FIG. 2.

FIG. 1.

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This invention relates to means for covering the roof of a building with thin strips or shingles of cement mortar or concrete.

In the construction of building roofs, 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 curving extremely thin slabs of concrete and the almost insurmountable difficulty of preventing the cracking of such slabs under curving and subsequently under expansion and contraction. In an endeavor to get away from this a shingle type of construction has been indicated, but here the necessity for even less thickness and the corresponding difficulty of curving has become even greater. The close fitting of the shingle surfaces when the 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 this same rigidity and brittleness and the resulting danger of breaking the shingle in endeavoring to firmly seat and hold it down.

The objects of the present invention are:

1. To build a shingle type concrete roof using a minimum of material and of economical cost; which will be securely attached to the sub-surface structure, and conform closely to this surface and shingles already thereon; which will be substantially free from expansion and contraction strains and random cracking incident there to; which will effectually care for joints due to construction; which will control and care for expansion, contraction, or other cracks, such as may 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 plan view showing the surface appearance of a typical portion of the finished roof.

Fig. 2 is a section taken as on the line II—II of Fig. 1.

Fig. 3 is a similar section on the same scale showing the roof under construction and indicating the anchoring means.

Fig. 4 is a plan view of a fragmentary portion of the roof and the mechanism employed in the construction; and

Fig. 5 a fragmentary section showing forming means for the first or edge strips used.

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

10 is a sheathing course such as is usually employed. 11, 12, 13, 14 and 15 are elongated shingle strips disposed parallel to the eave edge 10—A of the sheathing. The strip 11 is a starting strip and the strips 12, 13, 14, 15 are successive overlying shingle strips, which overlying strips are substantially identical. The overlying shingle strips after initial forming are preferably grooved, as at 16, to outline on these strips shingle patterns 12-A, 12-B, 12-C, etc.; 13-A, 13-B, etc., etc., as shown in plan in Fig. 1, and the starting shingle 11 is preferably also so grooved, although such grooving does not show in the finished roof. The strips are made in lengths of a plurality of shingles, as for example 10, except that half strips preferably are used to begin alternate courses.

20 and 21 are nails which are driven into the sheathing prior to placing the concrete thereon and which are embedded in the concrete during the placing and forming of the strips, these nails serving to anchor these strips securely to the sheathing.

A covering 25, as of tar paper, entirely encloses the starting strip 11 after this strip has been formed. A portion of this covering 25—A lies along the roof sheathing 10 and is placed thereon prior to the placing of the concrete, this portion preferably extending slightly beyond the upper edge of the strip. The nails 20 are driven through the covering into the sheathing with the heads of the nails projecting well thereabove but below the desired finished surface of the strip. 31, 32 and 33 are similar coverings around the shingle strips 12, 13 and 14, the base portion 31-A of the covering 31 lying along the roof sheathing and in conformity with and along the upper surface of the covering 30 of the starting strip 11; and the under-surfaces 32-A, 33-A of the coverings 32 and 33 lying along the sheathing and the upper surfaces of the coverings of the successive shingle strips 12 and 13. During construction of each strip, as shown in Fig. 4, the covering for such strip, as the shingle strip 15, is placed so that the underlying portion 34—A lies along the roof sheathing 10 and along the
upper surface of the folded over covering 33 of the completed strip with that portion 34 of the covering which is to be later folded over extending over the upper surfaces of others of the completed shingles in such amount as is necessary to provide covering for the lower end and top of the strip when finished and for a projecting top similar to the top 33-B of the covering 33. The coverings each are longer than the strip, having end portions as the end portion 34-B, with the covering over the ends on their respective strips after they are completed.

40 and 41 are guide members used in the construction of the roof. These members are at least equal in length to the longest strip to be made and are securely held together by ties or braces 42 (one only being shown) adjacent their opposite ends and at an intermediate point or points if desired, these braces being securely nailed or bolted to the members to accomplish a templet and form for a shingle strip. To provide clearance to work under the braces, blocks or shims 43, 44 may be used between the braces and the members 40, 41. The member 40 is provided with a templet and form edge 45, which has a depth equal to the thickness of the butt edge of the shingle strip, and the member 41 with a templet edge 46 corresponding in thickness to the upper edge of the strip. Preferably on account of the thinness of this edge of the strip, the templet edge 45 is a metal plate underlying the member 41 and an end form 46 (not shown) being used for the first strip of each row to confine and form the ends of the strip, the additional end form, being needed for subsequent strips of the row. 48 is a strike board for spreading the concrete of which the shingle strips are made and leveling the top surface of such strips.

