

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Roofing and/or Methods of and/or Apparatus for Making same

We, ALUMINIUM DISTRIBUTORS LIMITED, a company incorporated under the laws of the Dominion of New Zealand, of 21 Ghuznee Street, Wellington, New Zealand, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to roofing and/or methods of and/or apparatus for making same.

It is an object of the present invention to provide roofing and/or methods of and/or apparatus for making same which will enable a roof to be applied quickly and economically which roof will be less likely to leak and more durable than roofs of similar types as at present constructed.

Accordingly in one aspect the invention consists in a method of applying roofing to a building construction comprising the steps of transporting a roll of flat strip metal on a trailer or the like mobile construction to the site where roofing is to take place, forming said flat strip by rolling using a rolling mill mounted on said trailer or the like mobile construction, the finished form of the rolled sheet having a first upstanding edge at or near to a right angle to the plane of the sheet on one side and a second upstanding edge at or near to a right angle to the plane of the sheet on the other side, said second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet, cutting off a length of said rolled strip sufficient to enable the strip of material to be applied to the roof without transverse joints therein where the part to be roofed lies in the same plane or sub-

stantially the same plane, fixing a hooked holding means to the building construction being roofed, the hook thereof reaching over said first upstanding edge, applying a further sheet contiguous with said sheet already fixed in position with the flange of said further sheet lying over said first upstanding edge, folding said flange over said first upstanding edge and over said clip and folding said contiguous edges to provide a standing seam between contiguous sheets.

In a further aspect the invention consists in apparatus for use in transporting a roll of flat strip to a site to be used for roofing and for use in rolling said flat strip at the site to provide a sheet of roofing material, said apparatus comprising a trailer or the like mobile construction having mounted thereon mounting means for carrying a roll of flat strip and a strip rolling mill adapted to roll said flat strip to a contour suitable for use in the foregoing method.

In a still further aspect the invention consists in roofing, continuous at least from eave to gable, comprising strips of material formed by rolling on the site to a shape having one upstanding edge without a flange along one side of the material and another upstanding edge having a flange along the other side of the material said roofing being fixed to the building by the use of hooked clips, the hooked part of which engages the upstanding edge without a flange, the clip being fixed to the building and seams between contiguous sheets being provided by folding the flanged edge of one sheet over the unflanged edge of the contiguous sheet and folding the whole of the edges to form a standing seam.

One preferred form of the invention will now be described with reference to the accompanying drawings, in which:—

[Price 3s. 6d.]



material

Figure 1 is a side view of apparatus of the invention,

Figure 2 is a plan view of the apparatus shown in Figure 1 and with the lifting crane omitted,

Figure 3 to a larger scale shows the first stage rollers and is part of a cross sectional view on the plane 3—3, in Figure 1,

Figure 4 is an end view to correspond with Figure 3 in the direction of the arrow "A" in Figure 3,

Figure 5 shows a pair of rollers for the second stage of roller operational forming,

Figure 6 shows a pair of third and final stage rollers for forming the completed sheet or roofing strip,

Figure 7 to a larger scale shows part of Figure 1 to illustrate the guide table arrangements,

Figure 8 is an end view of Figure 7 on the cross sectional plane 8—8 in Figure 7,

Figure 9 is a cross sectional view on the plane 9—9 in Figure 7,

Figure 10 is a plan view of Figure 7,

Figure 11 is a side view of an expandable mandrel to a larger scale,

Figure 12 is an end view of Figure 11 in the direction of the arrow "B" in Figure 11,

Figure 13 shows the cross sectional profile shape of the finished roof strip,

Figure 14 shows one pattern of roofing joint, and

Figure 15 is a sketch to show one pattern of holding clip.

A basic advantage of the invention is due to mobility and whereby roof strip parts can be produced at the building site. Accordingly a trailer or the like transport means is used to mount and carry the roll of strip material and the apparatus.

Referring to Figures 1 and 2, a trailer comprises chassis side bars 1 and 1a and cross bar members 2. The chassis bars may be made of channel or angle section steel or of any other suitable shape and material.

The side chassis bars 1 and 1a are brought together at their front ends 3, and mount a suitable tow means such as a ball hitch 4. A retractable prop 5 is provided.

Road wheels 6 are shown on a chassis axle 7. A roll of strip material is shown in Figures 1 and 2 and indicated by the numeral 8. The roll 8 is mounted in position between the side bars 1 and 1a on carrying means comprising a core mandrel 9 having journal ends 10a.

The journal ends 10a are freely and rotatably contained in bearing gaps or half bearings 11 on the tops of blocks 12 on the side bars 1 and 1a positioned as shown.

