June 24, 1941. J. H. HARDY 2,246,514

METHOD FOR FORMING BUILDING SURFACES

Filed June 14, 1940 3 Sheets-Sheet 1

FIG. 1

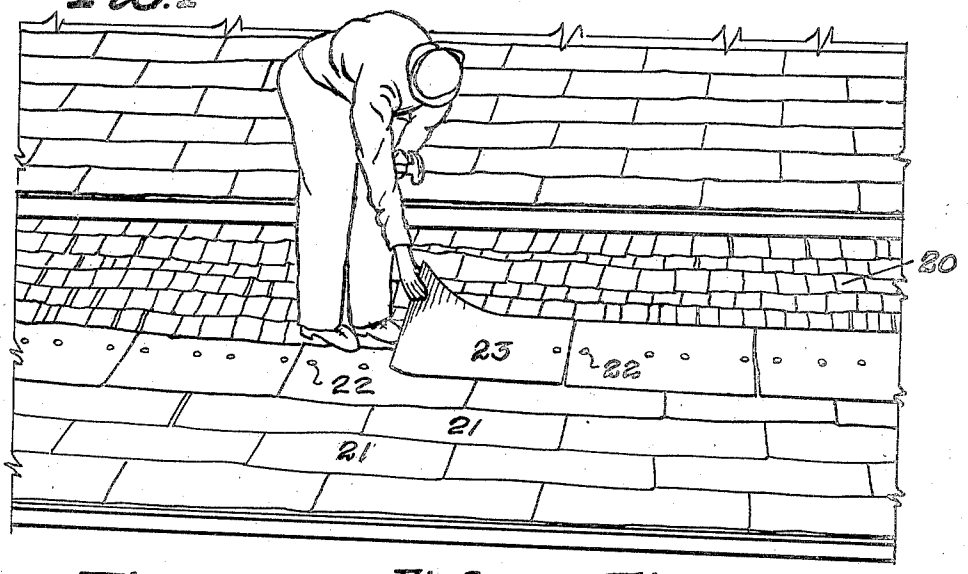


FIG. 2

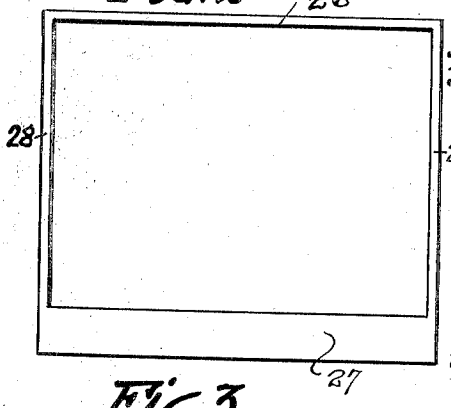


FIG. 5



FIG. 4

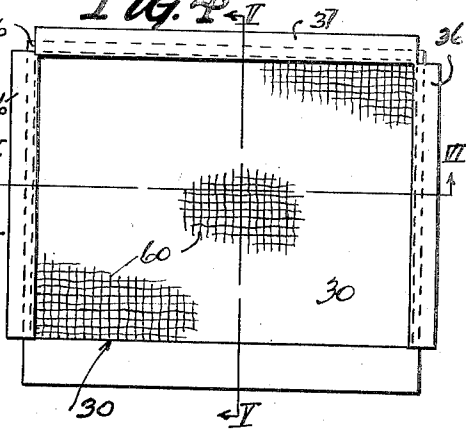


FIG. 3

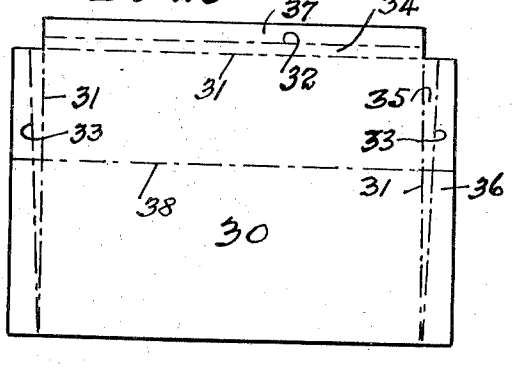
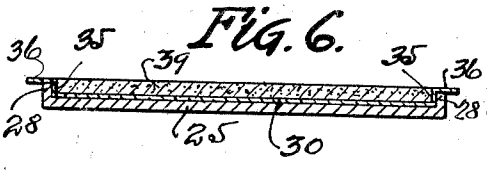


FIG. 6.



