Feb. 8, 1927. 1,616,968

N. L. HALL

CORRUGATED ROOFING OR SIDING SHEET

Filed Jan. 9, 1926

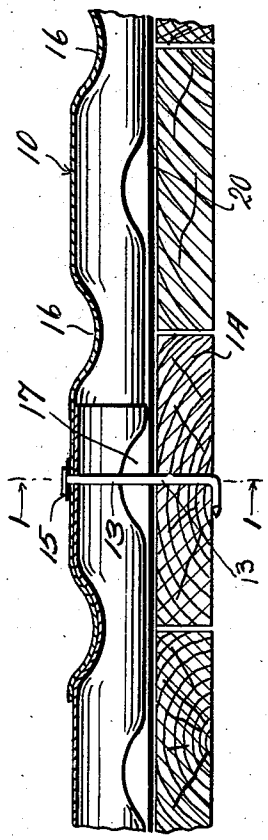


Fig. 1.

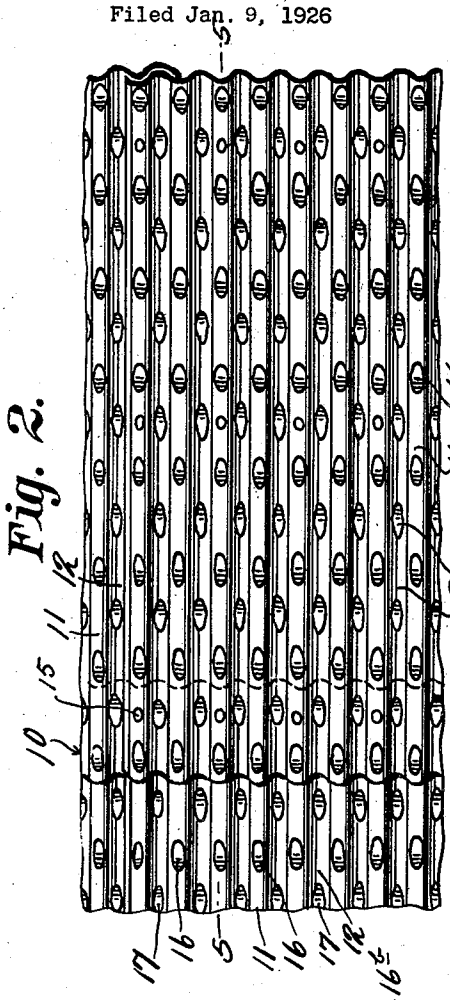


Fig. 2.

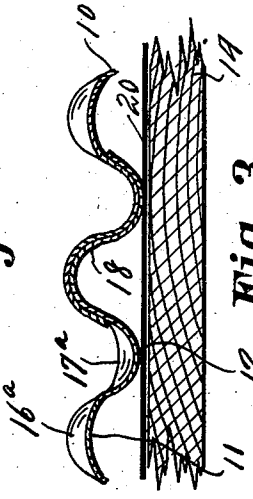


Fig. 3.



Fig. 6.

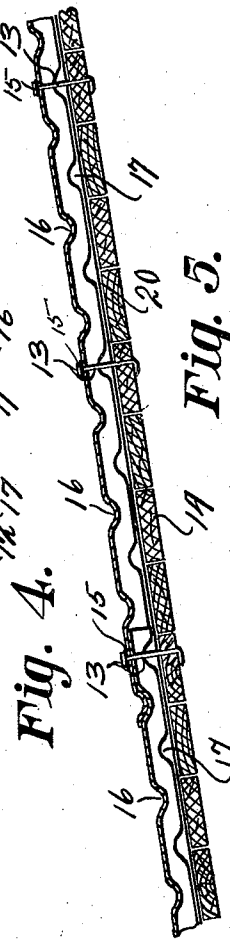


Fig. 4.

Fig. 5.

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Patented Feb. 8, 1927. 1,616,968

UNITED STATES PATENT OFFICE.

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CORRUGATED ROOFING OR SIDING SHEET.

Application filed January 9, 1926. Serial No. 80,282.

This invention relates to metallic roofing or siding and particularly roofing or siding formed of relatively large corrugated sheets.