To facilitate handling of the roll 8 a crane is provided. A vertical footstep sleeve 13 is shown only in Figures 1 and 2, and

is welded to or otherwise secured to cross bar members 14. A flange 15 on the top of the sleeve 13 forms one part of a bearing arrangement 15a to carry the weight of the crane end load.

The crane is shown in Figure 1 only. The crane post 16 has a jib 17, and at its lower end 16a, the crane post is rotatably accommodated in the sleeve 13. A flange or collar 18, on the post 16 rests on the flange 15 to act as the complementary component of the crane bearing support 15a.

A hand winch 19 on the crane post 16 and a winch rope 20, are used to raise and lower a crane hook 21. A suitable lifting bar and slings dependent from the hook 21 engage the mandrel journal ends 10a in any known way and are not shown in the drawings.

Again referring to Figures 1 and 2, to mount a rolling mill, a raised framework is securely fastened by welding or other means to the chassis bars 1 and 1a. In the construction shown, there are side frame members 22 and 22a raised above the chassis side bars 1 and 1a and parallel therewith. The frame members 22 and 22a are supported on strut members 23 with cross members 24 welded or otherwise attached to the frame members.

By the provision of the raised framework the rolling apparatus is raised to a height suitable to receive strip material unwound from the material supply reel 8.

In the operations to form roof strips, the strip material is drawn off the material roll 8 and passed over and along a guide roller and guide table and thereafter through a series of forming rollers, forming a three stage rolling mill.

A guillotine or the like cutting means is provided to cut off the required length of formed strip.

The strip material from the rolls moving onto the guide table is indicated by the dash lines 25 and the formed roof strip by the dash lines 25a in Figure 1.

A guide roller 26 and guide table 27 are shown in Figures 1 and 2, and to a larger scale in Figures 7 and 10, and in part in Figures 8 and 9.

Referring to Figures 7, 9 and 10, the guide table in the preferred construction shown is a wooden flat horizontal platform 28 having raised fence edges 29. The distance between the edges 29 is slightly greater than the width of the strip material moving along the platform. It follows that the strip material may move freely and without material sideways movement along the table platform 28.

Angle steel platform bars 30 are disposed along each side of the guide table 27 as shown in Figures 9 and 10.

Referring to Figures 7 and 9, there is shown a preferred construction where strong transverse steel bars 47 pass under the platform 28 at each end thereof and have extended ends 47a welded to the underside of the platform bars 30.

Referring to the construction shown in Figures 7, 8, 9 and 10, downwardly disposed clamp lugs 31 are welded to each platform bar 30 near the ends thereof, dependent from the outer edge of the horizontal flange 30a of the bar 30.

Pieces of externally threaded steel form carrying screws 32 as shown, and pass through holes 33 in the clamp lugs 31 and are adjustably secured by clamp nuts 34. The clamp nuts 34 may be appropriately adjusted in position on the carrying screws 32 to give transverse alignment of the guide table and the forming rollers.

The outer ends 32a of the carrying screws 32 pass through vertically slotted holes 35 in posts 36 upstanding from the side frame members 22 and 22a and welded thereto. Clamp nuts 37 on each side of the posts 36 may be used to vertically adjust the position of the carrying screws 32 and so regulate the height of the guide table to suit the forming rollers.

Flat steel bars 38 are attached by bolts or welding to the horizontal flange 30a of the platform bar 30 and extend forwards therefrom and terminate in eye bearings 39 pierced by horizontal axial bearing holes 40, suited to freely accommodate the ends of the guide roll spindle 41.

The guide roller 26 in the form shown consists of a lengthy barrel part 42 with end flanges 43 mounted on an axial spindle 41 aforesaid. The whole is so constructed and arranged that the top of the barrel part 42 is in horizontal alignment with the top of the guide table platform 28. The inner faces of the end flanges 43 are in corresponding alignment with the inner faces of the platform fence edges 29, to suit the width of sheet material. By this construction of guide roller and guide table, strip material from the roll 8 is guided in its travel to the forming rollers. As the material roll 8 is reduced in size by usage the material strip passes onto the guide roller at an inclined angle and passes therefrom in a horizontal plane disposition along the guide table top.

Friction means are provided to ensure that strip material entering the first stage forming rollers is flat, and free from wrinkles and the like, and slightly tensioned. One means for this purpose consists of a flat faced pressure pad to bear onto the strip material entering onto the guide platform 28.

Reference to Figures 7, 8 and 10 show one such pressure pad construction wherein

there is a strong transverse steel bar 44 with an attached dependent wood plate 45 positioned at the entry end of the guide platform 28 and overlying the first inch, more or less thereof which thus provides a backing plate. The transverse bar ends 44a are held in position on the platform bars 30 by holding clips 46 as shown in Figure 7. The contact wearing surface of the wood plate may be faced with Ferrobestos to provide a suitable pressure pad surface.

