Oct. 16, 1934. A. A. KRAMER 1,977,391

GRAIN BIN

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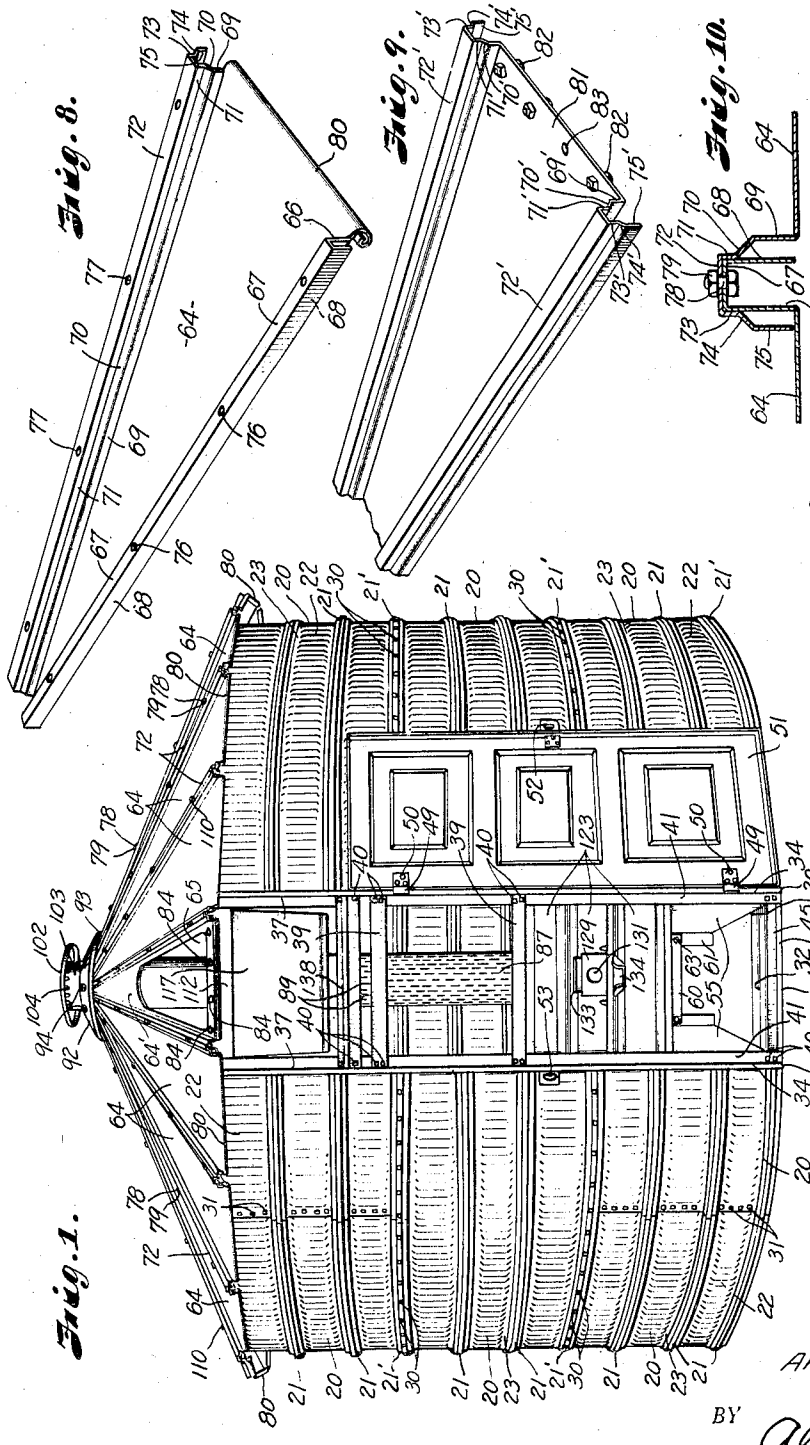


Fig. 1.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 7.