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June 24, 1941. J. H. HARDY 2,246,514

METHOD FOR FORMING BUILDING SURFACES

Filed June 14, 1940 3 Sheets-Sheet 2

Fig. 7.

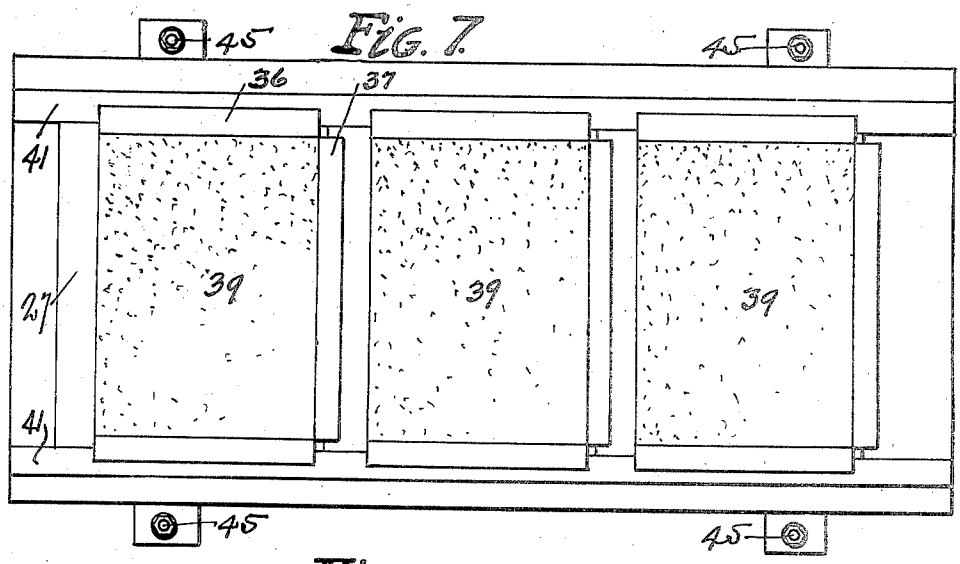
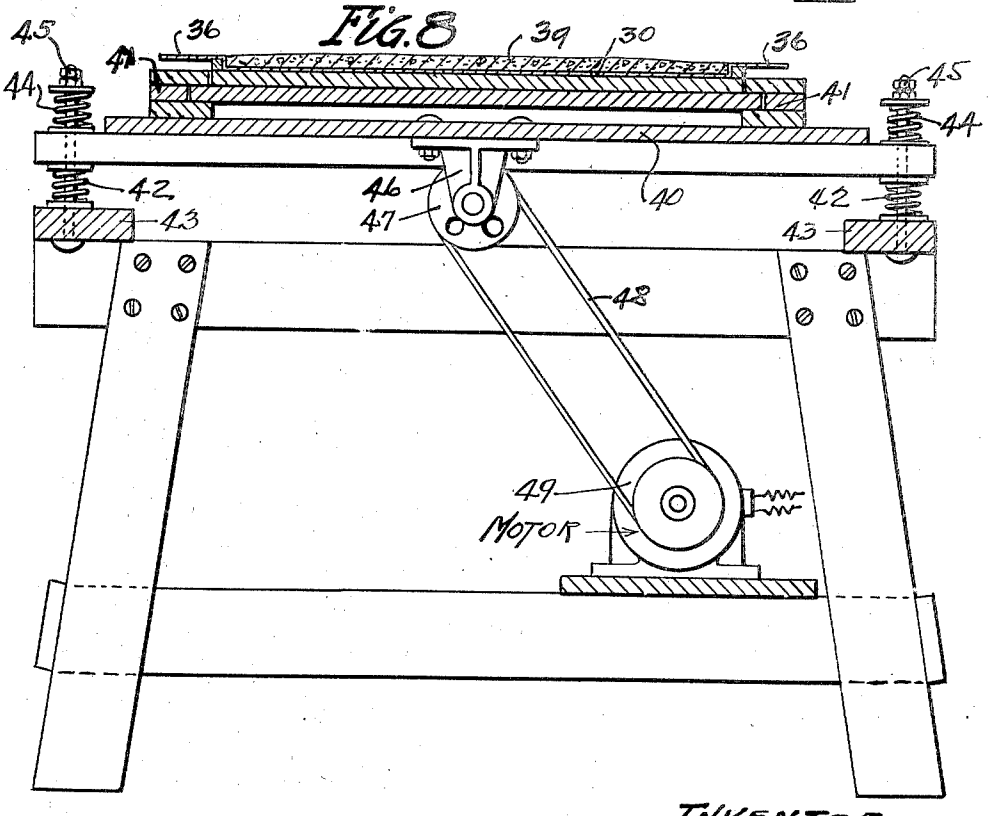