The pressure of the pressure pad on the strip material keeps it flat and at the same time provides sufficient frictional resistance against which the rolls, shortly to be described, can pull to keep the material flat in moving towards the first stage rollers.

The guide platform 28 is made to suit strip material eighteen inches wide, and the platform is thirty-four inches long. From the guide roller 26 to the centre of the first stage rollers is a distance of approximately forty inches. The roller stages are spaced at about fourteen inch intervals.

From the guide table 28, the strip material moves to forming rollers. In the construction shown in the drawings, there are three rolling stages to progressively form the strip material into roof strips. The rollers are mounted on the side frame members 22 and 22a in a manner to be described. The stages each comprise and use a shaped bottom roller, and a shaped top roller, the two being complementary each to the other.

In the first stage shown in Figures 3 and 4 there is a top roll 48 and a bottom roll 49, fixed respectively on shafts 50 and 50a carried in top shaft bearing blocks 52 and bottom bearing blocks 52a, slidably mounted in vertical stands 53. In the construction shown, the stands are twin pieces 54 of angle steel welded to the frame members 22 and 22a. Cap pieces 55 are welded inside the flanges of the stand angle steel pieces 54 at the top thereof. A cover plate 56 straddles the pieces 54 and is secured in place by nuts 57 on studs 58 passing through holes 56a in the cover plate. The studs 58 project upwards from the cap pieces 55. A roll adjusting screw 59 passes through a threaded centre hole 60 in the cover plate 56 and controllably bears onto the top bearing block 52.

The bottom bearing blocks 52a rest on the frame members 22 and 22a or if necessary on height adjusting packing pieces on the frame members.

A strong compression spring 61 is held between the bearing blocks 52 and 52a, whereby the rolls are normally held apart. The adjusting screw 59 can be manipulated to regulate the space between the rolls.

One end of the bottom roll shaft is extended beyond the bottom bearing block

to mount chain wheels. A chain drive wheel 62 is firmly mounted on the shaft and driven by a chain 63 transmitting motion and power from a suitable power unit. In the drawings, Figures 1 and 2, an electric motor and reduction gear unit 64 is shown mounting a chain driving wheel 64a.

The drive and roll arrangements pass the material through the rollers at a rate of about forty-five to fifty feet a minute.

A chain drive wheel 65 is securely mounted on the shaft 50a alongside the wheel 62 and transmits motion and power to a driven wheel 66 on the bottom shaft 51a of the second stage rollers by means of a driving chain 67.

At their opposite ends, the roll shafts 50 and 50a are extended and mount engaging toothed gear wheels 68, whereby the top roller is rotatably driven.

The second and third stage rollers have bearing blocks mounted in stands with adjusting screws and springs as described relative to the first stage, these parts are not shown in Figures 5 and 6.

The second stage bottom roll shaft 51a is extended and in addition to the driven chain wheel 69 before mentioned, there is a firmly mounted chain driving wheel 69 which by means of a driving chain 70 transmits motion and power to a driven wheel 71 on the bottom shaft 52a of the third stage rollers.

On the opposite ends of the shafts 51 and 51a of the second rollers, there are intermeshing toothed gear wheels 68a similar to those on the first stage rollers and for a similar purpose.

No engaging toothed gear wheels are on the third stage roller shafts, the third stage top roll is not power driven and moves "idle", receiving movement from the strip material passing through the rolls.

Referring to Figures 3, 5 and 6 respectively there are shown the first, second and third stage rollers respectively. In Figures 3 and 5, the strip material between the top and bottom rolls is represented by thick firm lines, where in Figure 3 there is indicated a strip flat bottom part 87a as a continuation of the flat strip material, and flared side edge parts 88a and 89a, and a flange 90a as an extension of the flared side and edge part 89a. In the second stage as shown in Figure 5, the numerals 87b indicate the flat bottom part, 88b and 89b the flared side edges, and 90b the flange part.

In the construction noted and with reference to Figure 3 the top roll 48 and the bottom roll 49 of the first stage comprise metal cylinders 72 six and five eighths inches in diameter and fourteen inches long. The bottom roll 49 has end plates or flanges 73 eight inches in diameter and with a

cylindrical surface face 74 of half an inch in width. The overall length of the roll is approximately seventeen and a quarter inches. The diameter of the roll therefore increases and to provide this increase a part 75 shaped as a frustrum of a cone joins each end of the cylinder 72 to a terminal end plate or flange 73.

The top roll 48 is complementary to the bottom roll 49. The top roll end plates 76 are about five and a quarter inches in diameter with a circumferential face 74a of half an inch in width.