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GRAIN BIN

Filed Nov. 21, 1931 4 Sheets-Sheet 2

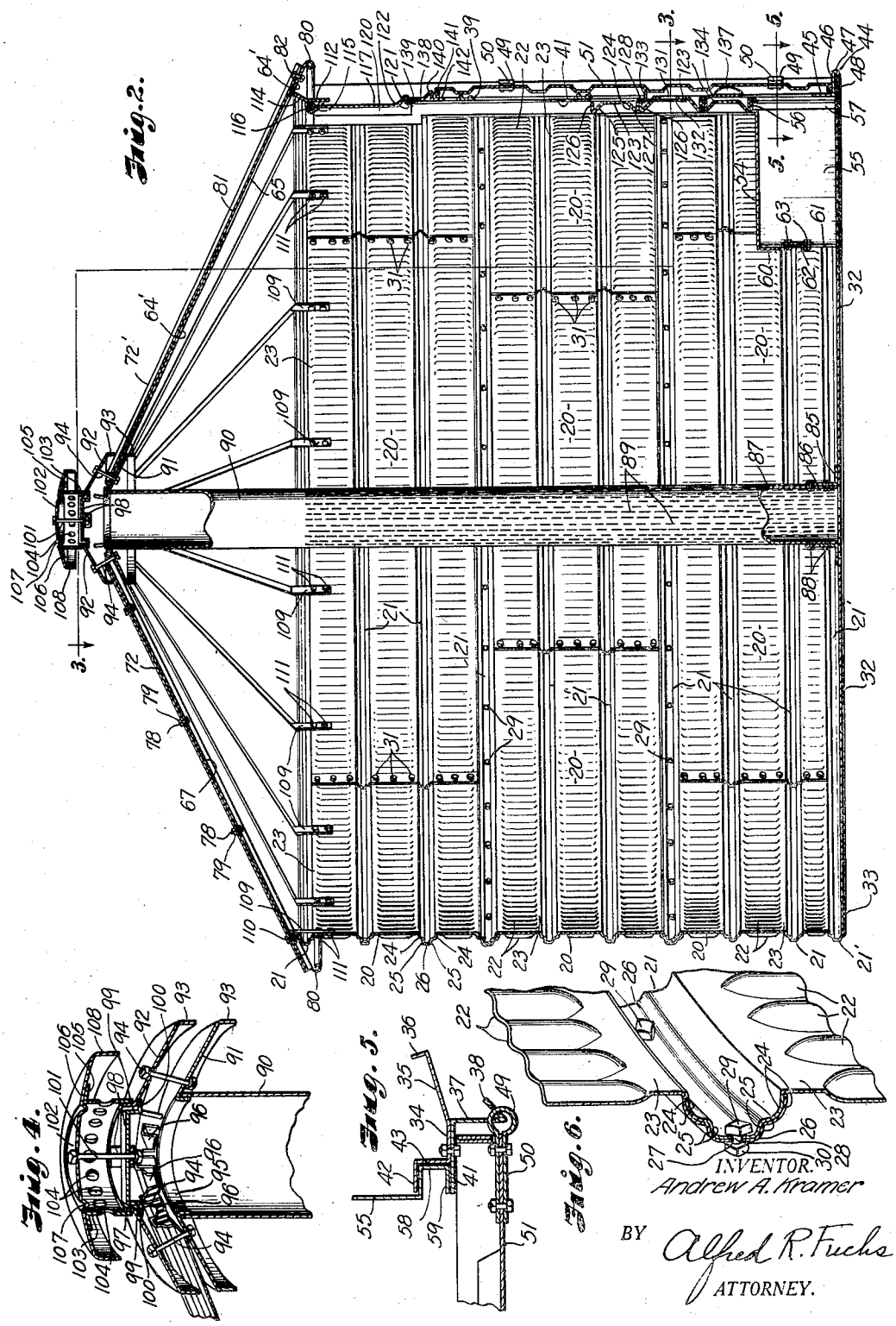


Fig. 2.

Fig. 4.

Fig. 5.

Fig. 6.

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GRAIN BIN

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Fig. 3.

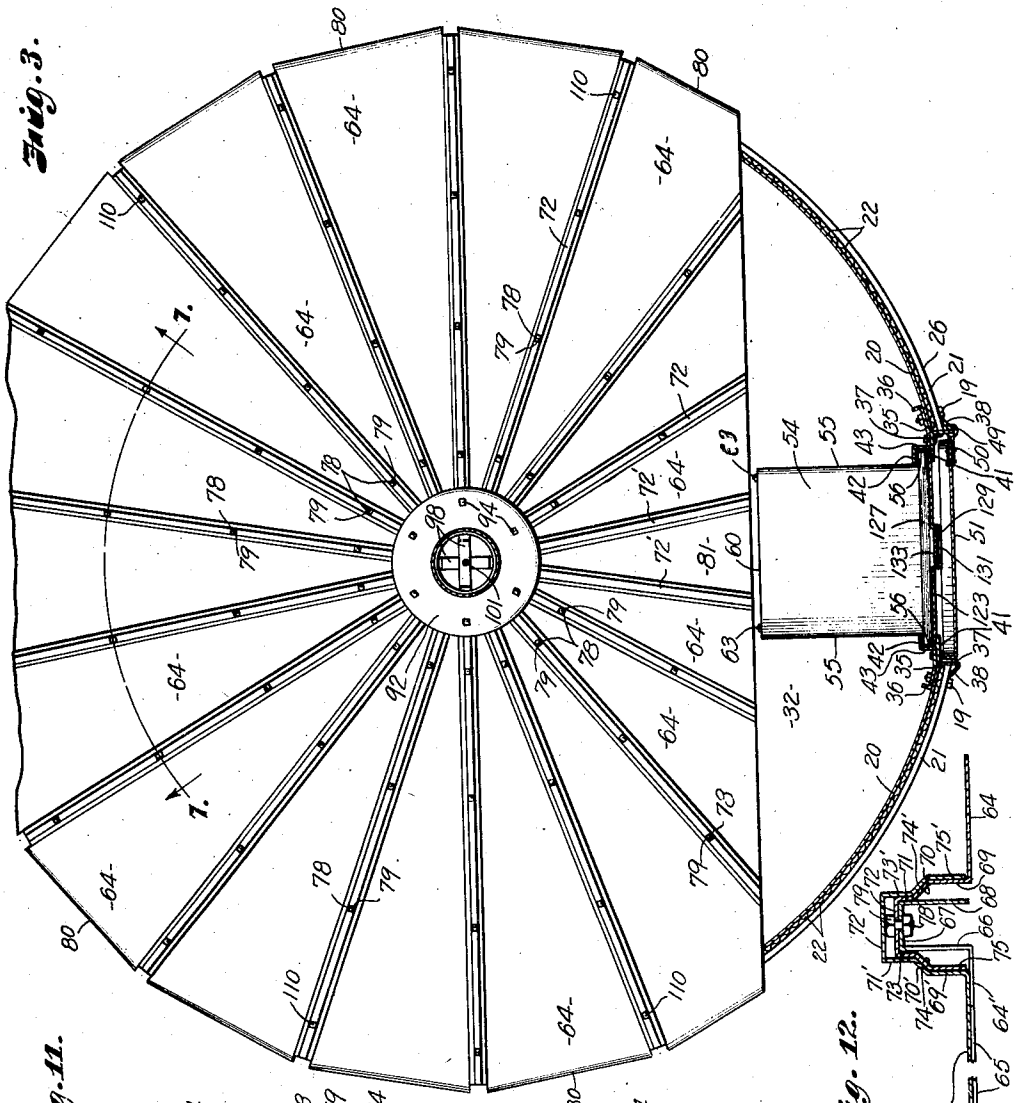


Fig. 11.

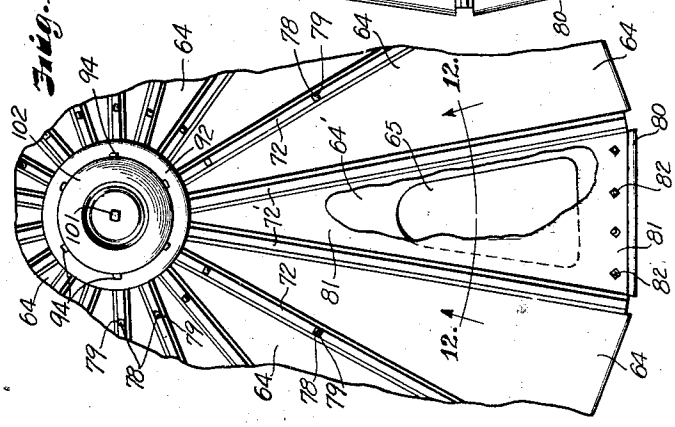


Fig. 12.

