much larger scale of the eave edges of typical preferred forms of the structure, and the various steps in laying each thereof, Fig. 3 being a section of the type shown in Fig. 1, and Fig. 6, a similar section of the type shown in Fig. 2; and

Figs. 7, 8, 9 and 10 similar transverse sections of further modification forms of the construction.

Referring now to the drawings in which the various parts are indicated by numerals:

11 is the roof sheathing. In Figs. 1 and 3, a sheet 13 of bituminous paper such as tar or asphalt paper is rolled out along the eave edge 11—A of the sheathing. The surface of this paper is covered throughout its width and length with a thin layer 15 of rich cement mortar or, if desired, even of neat cement mortar, the mortar being mixed preferably of such consistency that it may be applied with a brush or spray gun; and endeavor being used to apply this mortar of uniform thickness throughout, the thickness ordinarily accomplished being, according to circumstances, of the nature of $\frac{1}{16}$ to $\frac{3}{16}$ of an inch. Over this freshly spread layer of mortar, an open mesh net 17 is laid. In its preferred form this net is of some $\frac{3}{16}$ inch mesh with warp and woof at right angles, each formed of loosely twisted strands, each strand in turn being of hard twisted heavy cotton fiber, of heavy thread or light cord weight, the net preferably being furnished in continuous rolls conforming in width to the underlying paper and mortar and being rolled out over and pressed into the fresh mortar. After the net is laid, nails 19 are driven down against the surface of the net and the mortar, these nails

being spaced at desired intervals along and adjacent the eave edge 11—A and additionally throughout the entire length and width of the net area. After nailing, an additional layer 21 of the cement mortar, of generally the same thickness as the original layer, is uniformly spread as promptly as possible and before the preceding layer has set. Following the placing of the second layer of mortar, a second sheet 23, of bituminous paper is unrolled and pressed down into intimate contact with the mortar. A surface layer 25 of mortar is then spread uniformly over the just laid paper and following this, a roll of oiled or waxed paper 27 is spread over the surface layer of mortar and pressed into intimate contact therewith.

The upper edge 27—A of this waxed paper is spaced away from the upper edge 25—A of the cement mortar an amount such that it will underlie the next succeeding sheet 113, mortar 115, net 117, etc., which are laid, and the width of the waxed paper is such that its eave edge 27—B will extend beyond the eave edges 25—B, 13—B, of the mortar layer 25 and sheet 13 respectively to permit it being folded around these edges and tucked under as shown in Fig. 3, to be thereby held until curing has taken place.

In Fig. 4 a construction is shown conforming to the construction shown in Figs. 1 and 3, with the omission of the paper sheet 23 and mortar layer 25 there shown. In this figure the eave edge 27—B of the waxed paper 27 is shown extending beyond the eave edge of the sheet 11—A and the overlying roofing layers prior to being folded and tucked under the eave edges of such roofing layers.

In Figs. 2 and 5, a sequence is followed similar to Fig. 4, except that subsequent to the placing of the mortar layer 21, a sheet of substantially impervious paper 31 is coated on its underside with a layer 33 of mortar, and this mortar covered layer of paper is rolled out on, and its mortar facing 33 intimately contacted and incorporated with the mortar layer 21 previously laid. In this form of the roof the upper edge 31—A of the paper 31 underlies the first layer 113 of the succeeding strip of roofing in manner identical to the similar edge 27—A of the sheet 27 (Fig. 1) and the eave edge of the sheet 31 may be similarly extended and folded under, or provided the sheet 31 be of sufficient stiffness and adhering quality, may simply as shown be laid even with the eave edge of the underlying mortar and sheet layers.

Fig. 5 corresponds closely to Figs. 1 and 3, with the exception that the cement coated paper 31 has been, as in Figs. 2 and 6, substituted for the plain waxed paper 27 of Figs. 1 and 3.