The disposition of the guided entering flat material strip relative to the rolls is such that a projecting flange 90a is formed on only one side of the roof strip passing through the rollers. As shown, the flange 90a in Figure 1 and as shown at 90 in Figure 13 and 90b in Figure 5 is parallel with the flat bottom part and separated therefrom by the side edge part 89a in Figure 3 and as shown in Figures 5 and 13 at 89 and 89b respectively.

In the second roller stage and referring to Figure 5 of the drawings, there is a top roll 77 and a bottom roll 78 both having cylindrical bodies 72a similar to those of the first roll noted. The bottom roll 78 has outer plates or flanges 79 about nine inches in diameter with a corresponding reduction in diameter of the end flanges or plates 80 on the top roll 77. Both the end plates 79 and 80 of the second stage rolls have the same width of faces 81 and 81a respectively, that is, half an inch.

The overall length of the bottom roll 78 of the second stage is about sixteen and a quarter inches, consequently as will be seen by reference to Figure 5, the edge flared ends 88b and 89b rising from a flat bottom part 87b more nearly approach the vertical, than in the first stage. The flange 90b is contained between the end flanges 81 and 81a.

In the third and last rolling stage, the top roll 82 is shaped as a parallel cylinder with an annular step between the larger diameter of the roll and the cheek 83 thereof, which annulus is substantially in a plane at right angles to the axis of the roll. This annulus is faced with Ferrobestos or the like material so as to obviate or minimise scratching and tearing of the upstanding edges formed on the material during rolling.

The bottom roll 84 coincides with the top roll, and has end flanges 85 standing one and three quarter inches high above the cylindrical barrel 86 of the roll 84. The flanges 85 may be faced with Ferrobestos or the like for the purposes stated and their circumferential edges 85b coincide with a boss plate 82b on the top roll 82.

The third or last stage or pass is designed to produce a roller formed roof strip of

cross sectional shape as shown in Figure 13 and having a flat base or bottom part 87. On one side or edge 88 the material is turned to an angle of approximately 90° to the plane of the material base, and this plain edge 88 stands approximately one and three quarter inches high. On the opposite side, the material is likewise formed as an upstanding edge 89 one and three quarter inches high, and again at approximately 90° to the plane of the material. Beyond the later upstanding part 89 and turned away from the plane of the material, there is provided a flange 90 of about half an inch in width, which flange is disposed to lie parallel to the plane of the base material.

Beyond the last stage of the rolling mill there is provided a suitable guillotine or shearing means to cut off the formed roof strips to a required length. In the drawings, Figures 1 and 2, a hand guillotine is shown and indicated by the numeral 91.

The apparatus is preferably provided with an automatic switch operated so that when a length of material has been rolled through the mill, the switch is operated by contact by the advancing edge of the material remote from the mill to switch off the power, thus stopping the rolling operation. A movable cut-off electric power switch 92 is diagrammatically shown in Figures 1 and 2. When travel movement of the roof strip material has ceased by control operation of the cut-off switch or other control means, operation of the cutting guillotine then allows a roof strip of the determined length to be cut off. The power unit can then be restarted to roll another roof strip.

While the switch 92 is shown as being mounted on a stand it is preferably provided with a clamp by which it can be clamped on a support for the formed strip which support extends from the delivery end of the chassis. The switch can thus be clamped on the support at a distance from the guillotine corresponding to the required length of the finished roofing strips.

The upper movable blade of the guillotine has its lower cutting edge shaped as a shallow V so that it commences to cut the strip near its centre and cuts outwards towards the margins of the strip. It is found that this produces a clean cut without deformation of the shaped strip.

Manually operable starting and stopping switches are provided at a convenient position on the apparatus, and are not shown in the drawings.

As stated, the roll 8 of strip material is mounted on a mandrel 9 as shown in Figures 1 and 2.

It is desirable that the mandrel used should be a firm fit in the hollow core of the roll 8. Because of variations in core

hole sizes, and to meet this requirement, there is provided an expandable means on the mandrel 9 which is adjustable in effective diameter, within limits.

Referring to Figures 11 and 12, there is shown an adjustable mandrel having an axle shaft 10 with journal end 10a of a reduced diameter. The shaft 10 at each end continuous with the journal ends 10a is externally threaded with a right hand thread 10b at one end, and a left hand thread 10c at the other end.

A centre disc member or spider 93 and end disc members or spiders 94 and 94a are axially mounted on the shaft 10. Each disc is, of a lesser diameter than the diameter of the smallest roll core hole to which the mandrel is to be adapted.