Fig. 8



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METHOD FOR FORMING BUILDING SURFACES

Filed June 14, 1940 3 Sheets-Sheet 3

FIG. 9

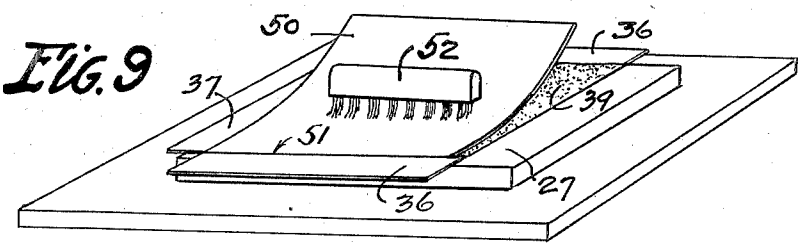


FIG. 10.

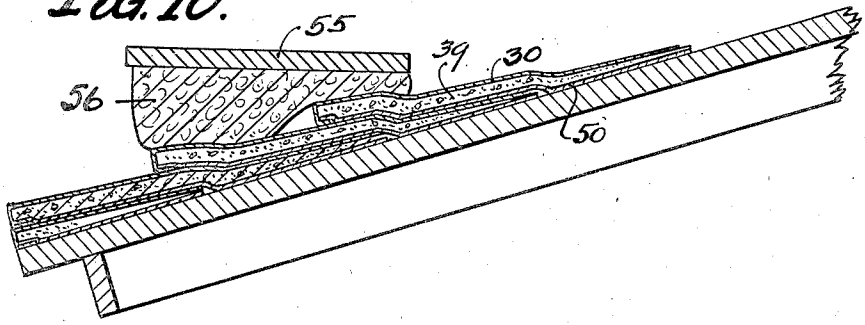
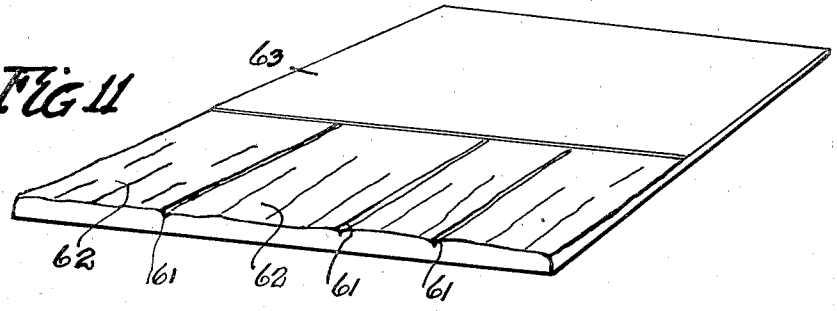


FIG 11



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UNITED STATES PATENT OFFICE

2,246,514

METHOD FOR FORMING BUILDING SURFACES

James Harris Hardy, Artesia, Miss.

Application June 14, 1940, Serial No. 340,421

23 Claims. (Cl. 108—6)

This invention relates to cement roof or side wall coverings, and more especially to roofing shingles or wall boards which are premolded of cement mortar and wrapped in paper, and are placed and fastened immediately after being so formed and before they have had time to set, in order that each overlying shingle or board may conform itself, or be conformed, closely and accurately to the underlying surfaces.