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GRAIN BIN

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Fig. 13.

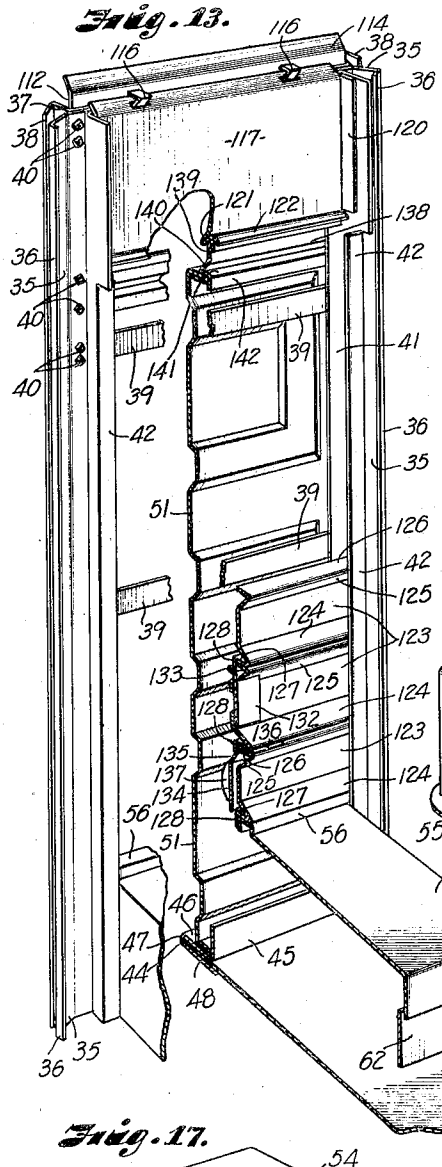


Fig. 14.

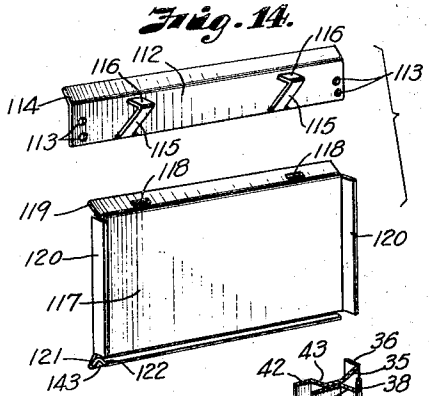


Fig. 15.

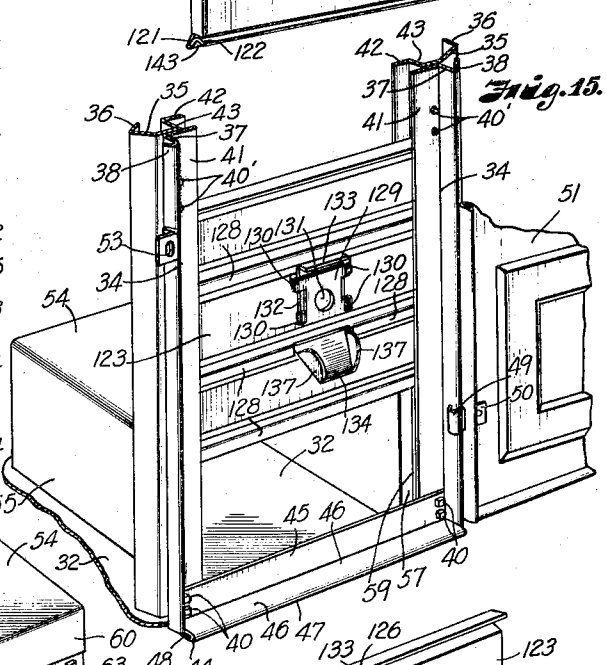


Fig. 17.

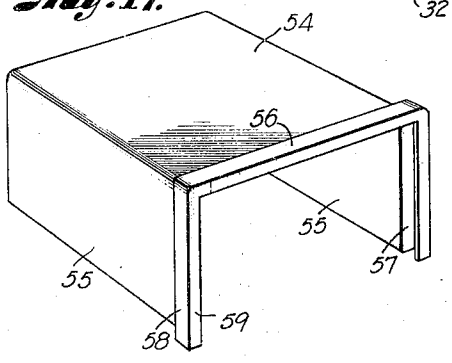


Fig. 18.

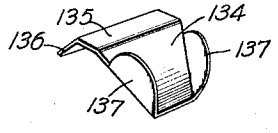
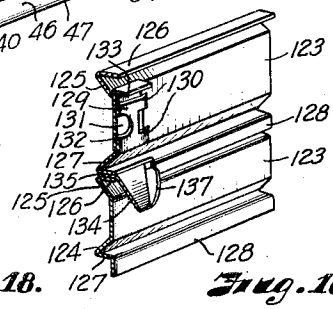


Fig. 16.



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UNITED STATES PATENT OFFICE

1,977,391

GRAIN BIN

Andrew A. Kramer, Kansas City, Mo.

Application November 21, 1931, Serial No. 576,524

31 Claims. (Cl. 189—3)

My invention relates to grain bins, and more particularly to a knock-down sheet metal grain bin.

My invention has for its purpose the provision of a knock-down grain bin of sheet metal that is constructed so that the same is strong and rigid and will maintain its shape. This is accomplished by the manner in which the side wall and the roof portion thereof are constructed, and the manner in which the sections of the side wall and the roof are joined together.

It is a further purpose of my invention to provide a grain bin having a wall portion that is corrugated both vertically and horizontally so that the same is stiffened in all directions and will maintain its shape against pressure in any direction. The wall is preferably made up of sections that are provided with transverse and longitudinal corrugations, whereby each of said sections is stiffened against bending in all directions.

It is a further purpose of my invention to provide a grain bin or similar sheet metal structure made up of sections that are each provided with transverse and longitudinal corrugations, and which overlap in such a manner that certain of said corrugations nest, said nesting corrugations being secured together by suitable securing devices, such as bolts.

It is a further purpose of my invention to provide a grain bin or similar sheet metal building or receptacle with a roof that is made up of similar sections, corrugated along the edge portions thereof, said corrugations nesting and having the securing means extending therethrough in a manner similar to that for the side wall sections.