The centre disc member 93 is freely mounted and rotatable at the approximate mid-position of the shaft 10 and is held between collars 97 on the said shaft. The outer disc members 94 and 94a are internally threaded at their axial centre, so that one disc member 94 is mounted on and rotatable on the right hand threaded part 10b of the shaft 10, and the other disc member 94a is mounted on and rotatable on the left hand threaded shaft part 10c.

The disc members have their peripheral edges 95 notched by slots. In the construction shown, there are four slots in each disc member, each slot being in corresponding alignment with slots in the other two discs. The slots 96 in the end disc members 94 and 94a have inclined bases, as shown at 98 in Figure 11. The slots 96a in the centre disc member 93 are deeper than those in the end disc members, the shape of the slot bottom faces being immaterial.

A plurality, e.g. four, in the case discussed, of loose blade members 99 slidably move in the slots 96 and 96a. The blades are made of flat steel bars and are so positioned in the slots that their outer edges 100 at all times project above the peripheral edges 95 of the disc members.

Each blade member has twin dependent guide lugs 101 at its mid-centre, the lugs being arranged one on each side of the centre disc member 93 as shown in Figure 11 only. The lugs 101 prevent lateral movement of the blades while permitting radial movement within the slots.

At their outer ends the blade member bottom or inner edges 102 are tapered or inclinedly shaped to conform with the inclined slot bases 98 and bear directly onto the said bases 98.

Strong coiled tension springs 103 connect blade members to the axial shaft and draw the blade members inwards, to ensure blade contact with the inclined bases 98 of the slots 96, and further act to prevent uncon-

trolled outwards movements of the said blade members.

Referring particularly to Figure 11, it will be apparent that when the centre disc member 93 is held stationary and the axle shaft manually rotated, then the outer disc members 94 and 94a will be transversely moved along the axial shaft threaded parts. Appropriate turning of the shaft will cause the discs to move apart, and otherwise turning will draw the disc members together. The described movement of the outer disc members will cause complementary radial movement of the blade members by the contact of the inclined slot bases 98 with the inclined lower edges 102 of the blade members.

By this arrangement the mandrel blades can be retracted so that the whole mandrel construction can be introduced into a roll core, and subsequently the mandrel parts be manipulated, as described, to project the blades outwards to grip the core walls.

In the applying of a roof to a building according to the method of this invention in addition to the provision of roof strips of cover material formed by the foregoing apparatus and method, it is necessary in roofing operations to provide means whereby the said roof strips can be fastened to the building construction, for example, to sarking provided thereon.

Referring to Figure 15, there is shown one suitable and preferred means of attachment, namely a clip. The clip shown may be made of metal strip, say one and a half inches wide, and of the same metal as used in the strip roof material.

Each clip as shown, has a stem 104 bent over at the top to form a hook 105 and bent backwards at the bottom to form a tail part 106. The clip is so proportioned that the hook can be placed over the roof strip upstanding edge 88 that has no flange part as shown in dash lines 105a in Figure 13, while the flat tail part can be nailed or otherwise fixed on the sarking or other roof construction. Nail holes are provided in the tail part 106 and are not shown in the drawings.

Where the roof strip is of a length to be affectedly moved by expansion and contraction when in use on a roof, the attachment means should be adapted to allow such movement.

Again referring to Figure 15, one such attachment adaptation is shown where the flat tail 106 is extended and bent over to form a fold-over piece 107 whereby is formed a U space 108 to slidably contain a fixing strip 109. The fixing strip 109 is attached to the roof construction by nails or the like passing through nail holes 111 in the clip ends.

Referring to Figure 13, a clip is shown

in use engaging the upstanding edge 88 of a roof strip. The said clip is shown in dash lines wherein is a hook part 105a passed over the top of the strip edge 88 and retaining the same, the clip stem part 104a and a tail part 106a positioned to be attached to the roof construction.

Generally, sliding clips are provided where the roof strip exceeds ten feet in length, or in special uses, where circumstances so require.

In roof construction, the clip hook ends are incorporated in the strip joints to be described.

The method of applying a roof to a building construction and using the foregoing apparatus is as follows.

The trailer or like transport means is loaded with a roll of the strip material. The free end of the material is passed through the rollers, so as to be ready to deliver formed roof strip material therefrom on arrival at the site. The trailer or the like is transported to the building site where roofing is to take place and the user then measures a roof and proceeds to form unit roof strips of the required length to apply a length of the strip to the roof without transverse joints therein where the part to be roofed lies in the same plane or substantially the same plane.

For example, supposing a building is to take sheets of roof material ten feet long, these sheets are made in strips ten feet long when cut off in complete single lengths. When the strip lengths are applied to the roof there are no transverse joints in the material of the roof strips where the part to be roofed is in the same or substantially the same plane. The advantage of this is considerable and enables roofs to be provided having a pitch as little as two inches in ten feet.