There has always been a demand for a metallic roofing and in response to this demand four different forms, as they may be termed, have been provided: i. e., roofing sheets, the margins of which are interlocked or soldered, metallic shingles, metallic tiling, that is, roofing sheets shaped to simulate tiles, and corrugated sheets. Metallic shingles have never been entirely satisfactory as it is difficult to make a proper joint which will prevent the passage of water and also because the stamped composite designs are so evidently imitations. The individual metallic tile has developed a very good effect but requires very careful mechanical work thereon in order to make a good job. The interlocked metallic sheets also require very careful joining and soldering and are very liable to open at the joint and, corrugated roofing sheets, though more easily laid and not requiring the mechanical skill required by the other forms of metallic roofing, are monotonous and ugly in design and, furthermore do not retain snow upon the roof but allow the snow to slide off of the roof in a partially congealed condition which makes this form of roof more or less dangerous. Furthermore, though the corrugations strengthen the roofing sheet longitudinally they do not tend to strengthen it laterally. A further objection to stamped designs on metallic roofing units is that the stamped designs do not carry the drainage downward along the slope of the roof. A further objection to metallic roofs is that the roofing sheets must be nailed or otherwise held to the rafters or to the sheathing and no provision is made for draining water away from the nail so that water is liable to collect around the nail head and percolate through the nail opening. Furthermore, where the edges of the individual units are seamed these seams are liable to become filled with dirt, thus adding to the capillarity of the seam and inasmuch as the seams are of small dimensions, capillary attraction is liable to draw water into the seam and cause the water to flow beyond the overlap.

The objects of my present invention are to provide an improved roofing sheet which requires but few pieces to cover a given area, which is particularly strong by virtue of the fact that it is longitudinally corrugated and laterally bridged, that the corrugations have sufficient depth to prevent capiliary attraction carrying water beyond the overlap of the two sheets, and which is further so formed that the sheet has a pleasing appearance closely resembling a wicker or tiling effect, thus relieving the monotony of ordinary corrugated sheet metal and making my roofing sheet particularly applicable to dwellings, filling stations, etc.

A further object is to provide means whereby continuous valleys are formed extending down the roof which will permit proper drainage, the sheet, however, being so constructed that it will act to retain snow upon the roof and prevent the sliding of this snow down the smooth surface of the roof and in this connection to so construct this sheet that the drainage toward the nail hole or nail, whereby the sheet is held to the roof, is reduced to a minimum.

Other and more detailed objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a transverse fragment section of a roof with the overlapping side margins of two roofing sheets applied thereto, the section being taken on the line 1—1 of Figure 2;

Figure 2 is a longitudinal section on the line 2—2 of Figure 1;

Figure 3 is a transverse section of a modified form of roofing sheet, the section being taken through two adjoining sheets on a line midway between the two sets of depressions;

Figure 4 is a top plan view of a roofing sheet such as illustrated in Figures 1 and 2;

Figure 5 is a longitudinal section on the line 5—5 of Figure 4;

Figure 6 is a fragmentary cross section of a corrugated roofing sheet formed in accordance with my invention and showing a modification in the form of the corrugations.

Referring to Figures 1 to 5 it will be seen that generally speaking this roofing sheet 10 has the form of ordinary corrugated sheet metal, that is, it is formed with alternate longitudinally extending crests 11 and valleys 12, these crests and valleys ex-

tending the full length of the sheet and the crests being provided with openings for the insertion of nails 13, these nails being of the ordinary type commonly used with corrugated sheet metal, being driven through the sheathing 14, and each nail having a relatively wide head resting against a washer 15 which is preferably of lead or like material.

So far I have described an ordinary form of corrugated metal sheet such as is used for roofing or siding. Such a sheet may be laid cheaply and quickly because of its relatively large area but such a sheet as this is monotonous in design and appearance, is transversely weak and is open to the objections that water running down the ridge or crest 11 will drain toward the nail hole and water of condensation forming under the sheet will flow continuously along the base of the corrugation and between it and the supporting sheathing by capillarity or drip, and, of course, snow will not be retained upon this sheet. In order to avoid these objections I form by stamping, pressing or any other means, a series of depressions 16 in the crests or ridges 11 of the corrugations, and form reverse depressions or elevations 17 at intervals in the valleys 12. These depressions 16 are arcuate in longitudinal section and are disposed at intervals of approximately 6″ from each other and the reverse depressions or elevations 17 are likewise arcuate longitudinally and disposed at intervals of about 6″ and alternate with the depressions 16. As shown in Figure 1 the depressions 16 and 17 are approximately flat transversely. In Figure 3, however, I illustrate depressions 16^a and 17^a which are transversely curved. In Figure 1 I have shown the lateral margins of two coacting sheets as being overlapped to an extent of a valley and a ridge and have shown these overlapping ridges and valleys as being formed with depressions 16 and 17. I do not wish to be limited to this, however, and in Figure 3 I have illustrated the margins of the two sheets as having plain corrugations 18 which overlap each other and without any depressions in the overlapping ridges and valleys. In Figure 6 I have illustrated a roofing sheet wherein the main longitudinally extending corrugations 11 and 12 have the depressions 16^b and 17^b, the bottoms of these depressions, however, instead of being transversely curved as shown respectively in Figures 1 and 3, being formed to conform more or less in general contour to the major corrugations that is, the bottom of the depression 16 at its middle is upwardly convex while the upper face of the upward projection 17 or reverse depression, as it may be termed, is transversely concave.