It is another object of my invention to provide a grain bin or similar receptacle having a roof made up of overlapping sections that have such joints between the sections that moisture will not enter the grain bin through the joints by capillary action. This is accomplished by providing a space between a side wall of the outer corrugation and a side wall of the inner corrugation at the joint formed by the nesting corrugations. Thus, a liquid tight joint can be made without the use of any kind of packing.

It is another purpose of my invention to provide new and improved ventilating means for a grain bin comprising a new and improved cap member on said roof, through which the ventilation is obtained.

It is another object of my invention to provide a new and improved closure means for a side opening in said grain bin, which is so constructed as to prevent the escape of grain through said opening, and which will also prevent the entrance of rain, or other moisture running down the side thereof, into the interior of the bin.

It is also an object of my invention to provide frame members for the side opening with which said closure members slidably engage, and with which a scoop box is slidably engaged, and which also receives the adjacent side wall sections in such a manner as to make any flexing of the sections forming the side wall unnecessary to assemble the same with the frame members, and at the same time provide a truly cylindrical side wall for said bin.

It is another purpose of my invention to provide a new and improved mounting for a closure member for a discharge opening on one of said slidably mounted closure members, and to provide a new and improved mounting for a spout associated with said discharge opening.

A further purpose of my invention is to provide a new and improved mounting for a swinging door in the upper portion of said side wall opening, whereby any water, such as rain, engaging the outside of said door cannot pass into the interior of the bin, and to provide a filling opening in the roof of said bin which is provided with a closure member that is so made that the same will not permit the entrance of rain or other water on the roof of the device to the interior thereof.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawings:

Fig. 1 is a perspective view of my improved grain bin showing the hinged door thereon open, and showing some of the slidable closure members in position, and showing the closure member for the roof opening removed.

Fig. 2 is a vertical sectional view through my improved grain bin, a portion of the ventilating stack being shown in elevation.

Fig. 3 is a section taken on the line 3—3 of Fig. 2, partly broken away.

Fig. 4 is an enlarged vertical sectional view through the ventilating cap member on the roof and an adjoining portion of the ventilating stack, certain of the roof sections being omitted.

Fig. 5 is a fragmentary sectional view on an

enlarged scale through one of the door frame members, showing a portion of the door and of the scoop box associated therewith, the section being taken substantially on the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary inside perspective view of the overlapping portions of two adjoining sections of the side wall.

Fig. 7 is a circumferential section of the roof taken on the line 7—7 of Fig. 3.

Fig. 8 is a perspective view of one of the roof sections.

Fig. 9 is a fragmentary perspective view of the cover section of the roof, that overlies the section having the filling opening therein.

Fig. 10 is an enlarged transverse sectional view through one of the roof joints.

Fig. 11 is a fragmentary plan view of the roof of the bin, partly broken away.

Fig. 12 is an enlarged sectional view taken on the line 12—12 of Fig. 11, partly broken away.

Fig. 13 is a perspective view partly in section, as viewed from the inside of the bin, of the door frame and associated closure members and scoop box, showing the main door closed.

Fig. 14 is a perspective view of the horizontally swinging door and the member on which the same is hingedly mounted.

Fig. 15 is a perspective view partly in section of a portion of the door frame and associated parts, as viewed from the outside of the bin.

Fig. 16 is a fragmentary perspective view partly in section of a plurality of the slidably mounted closure members engaging the door frame members, including the one having the discharge opening, the slidable closure therefor and the spout associated therewith.

Fig. 17 is a perspective view of the scoop box, detached, viewed from the front thereof,

Fig. 18 is a perspective view of the spout, detached.

Referring in detail to the drawings, my improved grain bin comprises a side wall portion made up of the sections 20, which are all alike except for the length thereof and for a slight modification in the lowermost ring thereof, and which overlap both circumferentially and vertically of said side wall. Said sections are curved to approximately the curvature that the same will assume when in position in the side wall, and each comprises a plurality of longitudinal or circumferential corrugations 21, and a plurality of transverse or vertical corrugations 22. The vertical or transverse corrugations 22 extend to a point closely adjacent the longitudinal or circumferential corrugations 21, as will be evident from Fig. 6, but merge in a narrow flat wall portion 23 on each side of each corrugation 21, except at the top and bottom edge portions of the sections where the corrugations 21 terminate in a free edge, as will be described below. The sections are each provided with a plurality of circumferential or longitudinal corrugations and these comprise a pair of corrugations located at each longitudinal or circumferential edge of the sheet from which the section is made, and preferably, a plurality of corrugations between the edges of the sheet, the corrugations being equidistantly spaced in a direction transversely or vertically of the section.

In Fig. 6 the details of the corrugations are more clearly shown, and each of the corrugations 21 comprises a pair of curved side walls 24 bent outwardly from the body of the sheet from which the sections are made, and curved both lengthwise and crosswise. A central rib portion is provided on each corrugation, which extends outwardly from the curved portions 24, said rib having curved side wall portions 25 extending from the portions 24 and connected at the outer ends thereof by means of a transversely straight and longitudinally curved portion 26, which forms the top or outermost portion of the rib. As will be evident from Fig. 6, there is a portion 26 on each of the nesting ribs 21 and these portions 26 engage with each other face to face and have aligning openings 27 therein, through which extend the securing elements, shown as being bolts 28 having the heads 29 thereon, which are preferably square and provided with nuts 30, said securing elements firmly clamping the rib portions 21 of the sections together and holding the same from relative longitudinal movement.

The form of the nesting corrugations 21 is such that the same are held firmly against any movement transversely of the corrugations when the same are in nesting condition. This adds to the strength of the bin, and furthermore, due to the shape of the corrugations, the same are readily assembled in proper relation to each other and easily held in such relation by unskilled workers while the bolts or similar fastening elements 28 are inserted to secure said sections together.

The sections, as previously stated, also overlap at the ends thereof, said corrugations also overlapping at such ends, the overlapped ends of the sections being secured together by any suitable fastening elements, such as bolts 31. Due to the provision of the rib and the pair of curved or arched portions 24 and 25 on each side of each corrugation, a very efficient stiffening formation is provided on the sections by means of the corrugations 21, and these corrugations aid in assembling the sections and in holding the same in proper relation after the bin is erected.