Where the pitch of a gabled roof is low, i.e. it is less than seven and a-half degrees so that the two sides of the roof are substantially in the same plane, sheet strips may be cut so that they pass as a continuous length right over the gabled top, thus providing a continuous roof from the eave on one side to the eave on the other side.

Referring to Figures 13 and 14, there is shown the method of application of roof strips to a building construction and a joint seam of contiguous strips.

Various types of joining means or flashings may be adapted for use at fascia, barge boards, eaves and the like and other features of the building whereby a roof strip as produced and cut off can be applied to a roof as a first run or length of roof covering material.

In Figure 13, in the adaptation shown, the flat bottom or base 87 of the first

roof strip is shown with the flanged edge 89 positioned alongside and close to the upstanding edge 110a of the flashing part 110 shown in dash lines. The flange 90 overlies the edge 110a aforesaid, and can be bent to form a seam therewith, as will be described.

The unflanged upstanding edge 88 of the first run roof strip is on the inner side, as shown. Alongside this strip edge 88 is a holding clip as shown in dash lines where there is a clip stem 104a with a hook part 105a passing over the exposed edge 88 of the roof strip. The clip tail 106a may be nailed to the roof structure.

Again referring to Figure 13 a further roof strip is represented in dash lines with a base 87b, and with an upstanding flanged edge 89b carrying the flange 90b butting closely against the upstanding flange 88 of the first sheet, and enclosing and covering the clip stem 104a and hook 105a as shown.

Referring to Figure 14, there is shown one type of standing seam or joint as adapted to join contiguous roof strips. In the making of this type of seam and referring to the construction shown in Figure 13, the overlapping flange part 90b is folded down closely onto the edge part 88 to form a single fold, and the single fold parts then folded over again to form a double fold seam as shown in Figure 14, and of a type well known in sheet metal working arts. This seam jointing process is continued to join together further strips or sheets as produced and placed in position on the building. The seams so made enclose the holding clips stems in part, and the hooks of the clips.

In Figure 14 an embodied clip is not shown.

WHAT WE CLAIM IS:—

1. A method of applying roofing to a building construction comprising the steps of transporting a roll of flat strip metal on a trailer or the like mobile construction to the site where roofing is to take place, forming said flat strip by rolling using a rolling mill mounted on said trailer or the like mobile construction, the finished form of the rolled sheet having a first upstanding edge at or near to a right angle to the plane of the sheet on one side and a second upstanding edge at or near to a right angle to the plane of the sheet on the other side, said second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet, cutting off a length of said rolled strip sufficient to enable the strip of material to be applied to the roof without transverse joints therein where the part to be roofed lies in the same plane or substantially the same plane, fixing a hooked holding means to the building con-

struction being roofed, the hook thereof reaching over said first upstanding edge, applying a further sheet contiguous with said sheet already fixed in position with the flange of said further sheet lying over said first upstanding edge, folding said flange over said first upstanding edge and over said clip and folding said contiguous edges to provide a standing seam between contiguous sheets.

2. A method as claimed in Claim 1, for use where the roof being made is a gable roof of low pitch which includes the step of passing the roofing strips continuously from eave to eave over the ridge.

3. A method of applying roofing to a building construction when effected substantially as described with reference to the accompanying drawings.

4. Apparatus for use in transporting a roll of flat strip to a site to be used for roofing and for use in rolling said flat strip at the site to provide a sheet of roofing material, said apparatus comprising a trailer or the like mobile construction having mounted thereon mounting means for carrying a roll of flat strip and a strip rolling mill adapted to roll said flat strip to a contour suitable for use in the foregoing methods as claimed in any one of Claims 1 to 3.

5. Apparatus as claimed in Claim 4, wherein said rolling mill comprises a three stage mill having shaped top and bottom rollers in each stage to progressively shape the material to the desired shape.

6. Apparatus as claimed in Claim 5, wherein the bottom rollers of each stage are driven.

7. Apparatus as claimed in Claim 6, wherein said rollers are driven so as to pass material through the mill at about forty-five to fifty feet per minute.

8. Apparatus as claimed in any one of Claims 4 to 7, wherein cutting means are provided at the delivery end of said mill whereby material may be cut off to the desired lengths.

9. Apparatus as claimed in any one of Claims 4 to 8, wherein said rolling mill is driven by an electric motor.

10. Apparatus as claimed in Claim 9, wherein motor cut out means are provided operable to stop the motor when the length of material is the desired length.

11. Apparatus as claimed in any one of Claims 4 to 10, wherein the last stage of said rolling mill has complementary rolls one side of each of which is adapted to form an upstanding edge on the material and the other side of each of which is adapted to form an upstanding edge with an outwardly turned flange thereon.