With further reference to Figs. 2, 5 and 6, it will be noted that the edge views of sheet 31 indicate a wavy or serrated sheet, and that the surface of the sheet 31 in Fig. 2 is indicated by irregular markings as crinkly, or other than smooth. It will be understood that the sheet 31 may be smooth and of substantial identity with the smooth waxed sheet 27, but the drawings are intended primarily to indicate a crinkled paper which will establish a similar crinkled surface or pattern in the underlying mortar, and which when removed will leave a roofing surface of crinkly or such other pattern or nature as the paper used will give.

Figs. 7 and 8 disclose structures closely following Figs. 3 and 4 with the omission of the fabric. Layer 15 of mortar in these views not being overlaid with fabric the covering layer 21 of the previous views is a part of the underlying edges 15 and has no initial separate identity or number.

Figs. 9 and 10 disclose structures following the showing of Figs. 3 and 4, with the exception that it has been found that the fabric 17 may be laid directly on the underlying bituminous sheet, as on the sheet 23 of Fig. 9, or the sheet 13 of Fig. 10, and overlaid with the mortar 25—C at 21, as the case may be, and embedment be secured in the placing of these layers.

Figs. 7 and 9 also furnish the suggestion that such number of alternate sheets and layers may be built up as may be desired, rather than stopping with the two layers there shown, and Fig. 9 the further suggestion that the fabric or other fibrous material may be placed in other than the lowermost layer. In these figures the cover sheet is shown terminating at the eave edge of the roof, but it will be understood that it may be extended and tucked under as in Figs. 1 and 3.

In Fig. 8 the eave edge of the cover sheet is secured by nails 35 which are additional to the nails 19 and are spaced from time to time along the edge to secure this sheet, such construction being permissible in cheap roofs where appearance is not of importance and cost a primary consideration.

It will be understood that in laying the roof endeavor in all cases is made to contact the paper sheets intimately with the mortar layers with as nearly as possible no entrained air. And in laying any of the types here shown, it is found that placing a roll of paper on the mortar surface and unrolling this paper along the mortar surface displaces the air effectually. It is believed that the crinkly paper may be similarly placed by unrolling and similarly displace the air even though the under surface of such crinkly paper be not coated.

It is found, however, that it is extremely difficult to lay the crinkly paper in intimate contact with a mortar surface and definitely displace all air from therebeneath in such laying, and it is found that a more efficient job can be done by coating the crinkly paper with mortar, and after such coating so rolling the paper that when unrolled this mortar surface will come into intimate contact with the underlying mortar surface over which the paper is spread and effectually solve the problem of displacing the air.

Should it be found that the entrained air is not all displaced by rolling out the paper, it is evident that vibration by some of the well known types of vibrating apparatus, perhaps modified to meet the exigencies of the situation, may be resorted to, to effect such displacement.

It has been found difficult to prevent smooth waxed paper from being displaced from the roofing surface during the curing period unless its upper edge slightly underlies the subsequently laid roofing and such underlying is therefore indicated, it being found that such underlying edge may subsequently be withdrawn at the end of the curing period. The eave edge, however, has no such securing means and it has been found best to let the paper overhang as described and immediately after laying, while all of the layers are wet and unset, raising the eave edge of the various roofing layers and sheets as an entity and folding and tucking under the edge of the paper to provide proper securing of such edge. Where crinkly paper has been used, however, the inherent stiffness furnished by the distortions of the paper due to crinkling and adherence of the

paper have been found to secure it satisfactorily against such displacement, and it is believed that the under-tucking of such edge may in these cases be omitted.

In the above descriptions, reference has been made from time to time to the eave edge of the roofing. It will be understood, however, that the term "eave edge," as applied to the first strip of roofing is equally applicable to the lower or eave edge of subsequent strips and is herein specifically so defined and intended.

It will be understood that in the claims where waxed or oiled paper is referred to, such paper may be crinkly paper or some other paper unless otherwise specifically noted.