For the starting strip, a board 50 may be secured to the underside of the sheathing 51, this board extending beyond the edge of the sheathing and being built up as by members 51, 52, the latter conforming in thickness to the thickness of the butt edge of the shingle. 53 are braces. 55 are nails which are driven through the member 41 at spaced intervals to secure the member 41 to the form structure to the sheathing, the edge of the templet 46, if of metal, being provided with holes 56 through which these nails may pass.

In constructing a roof in accordance with this invention the sub-surface structure or sheathing course 10 is built ordinarily of planking, in usual manner, the edges of the planks preferably closely abutting, although minor cracks or holes are not particularly objectionable and even a slight unevenness of surface may be tolerated.

A strip of tar paper 30, somewhat more than twice the width of the desired starting strip, is laid along the lower eave edge of the roof with the edge of that part 30-A of the paper which is to remain permanently in place extending slightly beyond the upper edge of the desired starting strip. The templet edge 46 is placed to overlie this extending portion and is fastened down as by the strip 41-A and nails 59-A. Nails 40 are driven into the sheathing through the paper 48-A but are left projecting there above, care being taken however that they may be cleared by the striker board 48. The form thus made is filled with fine aggregate concrete, or cement mortar and struck off to the level of the templet 48-A and 52. If the strip is to be marked into individual shingles the strip surface is scored or grooved in usual and well-known manner.

Subsequently the overhanging portion of the paper covering 30, and the end portions thereof, are cut away and the paper covering 30, with the portion 34-A, which is to underlie such strip 15, resting on the surface of the sheathing and on the covering 33 folded over the top of the shingle strip 14. Anchor nails 20, 21 are driven through the covering portion 34-A with their head portions protruding for embedment in the subsequently placed concrete. Preferably the nails 21 are placed to pass through the edge portions of the covering paper 33, 35-A of the completed shingles 14 and adjacent the upper edge thereof. The templet and form, including the guide members 40, 41, is placed on the underlaying portion 34-A of the covering 34, with the templet edge 46 of the member 41 resting on and holding the upper edge of such underlaying portion and the member 40 resting on it, corresponding to the thickness of the underlaying portion of the shingle strip 14 which is to be later exposed. Concrete is placed in the mold thus formed, and agitated or tamped to cause the underlaying covering portion 34 to lie flat along the sheathing, to conform closely to the unevenness of the upper edge of the underlaying shingle strip 14, and along the surface covering of such shingle strip. The top of the shingle strip is struck off and surfaced by the striker board 48, and if to be divided into individual shingles, is grooved; these grooves, if made, preferably extending entirely across the width of the strip to determine expansion or other cracks entirely thereacross along definite lines.

After the shingle strip is completed the end portions 34-B of the covering paper are turned in over the ends of the strip and a portion of 45 the covering paper 34 is turned upward over the lower edge of the strip and laid along the top surface thereof.

Preferably a row of starter strips is completed along the entire eave edge of the roof. The row of overlying shingle strips is built over the row of starting strips and subsequent rows of shingle strips thereafter constructed. The covering paper at the upper edge of the last row of strips completed is securely fastened down and the coverings over the shingles and shingle strips are left in place for at least such period as may be necessary to fully cure the concrete, or in many cases for a much longer period. Eventually, however, the covering paper is cut in two 60 along the eave edge of each shingle strip or row of strips and the folded end portions of the covering are cut away along the joints between the top edges of the shingle strips leaving only the finished surfaces of concrete shingles exposed to the view.

It will be understood that the covering material herein designated as tar paper may be of paper or other material and impregnated with asphalt, tar or other bituminous or if preferred an oleed paper, the particular material used being one which will prevent dispersion of the water in the concrete and permit the concrete to properly cure.

It will be further understood that the term 76
The preceding description has been confined to building a roofing surface and to a method of forming the shingles or strips which permits spreading the gravel base, spreading the concrete slab, spreading the gravel base, covering the gravel base, and securing and maintaining this covering in place until the concrete slab is cured, said sheet being of a size to encompass said surfaces and edges.