12. Apparatus as claimed in Claim 11, wherein said rolls carry on each side surfaces normal to the longitudinal axis of the rolls



roof strip is shown with the flanged edge 89 positioned alongside and close to the upstanding edge 110a of the flashing part 110 shown in dash lines. The flange 90 overlies the edge 110a aforesaid, and can be bent to form a seam therewith, as will be described.

The unflanged upstanding edge 88 of the first run roof strip is on the inner side, as shown. Alongside this strip edge 88 is a holding clip as shown in dash lines where there is a clip stem 104a with a hook part 105a passing over the exposed edge 88 of the roof strip. The clip tail 106a may be nailed to the roof structure.

Again referring to Figure 13 a further roof strip is represented in dash lines with a base 87b, and with an upstanding flanged edge 89b carrying the flange 90b butting closely against the upstanding flange 88 of the first sheet, and enclosing and covering the clip stem 104a and hook 105a as shown.

Referring to Figure 14, there is shown one type of standing seam or joint as adapted to join contiguous roof strips. In the making of this type of seam and referring to the construction shown in Figure 13, the overlapping flange part 90b is folded down closely onto the edge part 88 to form a single fold, and the single fold parts then folded over again to form a double fold seam as shown in Figure 14, and of a type well known in sheet metal working arts. This seam jointing process is continued to join together further strips or sheets as produced and placed in position on the building. The seams so made enclose the holding clips stems in part, and the hooks of the clips.

In Figure 14 an embodied clip is not shown.

WHAT WE CLAIM IS:—

1. A method of applying roofing to a building construction comprising the steps of transporting a roll of flat strip metal on a trailer or the like mobile construction to the site where roofing is to take place, forming said flat strip by rolling using a rolling mill mounted on said trailer or the like mobile construction, the finished form of the rolled sheet having a first upstanding edge at or near to a right angle to the plane of the sheet on one side and a second upstanding edge at or near to a right angle to the plane of the sheet on the other side, said second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet, cutting off a length of said rolled strip sufficient to enable the strip of material to be applied to the roof without transverse joints therein where the part to be roofed lies in the same plane or substantially the same plane, fixing a hooked holding means to the building con-

struction being roofed, the hook thereof reaching over said first upstanding edge, applying a further sheet contiguous with said sheet already fixed in position with the flange of said further sheet lying over said first upstanding edge, folding said flange over said first upstanding edge and over said clip and folding said contiguous edges to provide a standing seam between contiguous sheets.

2. A method as claimed in Claim 1, for use where the roof being made is a gable roof of low pitch which includes the step of passing the roofing strips continuously from eave to eave over the ridge.

3. A method of applying roofing to a building construction when effected substantially as described with reference to the accompanying drawings.

4. Apparatus for use in transporting a roll of flat strip to a site to be used for roofing and for use in rolling said flat strip at the site to provide a sheet of roofing material, said apparatus comprising a trailer or the like mobile construction having mounted thereon mounting means for carrying a roll of flat strip and a strip rolling mill adapted to roll said flat strip to a contour suitable for use in the foregoing methods as claimed in any one of Claims 1 to 3.

5. Apparatus as claimed in Claim 4, wherein said rolling mill comprises a three stage mill having shaped top and bottom rollers in each stage to progressively shape the material to the desired shape.

6. Apparatus as claimed in Claim 5, wherein the bottom rollers of each stage are driven.

7. Apparatus as claimed in Claim 6, wherein said rollers are driven so as to pass material through the mill at about forty-five to fifty feet per minute.

8. Apparatus as claimed in any one of Claims 4 to 7, wherein cutting means are provided at the delivery end of said mill whereby material may be cut off to the desired lengths.

9. Apparatus as claimed in any one of Claims 4 to 8, wherein said rolling mill is driven by an electric motor.

10. Apparatus as claimed in Claim 9, wherein motor cut out means are provided operable to stop the motor when the length of material is the desired length.

11. Apparatus as claimed in any one of Claims 4 to 10, wherein the last stage of said rolling mill has complementary rolls one side of each of which is adapted to form an upstanding edge on the material and the other side of each of which is adapted to form an upstanding edge with an outwardly turned flange thereon.

12. Apparatus as claimed in Claim 11, wherein said rolls carry on each side surfaces normal to the longitudinal axis of the rolls

which surfaces are faced with Ferrobestos or the like material.

13. Apparatus as claimed in Claim 11 or Claim 12, wherein said rolls are formed substantially as described with reference to the accompanying drawings.

14. Apparatus as claimed in any one of Claims 4 to 13, wherein said rolls are carried by shafts ranging in bearings and said bearings are slidably mounted in mounting means.