It further relates to thin structural members of this kind from which the air has been substantially removed and which have been covered with substantially air-proof material on both sides, the covering being held in place both by adhesion to the material and by the action of exterior air pressure, and particularly to such a structure in which the plastic material, cement mortar of such consistency when wet and inherently so thin that lateral displacement of the material between the coverings is substantially prevented if ordinary care is exercised in handling.

In using concrete as a roofing or siding material heretofore one or two plans has been followed. A structural member, as a shingle, has been premolded and after curing has been used as any ordinary shingle, slate or roofing tile, or the shingle has been molded in place on the roof itself. In the first of these alternatives it has been necessary to provide holes through which the shingles may be nailed to the base, or plastic edge portions through which this nailing may be accomplished, and even so it is found impossible to make the overlying shingles conform to the underlying ones, the shingles being in that respect very similar to slate in which conformity to curved surfaces is impossible and also close fitting of successive overlying units is similarly extremely unsatisfactory.

To obviate this numerous attempts have been made and some progress accomplished in forming the shingle or roofing units directly in place on the roof. No attempt so far as is known has, however, been made along this line in wall structures although obviously simulation of such structures in monolithic walls has been accomplished.

The objects of my invention are:

To provide a preformed roof or wall surfacing unit of cementitious material which may be handled while still wet and before set has taken place and be placed and conformed to an underlying base structure and for units placed thereon.

To provide a cementitious building unit inherently hardening and stiffening on setting in which the cementitious material is protected on opposite faces and substantially held by such protection against lateral displacement, during handling or otherwise, until set.

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

Fig. 1 is a perspective view of a roof surface actually being laid showing an unnecessarily rough underlying foundation of old wooden shingles in place and the new surface being laid thereon.

Fig. 2 is a plan of one of the shingle molds.

Fig. 3 is an outline of the paper lining for the mold.

Fig. 4 is a plan of the mold, lined with the paper ready to receive the cement mortar from which the shingle is made.

Fig. 5 is a section of the mold and paper lining, taken as on the line V—V of Fig. 4; and

Fig. 6 a transverse section taken on the line VI—VI of Fig. 4, these sections showing the mold filled with mortar and properly struck off.

Fig. 7 is a plan view of a vibrating table adapted for removing air from the shingles, with three molds thereon.

Fig. 8 is a section of the vibrating table taken on the line VIII—VIII of Fig. 7.

Fig. 9 shows a perspective view showing the covering paper being placed on the struck-off and vibrated surface of the shingle.

Fig. 10 is a fragmentary section of a roof showing a padded board for support of a workman.

Fig. 11 is a perspective view of a shingle having its wearing surface marked or secured to simulate a weathered shingle surface.

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

In Fig. 1, **20** is an old wooden shingle roof which has been partly covered by concrete shingles **21**, these shingles having been secured in place by nails **22** driven through the shingles and into the underlying structure, the positioning of the nails being as usual such that they are covered by subsequently laid shingles. **23** is a shingle being laid, one end of the shingle having been abutted against the previously laid shingle and lying along the roof surface while the other end portion is still grasped in the hand of the workman and has as yet not been flattened out.

The shingles are formed in a mold having a bottom **25**, and peripheral edges **26**, **27** and **28**, the edge **26** being of a depth conforming to the butt end of the shingle, the edge **27** conforming

in depth to the thin upper end and the side edges 28 being tapered between the two.

In this mold there is disposed a sheet of paper 30 adapted to form the top cover of the shingle when laid and to form a cover for the butt end and sides of the shingle, the thin edge ordinarily not being wrapped. The paper cover 30 may be an integral sheet and is preferably paraffined or waxed to make it water-proof. Preferably this sheet is creased along lines 31 to conform to the bottom of the mold and the edges again creased along lines 32, 33 to the depth of the butt and side edges of the mold, so that the edge linings 34, 35 may stand vertically upward, and flaps 36 for folding under the shingle sides, and 37 for folding under the shingle butt, may lie flat against the top of the butt and side edges 26, 28 of the mold during the forming and striking off of the material. The corners of the sheet are preferably cut away to permit easier folding.