After a roof, in accordance with the above specifications and drawings has been laid, it is allowed to cure for a period of ordinarily in excess of thirty days, after which the waxed paper, be it smooth or crinkly, is removed and the completion of the roof finally accomplished.

The paper used and herein referred to as bituminous paper is preferably paper known commercially as tar or asphalt paper, and depending on the preference of the builder, either may be used. Also some other type of paper or sheet material of similar nature which possesses resistance to water penetration, disintegration and other weather-resistant qualities, may be substituted for the bituminous paper specified without departing from the spirit and disclosure of my invention.

I claim:

1. A roofing surface laid on an underlying foundation, including, in overlying succession, a sheet of bituminous paper, a layer of mortar, a fibrous bonding material and a sheet of substantially waterproof material, said mortar and sheets being intimately contacted to displace air from therebetween and integrate adjacent surfaces, and means extending through under layers only of said surface embedded in and covered by said mortar, for securing said surface to said foundation.

2. A roof, comprising a foundation of sheathing or the like and successive overlapping roofing surface strips, each said strip including a sheet of bituminous paper, a layer of cement mortar, a fibrous bonding material, means extending through and securing said fibrous material, mortar, and sheet to said foundation, a second layer of mortar and an additional sheet of substantially waterproof material, overlying said sheet, layer, bonding material and securing means, said mortar layers and sheets being intimately contacted to dislodge substantially all air from therebetween and integrate the abutting surface thereof.

3. A roof, comprising a foundation of sheathing or the like and successive overlapping roofing surface strips, each said strip including a sheet of bituminous material, a layer of cement mortar, a fibrous bonding material, means spaced at intervals extending through and securing said fibrous material, mortar, and sheet to said sheathing, a second layer of mortar overlying said first named materials and said securing means, and an additional sheet of substantially waterproof material, said mortar layers and sheets being intimately contacted.

4. A roof in accordance with claim 3, in which the upper edge of each said sheet of waterproof material is spaced from the upper edge of its said strip to leave an uncovered mortar portion adapted for intimate and integrated contact with the next successive said strip.

5. A roof in accordance with claim 3, in which each said sheet of waterproof material is crinkly and adapted to transfer its surface pattern to the underlying mortar surface.

6. A roof in accordance with claim 3, in which the lower edge of each said sheet of waterproof material is folded over the lower edge of its respective said strip and tucked between said strip and said foundation.

7. A roofing surface laid on a suitable foundation, including successive overlapping strips, each strip including in overlying succession, a sheet of bitumenized material, laid on said foundation, a layer of mortar, a fibrous bonding material, means spaced throughout the length and breadth of said strip extending through and securing said fibrous material, mortar layer and sheet to said foundation, a second layer of mortar, covering said fibrous material and said securing means, a second sheet of bitumenized material, a third mortar layer and a removable sheet of substantially waterproof material, said sheets and mortar layers being intimately contacted to displace air from therebetween and integrate their surfaces.

8. A roofing surface in accordance with claim 7, in which each said removable sheet covers substantially only those portions of its said strip which after curing are to be exposed.

9. A roofing surface in accordance with claim 7, in which each said removable sheet is folded over and tucked beneath the lower edge of its related said strip.

10. A roofing surface laid on a suitable foundation, including successive overlapping strips, each strip including in overlying succession a sheet of bituminous paper, laid on said foundation, a layer of mortar, a fibrous bonding material, means spaced throughout the length and breadth of said strip extending through and securing said fibrous material, mortar layer and sheet to said foundation, a second layer of mortar covering said securing means, a second sheet of bituminous paper, a third mortar layer and a removable sheet of substantially waterproof paper spread over substantially only those portions of said strip which after curing are to be exposed, said sheets and mortar layers being intimately contacted to displace air from therebetween and integrate their surfaces.