This structure as shown in Figure 6 has the following advantage:—In making a depression as shown in Figure 1, the arc is reduced to a chord extending transverse of the corrugation. This chord is, in Figure 3 formed as an arc of larger radius but in either case the length of the original arc must be reduced to form the chord or is "upset." The structure shown in Figure 6 shows a crimped depression purposely designed so that the length over the crimps are the same as the original length of the arc, thereby avoiding any necessity for transverse upsetting. It is to be noted that the crimp in the valley 12, which crimp extends longitudinally of the depression 17^b allows a drainage of the valley 12 almost on a level with the valley, that is, the depression 17^b does not dam the drainage to the same height as would the depression 17^a in Figure 3, or 17 in Figure 1, where the descending drainage over the depression 17 is almost on a level with the portion 19. This is not the case with the structure shown in Figure 6.

While, of course, I do not wish to be limited to the particular dimensions given. I may state that in actual practice this sheet, which will be formed preferably of zinc, or zinc coated steel, will have the dimensions of an ordinary corrugated sheet metal sheet so that not over four sheets are required to cover one "square." The corrugations will be preferably 2½″ x ⅞″ and each depression 16 and the reverse depression 17 is not more than one-half of the depth of the corrugations. The depressions adjacent the top and lower ends of the sheet will be spaced from the end of the sheet a distance of approximately 1½ inches. Then the depressions will be spaced about every 6″ along the ridge with the valley depressions 17 disposed intermediate the ridge depressions. This spacing allows a uniformity of sheet to any 6″ or 12″ of length. Side corrugations can be left plain as in Figure 3 or formed with depressions as is the rest of the sheet, as shown in Figure 1. The depressions 16 or 17 may be of any desired length but the width of the depression is governed by the depth which is never more than half of the depth of the corrugation. The side edges of the sheet must always extend beyond the depressions along this side edge. That is, as illustrated in Figure 1, the margin of the sheet as at 19, projects beyond the corresponding depression 17 or 16 and the sheet is not cut or bounded by a line passing through either the ridge depressions or the valley depressions. This prevents any lateral drainage which might pass along the top of the depression and over the side of the sheet. This is assisted by making the top face of a depression on a curve, as shown in Figure 3 or Figure 6 rather than a flat surface, as shown in Figure 1. The sheet is to be applied in the same manner as any corrugated sheet and preferably against the

sheathing paper 20 in the manner illustrated.

While my sheet can be initially pressed into the desired shape, the proper way of forming it is to first corrugate the sheet to a proper width or depth and then press the depressions into the sheet. In making these depressions 16 or 17 the cross section of the depression will show a reduction in transverse length but this is compensated for by the fact that the longitudinal section along the ridge shows a length which will balance the two effects. The sheet should not be so depressed as to injure the metallic fiber, strength or grain of the sheet but should leave the sheet with its initial merits of strength and elasticity. While I have illustrated these depressions as being formed on a line normal to the corrugations, the depressions can be disposed at an angle to these lines thus developing a herring-bone effect if desired. The several advantages of this invention lie not only in the improved appearance of the roof itself which, as before remarked, simulates tiling, but in the fact that the depressions 16 and 17 very greatly strengthen the sheet for the reason that these depressions extend transversely of the corrugations and develop a lateral stiffness or truss effect which will simultaneously develop a longitudinal strength. This prevents the corrugations from spreading sidewise or tending to flatten out and adds very greatly to the stiffness and rigidity of the metal sheet. A further object resides in the fact that a depression immediately above a nail hole or the head of the nail intercepts the flow of rain water downward along the ridge and deflects the rain water laterally into an adjacent valley so that there is a minimum of drainage area. Thus, for instance, referring to Figures 1 and 2 it will be obvious that rain water will tend to drain laterally over the crest in Figure 1 and that the only rain water which can possibly drain toward the nail head is the water which may be collected below a depression 16 and the next adjacent nail head lower down, which is obviously very slight, particularly if the nail be driven adjacent to the depression 16 just above the nail. With my construction when side laps are formed of 1½ corrugations, any percolation which passes laterally over the first ridge of the seam is drained by an intercepting valley so that ample means is provided to prevent capillary attraction from carrying water laterally between the overlapping surfaces at the margins of two sheets and draining over the side margin of the under sheet. At certain seasons of the year when exterior temperature is lower than the interior temperature, the chill of a metallic roofing sheet will effect a condensation of the moisture of the interior air and this condensation will collect on the under side of the chilled roofing sheet in the form of a trickle which, due to capillarity, runs along the slope of the roof beneath the base of the corrugation in contact with the roofing paper or sheathing below. When a roofing sheet with a plain corrugation is used this trickle will flow without interruption but in a sheet with deformed corrugations such as mine, the continuity of this drainage is interrupted and thus it affords an opportunity for the water to spread over the roofing paper and be absorbed by a relatively large surface without affecting the roofing paper, deleteriously. The indentations or depressions assist in holding the snow load to the roof and thus guards for this purpose are not required. It will also be noted that the depressions or indentations make a series of upright inverted arches extending transversely and also longitudinally of the sheet so that the sheet is stiffened laterally and forms a bridged corrugated sheet. In actual practice it has been found that the depressions not only bridge and stiffen the sheet laterally but also stiffen it on a line normal to the direction of the corrugation. Such a sheet can be walked over with much less harm to the sheet than is possible where a plain corrugated sheet is used. I do not wish to be limited to the exact form of the depressions or indentations of the sheet nor to the exact placing of these indentations or depressions as I have illustrated them, as it is obvious that these details may be modified in many ways without departing from the spirit of the invention as defined in the appended claims.