15. Apparatus as claimed in Claim 14, wherein said mounting means are constructed and arranged substantially as described with reference to the accompanying drawings.

16. Apparatus as claimed in any one of Claims 4 to 15, wherein a guide roller and a guide table are provided between said means for carrying a roll of strip material and said rolling mill.

17. Apparatus as claimed in any one of Claims 4 to 16, wherein friction means are provided between said means for carrying a roll of material and said rolling mill to provide frictional resistance to said material as it is pulled into said rolling mill for the purpose of keeping said material flat.

18. Apparatus as claimed in Claim 17, wherein said friction means comprise a pressure plate having a frictional surface and adapted to press the material onto a backing plate.

19. Apparatus as claimed in any one of Claims 4 to 18, wherein carrying means are provided to carry a roll of strip material for rolling.

20. Apparatus as claimed in Claim 19, wherein said carrying means comprise a mandrel rotatable in half bearings and having expandible means to expand into the aperture through a roll of material.

21. Apparatus as claimed in Claim 20, wherein said expandible means comprise a plurality of blades having sloping inner surfaces, a pair of spiders having blade engaging means and being internally threaded to engage left and right hand male threads on said mandrel, the construction and arrangement being such that rotational movement of said mandrel relative to said spiders and blades causes endwise movement of said spiders and resultant radial movement of said blades.

22. Apparatus as claimed in Claim 21, wherein a central locating spider is provided.

23. Apparatus as claimed in Claim 21 or Claim 22, wherein springs are provided between said blades and said mandrel to maintain said blades in their position.

24. Apparatus as claimed in any one of Claims 19 to 23, wherein said carrying means are constructed substantially as described with reference to the accompanying drawings.

25. Apparatus as claimed in any one of Claims 19 to 24, wherein a crane means is provided to lift a roll of material onto said carrying means.

26. Apparatus as claimed in Claim 25, wherein said crane means are constructed substantially as described with reference to the accompanying drawings.

27. Apparatus as claimed in any one of Claims 4 to 25, wherein said trailer or the like mobile construction comprises a two wheeled trailer.

28. Apparatus for use in transporting a roll of flat strip to a site to be used for roofing and for use in rolling said flat strip at the site to provide a sheet of roofing material when constructed and arranged substantially as described with reference to the accompanying drawings.

29. Roofing, continuous at least from eave to gable, comprising strips of material formed by rolling on the site to a shape having one upstanding edge without a flange along one side of the material and another upstanding edge having a flange along the other side of the material, said roofing being fixed to the building by the use of hooked clips, the hooked part of which engages the upstanding edge without a flange, the clip being fixed to the building and seams between contiguous sheets being provided by folding the flanged edge of one sheet over the unflanged edge of the contiguous sheet and folding the whole of the edges to form a standing seam.

30. Roofing as claimed in Claim 29, wherein the roof is gabled but of low pitch and said strips are continuous from eave to eave across said gable.

31. Roofing as claimed in Claim 29 or Claim 30, wherein said hooked clips are constructed and arranged substantially as described with reference to Figure 13 of the accompanying drawings.

32. Roofing as claimed in Claim 29, wherein said hooked clips and holding means therefor are constructed and arranged substantially as described with reference to the accompanying drawings.

33. Roofing when constructed and arranged substantially as described with reference to the accompanying drawings.

34. Apparatus for the manufacture of roofing strips comprising a support for a roll of flat metal strip, a rolling mill arranged to form upstanding flanges along each edge of the strip as it is fed therethrough, an electric motor for driving the rolling mills, a guillotine adjacent the delivery of the rolling mill and an electric switch mounted at an adjustable distance from the guillotine in the path of the shaped strip from the rolling mill and arranged to be actuated by the leading end of strip to interrupt the current supply to the motor.



35. Apparatus according to Claim 34, wherein the rolling mill has complementary rolls one side of each of which is adapted to form an upstanding edge on the material and the other side of each of which is adapted to form an upstanding edge with an outwardly turned flange thereon.

36. Apparatus according to Claim 34 or 35, wherein a movable blade of the guillotine has its cutting edge shaped as a shallow V so that it commences to cut the strip near its centre and cuts outwardly towards its margins.

37. A method of making roofing strips comprising feeding a continuous metal strip through a rolling mill and a guillotine adjacent the delivery from the mill, bending in the mill, one edge of the strip through substantially a right angle, bending, in the

mill, the other edge of the strip through substantially a right angle along each of two spaced lines and in opposite directions so that both edges upstand from the same side of the strip, stopping the mill when a predetermined length of the strip has passed the guillotine and operating the guillotine to sever the said length from the remainder of the strip.

38. A method of making roofing strips to extend from at least eave to gable of a roof substantially as described herein.

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