11. A roofing surface in accordance with claim 10, in which said waterproof paper is of crinkled type and is coated on its underside before being spread, with an intimate layer of mortar, thereby to insure intimacy of contact of said mortar and duplication of the pattern of said paper on said strip.

12. A roofing surface in accordance with claim 10, in which each said removable sheet is wrapped around the lower edge of its respective said strip and tucked beneath said edge.

13. The method of laying a roof on a foundation which comprises placing along the eave edge of said foundation, a sheet of bituminous paper, covering said sheet with a substantially uniform layer of cement mortar, covering said mortar with an open mesh bonding fabric, securing said fabric, mortar and sheet to said foundation with nails spaced at intervals along and adjacent the eave edge and throughout substantially the entire area of said sheet, spreading over said fabric and first mortar layer a second mortar layer of substantially uniform thickness to cover

said nails and embed said fabric, disposing a second sheet of bituminous paper over said mortar layers, spreading over said bituminous paper an additional layer of mortar of substantially uniform thickness, disposing a sheet of substantially waterproof paper on said additional layer of mortar, said sheets and mortar being intimately contacted and integrated during laying to effect displacement and removal of substantially all air from therebetween; the upper edge of said waterproof paper being placed substantially parallel with and at a predetermined distance from the upper edge of said mortar layer to define an exposed mortar surface, and the lower edge thereof extending beyond the eave edge of said underlying mortar and sheets; and subsequently tucking said extending paper around and beneath said eave edges, to effect temporary securing of the lower edge of said waterproof paper; and thereafter overlapping said exposed mortar surface and a minor securing edge of said waterproof paper with an additional sheet of bituminous paper and repeating the aforesaid operation until the desired area of roof be covered.

14. A method of laying a roof in accordance with claim 13, in which the bituminous and waterproof paper is rolled out along the surface of the mortar to facilitate the displacement of air.

15. The method of laying a roof on a foundation which comprises placing along the eave edge of said roof a sheet of bituminous paper, covering said sheet with a substantially uniform layer of cement mortar, covering said mortar with an open mesh bonding fabric, securing said fabric, mortar and sheet to said foundation with nails spaced at intervals along and adjacent the eave edge and throughout substantially the entire area of said sheet, spreading over said fabric and first mortar layer a second mortar layer of substantially uniform thickness to cover said nails and embed said fabric, said second layer being integrated in placing with said first layer, disposing a sheet of substantially waterproof paper on said additional layer of mortar and intimately contacting said paper therewith to effect displacement and removal of substantially all air from therebetween, the upper edge of said paper being placed substantially parallel with and at a predetermined distance from the upper edge of said mortar layer to define an exposed mortar surface, the lower edge of said sheet extending beyond the eave edge of said underlying mortar and sheets, and subsequently tucking said extending edge around and beneath said eave edge, to effect temporary securing of the lower edge of said waterproof paper; and thereafter overlapping said exposed mortar surface and a minor securing edge of said waterproof paper with an additional sheet of bituminous paper and repeating the aforesaid operation until the desired area of roof be covered.

16. A roof including a foundation, a sheet of bituminous paper overlying said foundation, a layer of mortar overlying said sheet, fastening means spaced at intervals over a substantial area of the length and breadth of said sheet, particularly along the lower edge thereof, embedded in said mortar and securing said mortar and sheet to said foundation, a second sheet of bituminous paper overlying said mortar, a second layer of mortar overlying said second sheet and covering said fastening means, and a removable sheet of substantially waterproof material spaced over substantially only those portions of said mortar, which, after curing are to be exposed, said mortar and sheets being intimately contacted.

17. A roof including a foundation, a sheet of bituminous paper overlying said foundation, a layer of mortar overlying said sheet, a second sheet of bituminous paper overlying said mortar, a second layer of mortar overlying said second sheet and a sheet of substantially waterproof material spaced over substantially only those portions of said mortar which are not to be overlaid by subsequent sheets and mortar, said mortar and sheets being intimately contacted, and fastening means spaced at intervals over substantially the entire area of the length and breadth of said sheet, embedded in and covered by one said mortar layer and securing the structure to said foundation.