If desired the sheet may be perforated along a line 38 which will slightly underlie the butt edge of the shingle later superposed thereon and permit readier removal of the paper over the exposed portion of the shingle after curing has taken place. In some cases it has been found more satisfactory to use a heavier grade of paper for that portion of the paper which is not to be removed after curing, that is for paper which is to form a permanent part of the roof, in which case a paper treated with bitumen is preferably used. Such paper may be used throughout and if so is almost always scored; or bitumenized paper may be used in part and waxed paper in part, the two strips being overlapped along the line 33 in making the shingle and the waxed paper removed after curing.

The paper lining 30 is placed in the mold and cement mortar 39 placed thereon and roughly leveled up, the amount of mortar used being preferably very carefully measured so that there will be no deficiency or excess.

After filling the mold and spreading the mortar 39, the table is transferred to a vibrating table where further operations take place.

The vibrating table comprises a bed 40 having grooved side rails 41 adapted to loosely receive the edges of the shingle mold. This bed is supported at its four corners by underlying springs 42 which are seated on a frame 43. Disposed on the bed over the supporting springs are similar hold-down springs 44. Bolts 45 clamp the upper springs against the bed, the bed against the lower springs and the lower springs against the supporting frame. Mounted on the underside of the bed, substantially at its center, is a bracket 46 in which is journalled an unbalanced pulley 47. This pulley is driven through a belt 48 by an electric motor 49 or other suitable motor or engine and rapidly rotated so that the unbalanced pulley will impart a vibratory motion to the bed. In this movement the upper and lower springs confine the bed against bouncing and the grooved side rails confine the molds and transfer this vibratory motion from the bed to the molds.

The length of the guide 41 is made sufficient to hold a number of molds at the same time, it having been found that three molds will ordinarily give a sufficient amount of time for finishing and thoroughly vibrating the shingles. As each mold is filled and initial spreading of the mortar accomplished, it is slipped into the guides at one end of the bed and while being vibrated the surface of the mortar is troweled and further leveled up flush with the top of the mold. As a second mold is filled it is pushed into the guides at the same end of the bed moving the previous mold to the center and thence, with the addition of a third mold, to the discharge end of the bed. The vibratory motion imparted to the shingle and the floating or troweling of the surface of the mortar serves to substantially completely displace all entrained air, this air being upwardly displaced and any bubbles of air being broken up and wiped off the top by the troweling. Endeavor is used in mixing the mortar to use as small an amount of water as possible, but even so the amount of water necessary in the early stages of spreading usually affords a slight excess and quite wet surface.

As a fourth mold is inserted in the guides, the finished mold is removed and the surface of the mortar covered with a sheet of bitumenized paper 50, cut to size to exactly cover the mortar surface, except perhaps a minor portion of the thin edge, this paper eventually forming the bottom of the finished shingle. In placing the paper one edge 51 of the sheet is brought against the surface of the mortar along one edge of the shingle and the sheet is progressively contacted as by use of a brush 52 against further portions of the surface until intimate contact of the paper is made with the entire surface, every endeavor being made in such placement to displace and otherwise prevent the formation of entrained pockets of air so that intimate contact of the paper is had with the surface of the mortar. The edge portions 36 and 37 of the lining are then folded over against the paper 50 just placed and the shingle is removed from the mold. In accomplishing this removal the folded-over edges may first be used as tabs to accomplish lifting and transference of the shingle to a pallet or board (not shown) where a number, usually about ten, are stacked ready for removal to the roof.

In making the transfer from the mold to the pallet it is found that sagging of the center portion of the shingle is immaterial as the adherence of the paper to the opposite sides of the mortar by capillary attraction, adhesion and pressure of the air on the outer sides of the paper cooperate to hold the parts of the shingle together and that at least in a thin structure of the class described there is no displacement of the mortar laterally between the sheets.