The side walls of the bin are built up by means of these corrugated sections, beginning at the bottom thereof, the bottom 32 being first assembled with the lowermost ring of said sections 20, said bottom being a flat sheet metal member made up of one or more sheets of metal so as to form a unit, which is adapted to rest on the supporting surface for the grain bin, which may be rolled up on itself for shipment purposes. Due to the stiffness of the sections and their ability to maintain their arcuate shape, it is unnecessary to provide any fastening means for securing the bottom ring of side wall sections to the bottom 32. In assembling the bottom and said lower ring of said sections the bottom is preferably first placed in position and the inwardly extending flange 33 on the lower corrugation 21′ of each section is passed or slipped over the bottom 32. The corrugations 21′ are exactly like the corrugations 21 except for this inwardly extending flange 33.

The sections 20 are arranged with their vertical joints in staggered relation, and are cut so as to leave a vertical gap or opening therein running from the bottom 32 to the top of the side wall. A vertically extending frame member 34 is provided at each side of said opening, and said frame members 34, which are shown more in detail in Fig. 5, are each provided with an inner obliquely extending flange 35, with which the inner faces of the sections 20 engage at the end edges thereof adjacent the opening in the

side wall, said obliquely extending or inwardly inclined flange 35 having an inwardly directed lip 36 thereon. Each frame member 34 is further provided with an outwardly directed wall portion 37, which terminates in an inwardly directed obliquely extending flange 38, which is much shorter than the flange 35, and extends at an angle to the wall 37 that is much more acute than the angle at which the flange 35 extends to said wall 37.

The inclined flange 38 engages the tops or outer faces of the rib portions of the corrugations 21, or in other words, with the transversely extending faces 36 thereon. Said frame members 34 are arranged as shown in Fig. 3 with the obliquely extending flanges thereon extending away from each other. By providing the inclined flanges 35 and 38, the circular or cylindrical contour of the side wall of the bin is maintained without the necessity of making any bend or offset therein as would be necessary if the flanges 35 extended at right angles to the portions 37 of said members 34.

The sections 20 are secured to the members 34 by means of bolts 19 passing through the flanges 35. The frame members are secured together at intervals by means of cross members 39 in order to maintain a uniform spacing between the members 34, said members 39 being secured to the members 34 in any suitable manner, as by means of the fastening elements 40, such as bolts, said cross members 39 being secured to the outer flanges 41 provided on the members 34 and extending substantially at right angles to the outwardly directed portions 37 thereof, said flanges 41 being spaced from the flanges 42 provided on the rearwardly or inwardly extending portions 43 of said frame members so as to define a channel between the flanges 41 and 42, the frame members being shown as being each made up of a pair of sheet metal members, being bent into the shape shown and bolted together at their engaging flat faces by means of the bolts 40 extending through the openings 40' in said engaging faces and through aligning openings in the members 39 and the bottom cross members 44, as will be evident from Figs. 5 and 15.

The bottom cross member 44 connects the members 34, and has an upwardly extending flange 45 thereon, which engages the outer faces of the flanges 41, and is bolted thereto, and a forwardly extending portion 46 bent back on itself at 47, and having a rearwardly extending flange portion 48 thereon integral with the portion 46 and spaced therefrom sufficiently to receive the edge of the bottom sheet 32 therebetween, the flange portion 48 being somewhat longer than the forwardly extending portion 46 to bring the extreme rear or inner edge portion of the flange 48 inwardly beyond the upstanding flange portion 45 on the member 44, the member 44 thus being, in effect, a threshold member with an upstanding lip thereon.

The one frame member 34 has aligning slots in the portions 37 and 38 thereof to receive the substantially cylindrical portion 49 of the hinges 50 provided on the door 51, which fits within the opening between the members 34 between the outwardly directed flanges 37 thereon, and which has any suitable locking means thereon, such as the hasp 52, which is adapted to be engaged with the eye 53 for the reception of a pad lock or similar locking member, (not shown).

A scoop box 54 is provided, which has a top wall and side walls 55, a box flange 56 being provided which runs around the outer edge of the scoop box 54 along the top wall and the side walls 55, said box flange comprising a portion 57 that extends at right angles to the adjacent wall, such as the side wall 55, a portion 58 extending substantially parallel to said wall and a portion 59 extending at right angles to the portion 58 so as to form a rectangular bead running up and down on each side of the scoop box at its outer end. The rectangular beads thus formed are of such a size that the same will be slidably received in the channels formed by the flanges 41 and 42 and the wall portion 43 on the members 34. There is no bottom wall to the scoop box forming member 54, the bottom thereof being formed by the bottom 32 of the bin, the bottom edges of the side walls 55 engaging with said bottom 32 when the scoop box has been assembled with the members 34 by sliding the same downwardly in the channels previously described. The inner end of the scoop box is formed by turning the flange 60 downwardly from the top thereof and the flanges 61 inwardly from the side walls 55, the flanges 60 and 61 overlapping and being preferably secured together, as by means of welding. An opening is thus provided in the rear of the scoop box, which may be reduced in size if desired, by providing a transverse plate 62 secured to the flanges 61 by any suitable securing means, such as the bolts 63. The grain will thus enter the scoop chamber through the openings under the transverse plate 62.

The roof of the bin is made up of a plurality of wedge shaped or triangular sections 64 and a section 64', the section 64' being just like the section 64, which will be described below, except that an opening 65 is provided in the section 64' for filling grain into the bin through the roof. The roof sections, except for the opening 65 referred to, are all alike and comprise a body portion that is substantially flat, and which has marginal corrugations along the radial edges thereof, one of said corrugations comprising an upwardly directed flange portion 66 extending at right angles to the body portion of the section, a transverse flat top wall portion 67 extending perpendicular to the flange 66 and thus parallel to the body portion of the section, and a flange portion 68 depending therefrom and arranged in parallelism to the upstanding flange 66 and of susbtantially the same height as said flange 66. One of the joints between the sections 64 is shown in Fig. 10, and the relative arrangement of a plurality of such sections is shown in cross section in Fig. 7.