18. A roofing surface laid on an underlying foundation, including, in overlying succession, a flexible sheet of substantially waterproof material, a layer of mortar, a fibrous bonding material and a final sheet of substantially waterproof material, said mortar and sheets being intimately contacted to displace air from therebetwen and integrate adjacent surfaces, and means extending through under layers only of said surface, embedded in and covered by said mortar, for securing said surface to said foundation.

19. A roof including a foundation, and strips of surfacing material disposed in shiplap fashion on said foundation, each said strip including in overlying succession, a sheet of bituminous material, a layer of cement mortar and a fibrous bonding material intimately contacted, and fastening means embedded in and covered by said mortar, said means extending through and securing said mortar and sheet to said foundation.

20. The method of laying a roof on a foundation which comprises placing along the eave edge of said foundation, a sheet of bituminous paper, covering said sheet with a substantially uniform layer of cement mortar, covering said mortar with an open mesh bonding fabric, securing said fabric, mortar and sheet to said foundation with nails spaced at intervals along and adjacent the eave edge and throughout substantially the entire area of said sheet, spreading over said fabric and first mortar layer a second mortar layer of substantially uniform thickness to cover said nails and embed said fabric, disposing a sheet of substantially waterproof paper on said second layer of mortar, and intimately contacting and integrating said sheets, mortar and fabric during laying to effect displacement and removal of substantially all air from therebetween; the upper edge of said waterproof paper being placed substantially parallel with and at a predetermined distance from the upper edge of said mortar layer to define an exposed mortar surface, and the lower edge thereof extending beyond the eave edge of said underlying mortar and sheets; effecting temporary securing of the lower edge of said waterproof paper; and thereafter overlapping said exposed mortar surface and a minor securing edge of said waterproof paper with an additional sheet of bituminous paper and repeating the aforesaid operation until the desired area of roof be covered.

21. The method of laying a roof on a foundation which comprises placing along the eave

edge of said foundation, a sheet of substantially waterproof material, covering said sheet with a substantially uniform layer of cement mortar, covering said mortar with an open mesh bonding fabric, and embedding said fabric in said mortar, securing said fabric, mortar and sheet to said foundation with nails embedded in and covered by said mortar, said nails being at least spaced at intervals along and adjacent the eave edge of said sheet, disposing a sheet of substantially waterproof paper on said layer of mortar and fabric and intimately contacting and integrating said paper with said mortar, to remove substantially all air from therebetween; the upper edge of said waterproof paper being placed substantially parallel with and at a predetermined distance from the upper edge of said mortar layer to define an exposed mortar surface, and the lower edge thereof extending beyond the eave edge of said underlying mortar and sheets; and subsequently effecting temporary securing of the lower edge of said waterproof paper; and thereafter overlapping said exposed mortar surface and a minor securing edge of said waterproof paper with an additional sheet of waterproof material and repeating the aforesaid operation until the desired area of roof be covered.

22. The method of laying a roof on a foundation which comprises placing along the eave edge of said foundation, a sheet of bituminous paper, covering said sheet with a substantially uniform layer of cement mortar, covering said mortar with an open mesh bonding fabric, securing said fabric, mortar and sheet to said foundation with nails driven through said fabric, mortar and sheet, particularly along the eave edge thereof, spreading over said fabric and first mortar layer a second mortar layer of substantially uniform thickness to cover said nails and embed said fabric, intimately contacting and integrating said sheets, fabric and mortar during laying to effect displacement and removal of substantially all air from therebetween; thereafter overlapping the upper edge portion of said mortar surface with an additional sheet of bituminous paper and repeating the aforesaid operation until the desired area of roof be covered, and protecting the upper surface of said mortar during a predetermined curing period.

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