As promptly as possible after the shingles are made and in any event before initial set takes place, the shingles 21 are transferred to the roof and are laid in place on the surface prepared for them and nailed down thereon, the nails 22 obviously driving through the paper and wet mortar without appreciable resistance and the mortar closing around the nails. Subsequent courses are laid in usual shingle fashion and are immediately nailed, care being taken that the nails are so placed that each subsequent course will overlie the nails of the under course. After the shingles have been stacked on the pallet and before transfer to the roof an additional pallet may be laid on top and the entire stack inverted. If, however, this is not done and the shingles are carried to the roof as initially stacked it will be remembered that the upper surface of the shingle on the pallet is that surface which will face downward on the roof. In such event one end of the shingle may be picked up from the pallet, the shingle lifted into edgewise or endwise position, the other edge clasped and the shingle be turned over as though it were a hardened article. In both the lifting movement and the shift of the

shingle to position after removal from the pallet the center portion of the shingle will sag and it is ordinarily necessary to bring one end of each successive shingle into place on the roof abutting the adjoining previously laid shingles and to a certain extent allow the bowed under surface of the shingle to roll into place, the shingle **23** being laid in Fig. 1 showing approach to completion of this movement. Shingles of each overlying course are in usual manner laid to break joints with the joints of the underlying course.

To accomplish this the shingles are merely cut in two with a heavy pair of shears, making such starting length of shingle as may be desired. Ordinarily the cut edge of a starting shingle for a course is left without edge protection by the paper and the next shingle butted against it. If the courses are short the cut away half of the shingle is merely retained until the opposite end of the course is reached and then used. Otherwise after the second shingle of the course is laid a full shingle of the next course is laid along the edge of the roof and the remaining short portion of the cut shingle immediately used. In such case to obviate the raw exposed edge of the concrete a strip of the bottom paper may be cut away, the mortar along the strip be removed and the upper paper folded under to complete a new edge. Along roof hips the edges of the shingles are cut to the proper angle so that they substantially abut along the line of the hip and the set of shingles laid thereover, obviously with their centers following the line of the hip. A line of properly overlapping shingles may be laid along the line of a valley and the roof courses brought up and cut to properly overlie these underlying courses. In laying the roof courses, it is found that each overlying course ordinarily conforms itself closely to the underlying courses. In laying hips and valleys this also occurs, but it is obviously preferably, or even in some cases necessary, to press the shingle down firmly into conformity with the underlying shingle and this is ordinarily done. It is found that the shingles conform themselves remarkably close to underlying surfaces. It is also found that it is possible to walk on the completed surface of the shingle immediately after it is laid with no appreciable displacement of the mortar, though such practice is not believed to be a satisfactory one. To facilitate the work of laying and also to exert a pressure to accomplish definite conformation of the shingle surfaces a board **55** is ordinarly used, which board has a pad **56** secured underneath which distributes the weight of the workman and presses the shingles closely together.

After laying the paper covering is allowed to remain for several weeks until the shingle is fully cured, after which time the paper exposed below the butt of the shingle is removed, being torn apart along the line **38** or cut along the butt of the shingle. Ordinarily the flap **37** underlying the shingle butt pulls out but the side flaps **36** must usually be cut off along the shingle edge.

The mortar used may be plain cement mortar of such composition and proportion as is desired, or there may be mixed therethrough fiber, preferably cotton, to toughen the structure. In Fig. 3 a net **60** woven from heavy cotton thread or strands is shown on the lining of the mold. If this mesh is used the mortar is laid and spread directly thereon. Subsequently vibration is found to bring the net upward toward the top, this being the bottom of the shingle when laid.

The mold for that portion of the shingle which is to be exposed to the weather may be provided with ribs which may be at uniform intervals, or at random intervals to establish defining grooves **61**, as shown in Fig. 11, and simulate random width shingles, and the surface of the mold between these ribs may be wrinkled or otherwise shaped to simulate in the shingles the weather-worn surface **62** of old wooden shingles. Obviously where this is done the paper laid over the rib surface must be thin enough to allow the mortar to conform the paper and itself, under vibration and troweling, to the inequalities of the mold surfaces. Such paper usually is a separate sheet from the paper **63** which underlies the butt end of a succeedingly laid shingle.

It will be understood that the description herein has been almost entirely confined to the description of a shingle and its use in a roof. It will be understood, however, that particularly where the shingle is reenforced with cotton mesh or the like it may be successfully applied to building walls, the adherence of the paper covering to the surfaces proving sufficient together with the inherent stiffness of the mortar to prevent displacement even where the shingles are vertically disposed. Usually however wall boards or shingles are preferably of much less vertical depth than the shingle depths shown.