I claim:—

1. As an article of manufacture, a longitudinally corrugated metallic sheet having uniformly spaced depressions in the crests and valleys of the corrugations, said depressions extending toward the medial plane of the corrugated sheet.

2. As an article of manufacture, a longitudinally corrugated metallic sheet having the crests and valleys, throughout substantially the entire extent of the sheet, formed at uniform intervals with depressions extending toward the medial plane of the sheet, said depressions having a depth approximately equal to one-half the depth of the corrugations.

3. As an article of manufacture, a longitudinally corrugated metallic sheet having the crests and valleys, throughout substantially the whole extent of the sheet, formed at intervals with depressions extending toward the medial plane of the sheet, the depressions extending the full width of the respective crests or valleys but being of less depth than the depth of the corrugations.

4. As an article of manufacture a longitudinally corrugated metallic sheet having the crests and valleys of the corrugations,

throughout substantially the entire extent of the sheet, formed at intervals with depressions extending toward the medial plane of the sheet, the depressions extending the full width of the respective crests or valleys but being of less depth than the depth of the corrugations, the bottoms of both sets of depressions being transversely curved.

5. As an article of manufacture a longitudinally corrugated metallic sheet having the crests of the corrugations formed at intervals, throughout substantially the entire extent of the sheet, with depressions extending inward from the outer surface of the sheet and the valleys formed at intervals throughout the entire extent of the sheet with depressions extending reversely to the first named depressions, the corrugations adjacent the upper and lower ends of the sheet being disposed inward of the edges of the sheet, the lateral margins of the sheet extending beyond adjacent depressions.

6. As an article of manufacture, a longitudinally corrugated metallic sheet having nail hole openings extending through the crests of the corrugations, the crest of each corrugation above and adjacent each nail hole opening being formed with a depression equal in width to the width of the crest but less in depth than the depth of the corrugations to thereby discharge water into the valleys on each side of the crest, said depression acting to prevent rain from running down the crest of the corrugation into said nail hole.

7. As an article of manufacture, a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest and each valley being deformed at intervals throughout substantially the entire extent of the sheet, said deformations extending transversely to the direction of the corrugations, the deformations being less in depth than the depth of the corrugations.

8. As an article of manufacture a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, the valleys on both sides of the sheet being deformed at intervals throughout substantially the entire extent of the sheet to provide transversely extending bridged portions.

9. As an article of manufacture a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest being deformed at intervals throughout substantially the entire extent of the sheet to provide depressed portions discharging laterally into the adjacent valley.

10. As an article of manufacture a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest having transversely extending pressed out portions less in depth than the depth of the crest, and each valley being formed at intervals to provide pressed out transversely extending portions less in depth than the depth of the valley, said pressed out portions being longitudinally crimped along the middle line.

11. As an article of manufacture a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest at intervals being deformed to provide a transversely rounded depressed portion having a longitudinally extending transversely rounded crimp along its middle, the length of said crest over a crimp being the same as the original transverse length of the crest prior to deformation.

12. As an article of manufacture, a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest being bounded at separated intervals on each side of the medial vertical plane of the crest by depressions in the crest less in depth than the depth of the crest and extending toward the medial plane of the sheet, and each valley being bounded at separated intervals by depressions on each side of the medial vertical plane of the valley extending in an opposite direction to the depressions in the crest and toward the medial plane of the sheet.

13. As an article of manufacture a metallic sheet having corrugations extending parallel to each other to provide a series of alternate crests and valleys, each crest being bounded at separated intervals on each side of the medial vertical plane of the crest by depressions in the crest less in depth than the depth of the crest and extending toward the medial plane of the sheet, and each valley being bounded at separated intervals by depressions on each side of the medial vertical plane of the valley extending in an opposite direction to the depressions in the crest and toward the medial plane of the sheet, the depressions in the valleys being staggered with relation to the depressions in the crests.

In testimony whereof I hereunto affix my signature.

NEWTON L. HALL.