The opposite marginal radially extending edge of each section 64 is provided with a corrugation of somewhat different character than the corrugations previously described, the previously described corrugations forming substantially a rectangular box flange along one radial edge of the section. The corrugation on the other radial edge of the section comprises a flange portion 69 extending upwardly substantially at right angles to the body portion, an upwardly and laterally inclined portion 70, an upwardly extending portion 71, which is parallel to the portion 69, but offset therefrom, a transversely extending flat top portion 72 extending at right angles to the upwardly extending portion 71 and extending parallel to the body portion of the

section 64, a downwardly directed flange portion 73 perpendicular to the top portion 72 and parallel to the portion 71 of said corrugation, a downwardly and outwardly inclined portion 74 diverging from the portion 70, and a depending flange portion 75 of substantially the same length as the upstanding flange portion 79 and substantially perpendicular to the body portion of the section 64. The distance between the inner faces of the parallel walls 71 and 73 is such as to closely receive the outer faces of the walls 66 and 68 of the box flange corrugations of an adjoining section 64, as shown in Fig. 7 and Fig. 10. While the wall portions 70 and 74 are inclined away from the walls 66 and 68 of the box flange corrugations and the walls 75 and 69 are spaced a substantial distance therefrom, the top wall 67 of the box flange corrugation seats face to face against the inner face of the top wall 72 of the corrugation just described at each joint, and openings 76 are provided in the box flange corrugations that align with openings 77 in the flaring corrugations so that fastening elements, such as the blots 78, may be passed through the aligning openings, and the sections 64 are thus clamped in fixed position relative to each other by the cooperation of the bolts 78 and the nuts 79.

Each section 64 is further provided with a downwardly and inwardly directed transversely curved flange portion 80, forming a substantially helical roll of approximately one turn on the outer or lower edge of each roof section 64, which form the eaves on the roof when the sections are arranged in adjoining relation, the roll portions 80 being slightly shorter than the sections, or approximately the length between the upwardly extending flange 66 and the upwardly extending flange 69 at the outer end of each section, so that the same will be arranged end to end when the sections are assembled with the radial edges of the sheets in nested condition, as shown in Figs. 7 and 10.

A closure member 81 is provided, which is similar to the sections 64, except that the roll 80 is omitted and that instead of providing a box flange along one edge thereof, the flanges along both edges thereof are made alike, each having the upwardly extending flange 69', the inclined wall portion 70', the wall portion 71', the flat transverse top wall 72', the depending wall 73', the inclined wall 74', and the depending flange 75', corresponding to the portions 69, 70, 71, 72, 73, 74, and 75, previously described in connection with the section 64, this section 81 being shown in perspective in Fig. 9. There are no openings provided in the top walls 72' of the corrugations for fastening elements, in the section 81, said top walls 72' of the section 81 merely overlying the top walls 72 of the outer corrugations at each interfitting joint at the opposite sides of the roof section 64'. The section 81 is secured to the section 64' by means of bolts 82 that extend through openings 83 in the section 81 and through openings 84 in the section 64'.

Mounted on the bottom 32 in the center thereof is a collar having the horizontal flange portion 85 resting on the bottom 32 and having the cylindrical upstanding portion 86, within which is mounted a vertically extending tubular stack or conduit member 87, which may be secured to the cylindrical sleeve-like portion 86 by means of suitable fastening elements, such as the bolts 88. The stack or tubular conduit 87 is provided with a plurality of slitlike perforations 89 therein, permitting the passage of air and vapors into the stack 87. The perforated portion of the stack terminates some distance below the upper end thereof, preferably, substantially in alignment with the top wall of the bin. An unperforated portion 90 extends upwardly to the peak of the roof.

The roof is provided with a pair of cap members 91 and 92 at the inner ends of the sections 64 and 64', which sections have the inner ends thereof spaced from each other to leave an opening in the center of the roof, said cap members 91 and 92 being made substantially alike except for slight differences at the inner portions thereof, and each have a depending flange 93 thereon, the flange 93 on the member 92 engaging the tops of the corrugations formed on the edges of the roof sections, or in other words, the walls 72 extending across the tops of said corrugations, and the upper face of the lower cap 91 engages the bottom face of the body portion of each of the sections.

The cap members 91 and 92 are drawn into clamping engagement with the roof sections by means of the bolts 94 provided with nuts for drawing the same tight in the usual manner. The lower cap member 91 has a central opening, which is surrounded by the depending lip or flange 95, which snugly receives the upper end portion of the stack 87, or in other words, the unperforated portion 90 thereof at its upper end. Thus the stack discharges through the opening formed in the lower cap member 91 between the cap members 91 and 92, said cap members being spaced from each other due to the provision of the flange 93 on the member 92, and the upstanding corrugations on the roof sections. The spaces between the corrugations on the roof sections provide openings 96 leading into the space between the cap members 91 and 92.

The upper cap member 92 has an upstanding lip or flange 97 thereon similar to the depending flange 95 on the member 91, and has a pair of cooperating bars 98 extending across the central opening in the member 92 and secured in any suitable manner thereto. In the arrangement shown, the cross bars have downwardly offset portions 99 thereon and outwardly directed ends 100, which engage under the cap 92, and are held in clamping engagement with the under surface of the cap member 92 by means of the bolt 101 that extends through the aligning openings in the central portions of the members 98 and through the top wall 102 of a cap member, which has a tubular body portion 103, which snugly receives the annular flange 97 on the member 92, and which has a plurality of side openings 104 therein, the tubular member 103 having a laterally outwardly directed flange 105 thereon, there being an outwardly directed flange 106 on the cap 102, said cap 102 having an annular inwardly directed corrugation 107 thereon, which fits within the outer end of the tubular member 103, and the flange 106 terminating in a depending flange 108. The flange 106 and the flange 108 prevent the entrance of water through the openings 104, and the bolt 101 secures the members 98, 102 and 103 together in fixed position when the nut thereon is tightened down on the same. Due to the provision of the openings 96 and the openings 104, air passes inwardly through the openings 96 and upwardly in the member 103 and out through

the openings 104, thus setting up a draft in the top of the stack, which causes an upward current of air in the stack 87, which will ventilate the grain bin and aid in reducing the heating action of the grain therein, and will also carry any moisture that may be in the grain, out of the bin.

The roof sections are secured to the uppermost ring of said sections by means of the angular brackets 109, which are secured by means of the bolts 110 to the under sides of the roof sections and by means of the bolts 111 to the inner faces of the top ring of the side sections.