4. The method of forming a section of concrete surfacing including providing a base, placing on said base a sheet of substantially non-porous covering material, securing through said sheet and into said base, means, having anchoring portions extending above said sheet, forming on a definitely outlined area of said sheet a thin concrete slab, with its under-surface conforming closely to the contour of said base, and with said anchoring portions embedded, scoring the surface of said slab to outline a unit pattern thereon; folding outlying portions of said sheet over the edges and top of said slab and securing and maintaining said covering in place until the concrete slab is cured.

5. The method of building a concrete surfacing unit which includes providing a base including permanent and removable portions, laying on said base a sheet of covering material, adapted to substantially prevent dispersion of moisture, securing through said material and into permanent portions of said base, means, having anchoring portions extending above said sheet, placing on a limited area of said sheet a shallow bottomless form conforming to the plan of said section, depositing concrete in said form and striking off the face of said unit to a desired contour and thickness; removing said form, folding extending portions of said sheet over the surface of said unit including the edges thereof and maintaining said covering in place until the concrete has cured, said sheet being of a size to encompass said surfaces and edges, and said removable base portions being removed after said concrete has set.

6. The method of building a section of concrete surfacing, which includes providing a base including permanent and removable portions, laying on said base a sheet of covering material, adapted to substantially prevent dispersion of moisture, securing through said material and into permanent portions of said base, means, having anchoring portions extending above said sheet; placing on a limited area of said sheet a shallow bottomless form conforming to the plan of said section, depositing concrete in said form and striking off the upper surface of said section to a desired contour and thickness, scoring said section to establish a unit pattern thereon, removing said form, folding extending portions of said sheet over the surface of said section including the edges thereof and maintaining said covering in place until the concrete has cured, said sheet being selected of a size to encompass said surfaces and edges.

7. The method of forming a concrete surfacing unit, including providing a base including permanent and removable sections, placing on said base a sheet of substantially non-porous covering material, securing through said sheet and into said permanent portions of said base, means, having anchoring portions extending above said sheet; forming on a defined area of said sheet a thin concrete slab, with its under-surface conforming closely to the contour of said base course, and with said anchor portions embedded, and thereafter folding outlying portions of said sheet over the edges and top of said slab and securing and maintaining said covering in place until the concrete slab is cured, said sheet being of a size to encompass said surfaces and edges.

8. The method of forming a section of con-

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crete surfacing including providing a base including permanent and removable portions, placing on said base a sheet of substantially non-pervious covering material, securing through said sheet and into said permanent portions of said base, means, having anchoring portions extending above said sheet, forming on a defined area of said sheet a thin concrete slab, with its under-surface conforming closely to the contour of said base, and with said anchoring portions embedded, scoring the surface of said slab to outline a unit pattern thereon, allowing said concrete to set; and thereafter folding outlying portions of said sheet over the edges and top of said slab and securing and maintaining said covering in place until the concrete slab is cured, said sheet being of a size to encompass said surfaces and edges.

9. The method of forming a concrete surface over an underlying structure, comprising initially placing on said structure a sheet of substantially non-pervious material, securing into said structure anchor means, each having a protruding portion, forming on a partial area of said sheet, a concrete slab with its under surface conforming to the contour of said structure and with said protruding anchor portions embedded, folding and securing outlying portions of said sheet over the edges and top of said slab, and successively repeating the operation, and thereafter maintaining the covering sheets in place until said slabs are cured.

10. The method of forming a concrete roofing surface which comprises establishing a sheathing base, laying along an eave edge thereof, with substantially one-half thereof overhanging said eave, a sheet of bituminous covering material of a width and length sufficient to wrap a desired starter strip, securing into said base, anchor means having projecting portions, forming on said sheet a concrete starter strip, and wrapping extending portions of said covering material around the edges thereof and over the top surface thereof; placing on said base and said wrapped starter strip a second sheet of bituminous covering material of width and length to enwrap a desired shingle strip, securing into said base anchoring means having projecting portions, forming over said slab and base a concrete shingle strip and folding said sheet around the edges and over the surface of said finished concrete; and thereafter repeating the second step of said method, and subsequently securing the upper edges of the sheet covering the last completed shingle strip and maintaining said coverings in place until the concrete has completely cured.

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