Where used for interior walls as in kitchens, bathrooms or elsewhere, the strips are usually of uniform thickness and are ordinarily transversely grooved at uniform intervals preferably into squares simulating tiles, and the edges and ends of the strips are closely abutted instead of overlapped in shingle fashion.

Flooring tiles may be similarly formed and laid with even greater ease than wall tiles differing ordinarily only in being preferably somewhat thicker than the wall tiles.

It will be understood also that the term "shingle" as herein used and as used in the claims is intended to apply to any thin sheet, slab, strip or tile used for roofing, exterior siding, or interior walls or floors.

I claim:

1. A method of surfacing a roof which includes preforming thin shingle-like units of cement mortar, intimately contacting substantially water-proof paper covers with the opposite faces of each said unit, moving each shingle so formed to the position in which it is to be used, and laying and securing it in place prior to initial setting of the cement.

2. A method of laying a roofing surface which includes preforming thin shingle-like units of cement mortar, intimately contacting substantially water-proof flexible covers with the opposite faces of each said unit, moving each shingle so formed to the position in which it is to be used and laying and securing it in place prior to initial setting of the cement.

3. A method of laying a roofing surface, which includes preforming thin shingle-like units of cement mortar, compacting and displacing air therefrom, intimately contacting flexible substantially water-proof surface coverings with the opposite faces of each said unit, moving the unit so formed to the position in which it is to be used, and laying and securing it in place prior to initial setting of the cement.

4. A method of laying a roofing surface, which includes preforming thin shingle-like units of

cement mortar compacting and displacing air therefrom, intimately contacting substantially water-proof paper coverings with the opposite faces of each said unit, moving the unit so formed to the position in which it is to be used, and laying and securing same in place prior to initial setting of the cement.

5. A method of laying a roofing surface which includes preforming thin shingle-like units of cement mortar, intimately contacting substantially water-proof flexible coverings with the opposite surfaces and the butt and side edges of each said unit, moving each unit so formed to the position in which it is to be used, and securing same in place prior to initial setting of the cement.

6. A method of laying a roofing surface which includes preforming thin shingle-like units of cement mortar, intimately contacting substantially water-proof paper coverings with the opposite faces and the butt and side edges of each said unit, moving each unit so formed to the position in which it is to be used, and conformably securing same in place prior to initial setting of the cement.

7. The method of making a building surface, which includes forming a plurality of slab-like units of cement mortar, covering the opposite faces of each said unit with substantially water-proof paper and intimately contacting said paper with said faces, moving said units and conformingly securing same in place while said mortar is still plastic.

8. The method of making a building surface which includes forming a plurality of slab-like units of cement mortar, covering the opposite faces of each said unit with substantially water-proof flexible surfacing material and intimately contacting said material with said faces, moving said units and conformingly securing same in place while said mortar is still plastic.

9. The method of making a building surface which includes forming a plurality of thin flat units of cement mortar, covering the opposite faces and the edges of each said unit with a substantially air-proof and flexible sheet-like material, intimately contacting said material with said faces and displacing the air from therebetween, moving said units to the position in which they are to be used and conformingly securing them in place prior to initial setting of said cement.

10. The method of making a building surface which includes forming a plurality of thin flat units of cement mortar, covering the opposite faces and the edges of each said unit with a substantially air-proof sheets of paper intimately contacting said paper with said faces and displacing the air from therebetween, moving said units to the position in which they are to be used and securing them in place prior to initial setting of said cement.

11. The method of surfacing a roof which includes lining a shallow mold with substantially water-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to spread and compact same, to drive out and brush off entrained air from the mortar and to intimately contact same with said paper placing on said mortar a sheet of paper of conforming size and intimately contacting said paper with said mortar to displace air from therebetween, removing the plastic shingle thus formed and placing and securing it on the roof before initial set of the cement.

12. The method of forming a surfacing unit which includes lining a shallow mold with substantially water-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to spread and compact same, to drive out and brush off entrained air from the mortar, and to intimately contact same with said paper, placing on said mortar a sheet of paper of conforming size and intimately contacting said paper with said mortar to displace air from therebetween, whereby to provide a temporarily plastic unit sufficiently stable for handling and placing prior to initial set of the cement.