The members 34 are connected at their upper ends by means of a cross member 112, which is bolted, by means of bolts 40 to the members 34, said bolts extending through the openings 113 in the member 112 and the aligning openings in the sections of the members 34, as previously described, the member 112 engaging the outer faces of the flanges 41 in a similar manner to the members 39, the member 112 having an upwardly and outwardly inclined flange 114 thereon and having the strap members 115 extending at an oblique angle inwardly and upwardly from adjacent the lower edge thereof, said strap members 115 having end portions 116 that are directed inwardly, thus forming hook-like members on the inner face of the member 112.

A door 117 is swingingly mounted on the hook-like members 115 by passing the hook-like members through the slots 118 on the upwardly and outwardly inclined flange 119 on said door 117. The door 117 also has a pair of inwardly extending side flanges 120 thereon, which are freely received between the inwardly extending flanges on the members 34, the flanges 42 terminating short of the upper ends of the members 34, as will be clear from Fig. 13, while the flanges 41 serve as stops to limit the outward movement of the door, the flanges 42 terminating at such a distance below the tops of the members 34 as to permit the inward swinging of the door 117. The door 117 is provided with an outwardly inclined lip 121 along its lower edge, the material forming the lip being doubled back on itself so as to provide an inwardly and downwardly directed lip 122 shorter than the lip 121, for a purpose to be described below.

The opening in the side wall of the bin between the top of the scoop box 54 and the door 117 is closed by means of a plurality of closure members of sheet metal, which fit on top of each other in vertically aligned relation, and which slidably engage at opposite ends thereof in the grooves or channels formed between the flanges 41 and 42. Said members 123 are each provided with a pair of oppositely inclined portions 124 and 125, the portion 124 being inclined inwardly and downwardly, and the portion 125 inwardly and upwardly from the central body portion of the member 123.

Each member 123 is further provided with a flat top face formed by means of a flange 126 extending outwardly from the inclined portion 125 and being substantially perpendicular to the body portion of the member 123. The bottom portion of each of the members 123 is provided with a similar flat face formed by the outwardly extending flange 127, which is provided with a downwardly directed lip or flange 128 on the outer edge thereof, the flange 128 on the lowermost member 123 overlapping the outer face of the box flange 56 on the top of the scoop box to provide a water proof and grain tight joint between the top of the scoop box and said member 123, while the flange 128 on each of the other members overlaps the outer edge of the top flange 126 of the member 123 below the same. Thus the members 123 have top and bottom flat faces that engage each other so that each member 123 rests solidly on the next lower member 123, and the corrugations formed by means of the portions 124 and 127 and the portions 125 and 126 are of such a height that these will fit slidably within the channel between the flanges 41 and 42.

One of the members 123 is provided with an outwardly struck portion 129 therein, which is formed by cutting the material of the member 123 at certain points and striking the same outwardly so as to provide two pairs of ears 130 on the outwardly struck portions, which connect the same with the body portion 123, the portion 129 having an opening 131 therein, through which grain is discharged. A closure member in the form of a slide 132 of sheet metal engages in back of the outwardly struck portion 129 between the ears or joining portions 130, and has an outwardly extending flange 133 at the top thereof by means of which the same can be grasped to slide the same into and out of closing position.

A spout 134 is mounted below the opening 131, said spout 134 having a pair of flanges 135 and 136 thereon, which are inclined at an oblique angle to each other, the flange 135 being of substantially the width of the flat portions 127 and 126 so that the same can be inserted between a pair of the members 123 in the joint immediately below the opening 131 so that the spout 134 having the side flanges 137 thereon, will normally project outwardly with the body thereof sloping in a downward direction from the bin in the manner shown in Figs. 15 and 16. The flange 128 is cut away at the point where the spout is inserted so as not to interfere with the insertion of the spout in the manner referred to. When it is desired to close the door 51 it is necessary to move the spout into such a position that it will not be damaged by the closing of the door due to the fact that it projects outwardly from the member 123.

In order to close the door 51, the spout is moved to the position shown in Fig. 13. This is done by merely pulling outwardly on the spout until the same reaches the point where the flange portion 135 no longer is engaged between the flat faces 127 and 126 of adjoining members 123, and the flange 136 is located between said flat faces. When this is the case the body portion of the spout 134 extends substantially vertically downwardly from the front of the member 123, as shown in Fig. 13, and will not interfere with the closing of the door and no damage will be done to the spout when the door is closed. The spout is also shown in this position in Fig. 2.

The members 123 are slid into position one at a time as the grain bin is filled and may extend up as high as the door 117. A closure member 138 is provided between the top of the door 51 and the door 117, the closure member 138 being bolted to the frame members 134 on the flange 31 by means of the bolts 40 in the manner previously described in connection with the members 39. Said member 138 has a doubled back top edge portion 139, an outwardly inclined portion 140, a horizontal inwardly extending flange portion 141, and a depending

flange 142, the flange 141 engaging the top flange on the door 51 and the flange 142 serving as a stop member for the door 51 at the top thereof. The horizontally hinged door 117 engages the doubled top edge portion 139 of the closure member 138 in the manner shown in Fig. 13, the doubled outwardly inclined lip 121 thereon lying on one side of the portion 139, and the inwardly inclined lip 122 engaging the other side thereof, said doubled edge 139 thus lying in the channel 143 provided between the portions 121 and 122. The door 117 is thus held from bulging in an outward direction by engagement of the flange 122 with the doubled portion 139. The doubled lip 121 and the flange 122 form both a water proof and grain tight joint between the member 138 and the door 117. When it is desired to open the door 117, it is first raised on the hinges or hook-like members 115, and then swung inwardly, it being necessary to raise the door 117 sufficiently to elevate the bottom edge of the doubled portion 121 above the top edge of the doubled portion 139 on the member 138.

I claim:—

1. In a grain bin, a side wall portion having closely spaced vertically extending corrugations and circumferentially extending corrugations therein much more widely spaced than said vertically extending corrugations.

2. In a grain bin, a side wall comprising sheet metal sections each having closely spaced vertically extending corrugations and circumferentially extending corrugations therein much more widely spaced than said vertically extending corrugations, certain of said circumferentially extending corrugations of adjoining sections nesting.