13. The method of surfacing a roof which includes lining a shallow mold with substantially air-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to intimately contact it with the paper lining, to compact the mortar, to drive out and displace entrained air therefrom, and to smooth and level up the surface, laying on said mortar a sheet of paper of conforming size and intimately contacting said paper with said surface to displace air from therebetween, removing the shingle so formed immediately from the mold, folding edge portions of said paper over the edges of the mortar, and laying and securing the shingle in place on the roof before the cement has set and with said edge portions underlying said shingle.

14. The method of surfacing a roof which includes lining a shallow mold with substantially air-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to intimately contact it with the paper lining, to compact the mortar, to drive out entrained air therefrom, and to smooth and level up the surface, laying on said mortar a sheet of paper of conforming size and intimately contacting said paper with said surface to displace air from therebetween, removing the shingle so formed immediately from the mold, folding edge portions of said paper over the edges of the mortar, and laying and securing the shingle in place on the roof before the cement has set and exerting pressure thereon to intimately conform the shingle to the underlying structure.

15. The method of surfacing a roof, which includes lining a flat shallow mold with substantially water-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to intimately contact the mortar with the paper lining, to compact the mortar, to drive out entrained air therefrom, and to smooth and level up the surface, covering said surfaced mortar with a sheet of substantially water-proof paper, of conforming size, and intimately contacting said paper with said surface to displace air from therebetween, removing the plastic shingle thus formed and placing and securing it in place before initial set of the cement.

16. The method of surfacing a roof, which includes lining a flat shallow mold with substantially water-proof paper, spreading over said paper a layer of cement mortar, vibrating and troweling said mortar to intimately contact the mortar with the paper lining, to compact the mortar, to drive out entrained air therefrom, and to smooth and level up the surface, covering said surfaced mortar with a sheet of substantially water-proof paper, of conforming size, and intimately contacting said paper with said surface to displace air from therebetween, removing the plastic shingle thus formed and placing and con-

formingly securing it in place before initial set of the cement.

17. A method of making a building surface, which includes preforming thin slab-like units of cement mortar, intimately contacting pliable surface coverings with the opposite faces of each said unit, moving the unit so formed to the position in which it is to be used and securing it in place prior to initial setting of the cement.

18. A method of forming a building surface, which includes preforming thin slab-like units of cement mortar, intimately contacting pliable surface coverings with the opposite faces and edges of each said unit, moving the unit so formed to the position in which it is to be used and securing it in place prior to initial setting of the cement.

19. A method of surfacing a roof, which includes preforming thin shingle-like units of cement mortar, intimately contacting pliable sheet-like covers with the opposite faces of each said unit, moving each shingle so formed to the position in which it is to be used, and placing and securing it in place prior to initial setting of the cement.

20. A method of surfacing a roof, which includes preforming thin shingle-like units of cement mortar, intimately contacting pliable sheet-like covers with the opposite faces and edges of each said unit, moving each shingle so formed to the position in which it is to be used, and placing and securing it in place prior to initial setting of the cement.

21. The method of making a building surface, which includes lining a shallow mold with a pliable surface covering, disposing in said mold a net-like sheet of fibrous material, spreading thereon a layer of cement mortar, vibrating and troweling said mortar to spread, compact, and drive out entrained air therefrom and to incorporate said fibrous material in said mortar, covering the slab thus formed with pliable surface covering material, removing the slab thus formed and placing and securing it in place prior to the setting of said cement.

22. The method of making a building surface, which includes forming a plurality of thin, flat units of cement mortar, and incorporating in said mortar fibrous material to re-enforce and toughen the structure, covering the opposite faces of each said unit with pliable surface coverings and intimately contacting said coverings with said faces, moving said units to the position in which they are to be used and securing them in place prior to initial setting of said cement.

23. The method of making a building surface, which includes forming a plurality of thin, flat units of cement mortar, and incorporating in said mortar fibrous material to re-enforce and toughen the structure, covering the opposite faces and the edges of each said unit with pliable surface coverings and intimately contacting said coverings with said faces and edges, moving said units to the position in which they are to be used and securing them in place prior to initial setting of said cement.

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