3. In a grain bin, a side wall comprising sheet metal sections each having a plurality of vertically spaced sets of vertically extending corrugations and circumferentially extending corrugations therein said vertically and circumferentially extending corrugations being non-intersecting, certain of said circumferentially extending corrugations of adjoining sections nesting, and means for securing said sections together extending through the nesting portions of said corrugations, said sections having circumferentially extending corrugations between the sets of vertically extending corrugations.

4. In a grain bin, a side wall comprising a plurality of arcuate sheet metal sections each having a plurality of circumferentially extending longitudinally and transversely curved corrugations therein, means for stiffening said sheets between said corrugations, said stiffening means being spaced from said corrugations, certain of said circumferentially extending corrugations of adjoining sections nesting, and means for securing said sections together extending through the nesting portions of said corrugations.

5. In a sheet metal structure, a wall having corrugations therein, said corrugations having a base portion, a central rib portion surmounting said base portion and side wall portions converging toward said central rib, said rib having a transversely straight wall portion.

6. In a sheet metal structure, a plurality of sections having nesting corrugations therein, said corrugations each having a base portion surmounted by a rib portion narrower than said base portion and side wall portions converging toward said rib, whereby said corrugations have wide nesting portions and narrow nesting portions at each nesting joint of said structure.

7. In a sheet metal structure, a plurality of sections having corrugations therein, said corrugations each having a base portion surmounted by a rib portion narrower than said base portion and side wall portions converging toward said rib and said rib having a transversely straight wall portion, corrugations having transversely straight wall portions engaging face to face with said first mentioned straight wall portions, and fastening elements extending through said transversely straight wall portions.

8. In a sheet metal structure, a plurality of sections having nesting corrugations therein providing joints between said sections, each of said joints comprising a corrugation having a base portion having curved side wall portions converging toward a central transversely curved rib surmounting said base portion, said rib being narrower than said base portion, a corrugation corresponding in shape thereto seated in said first mentioned corrugation and having a rib engaging said first mentioned rib face to face, and fastening elements extending through said rib portions.

9. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, said frame members each having a pair of obliquely extending flanges thereon extending toward and engaging said side wall adjacent said frame members.

10. In a device of the character described, a roof comprising a plurality of sections having nesting corrugations forming joints connecting said sections, one of said corrugations at each joint having a base portion, having inclined side walls and a central rib narrower than said base portion, provided with a flat top, the nesting corrugation being seated in said first mentioned corrugation and having a flat top engaging the flat top of said rib, and securing means extending through said flat tops of said corrugations.

11. In a device of the character described, a roof comprising a plurality of sections having nesting corrugations forming joints connecting said sections, one of said corrugations at each joint having inclined side walls and a central rib provided with a flat top, the nesting corrugation being seated in said first mentioned corrugation and having a flat top engaging the flat top of said rib and side walls spaced from said first mentioned corrugation at the base thereof.

12. In a sheet metal structure, a roof comprising a plurality of sections having joints comprising nesting corrugations, the inner and outer corrugations having engaging wall portions to hold said corrugations against relative lateral displacement, and the wall of said outer corrugation at the free edge thereof being spaced from the adjacent wall of said inner corrugation.

13. In a sheet metal structure, a roof comprising a plurality of sections having joints comprising nesting corrugations, the inner and outer corrugations having engaging wall portions to hold said corrugations against relative lateral displacement, and a portion of a side wall of said outer corrugation being spaced from the adjacent side wall of the inner corrugation.

14. In a metallic bin, a roof comprising a plurality of metallic sections having overlapping joints comprising nesting corrugations, securing means for connecting said sections extend-

ing through said corrugations, one of said sections having an opening therein, and a closure for said opening comprising a sheet metal member overlying the section having the opening therein and having marginal corrugations overlapping the corrugations at the joints on both sides of the section with the opening therein.

15. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, said frame members each having a pair of obliquely extending flanges thereon extending toward and engaging said side wall adjacent said frame members, and each member being shaped to provide an angular portion thereon adapted to serve as a door frame and a shallow channel portion lying inwardly of said angular portion, and closure members engaging slidably in said channel portion.

16. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, and metallic closure members slidably engaging with said frame members and mounted in vertically adjoining relation in said opening, each of said closure members having a bottom edge overlapping the outer side of the closure member therebelow.

17. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, and metallic closure members slidably engaging with said frame members and mounted in vertically adjoining relation in said opening, each of said closure members having a substantially horizontal bottom flange and a substantially horizontal top flange, said bottom flange having a lip depending from the outer edge thereof.

18. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, and metallic closure members slidably engaging with said frame members and mounted in vertically adjoining relation in said opening, each of said closure members having a substantially horizontal bottom flange and a substantially horizontal top flange, the top flanges of one section being engaged by the bottom flange on the next higher section and a spout having an angular inner end portion extending between the bottom flange of one of said closure members and the top flange of the adjoining closure member.

19. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, and metallic closure members slidably engaging with said frame members and mounted in vertically adjoining relation in said opening, one of said closure members having an outwardly struck portion therein provided with an opening and a member for closing said opening mounted to slide in the rear of said outwardly struck portion.

20. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, and metallic closure members slidably engaging with said frame members and mounted in vertically adjoining relation in said opening, a transverse member connecting said frame members adjacent the upper ends thereof and a door hinged on said transverse member, said door having a lip overlapping the outer face of one of said closure members below said door.

21. In a grain bin, a side wall having an opening therein, a pair of vertical frame members on opposite sides of said opening, said frame members each having an angular portion thereon adapted to serve as a door frame and a shallow channel portion lying inwardly of said angular portion, a scoop box having a box flange thereon engaging said channel portion to mount said box in said frame members for vertical sliding movement and metallic closure members slidably mounted in said channel portions above said box in vertically adjoining relation, a closure member overlapping said box on the outer side thereof.

22. The combination with a grain bin having a roof provided with ribs thereon, and spaced cap members at the center of said roof providing an air space therebetween having openings into the same between said ribs, of means for ventilating said bin comprising a stack extending upwardly from adjacent the bottom of said bin into communication with said space, and a tubular member mounted on the upper of said cap members having openings therein and a closure for the top of said tubular member.

23. In a grain bin a side wall comprising a plurality of curved sheet metal sections, the major portion of each of said sections being corrugated, said corrugated portion comprising corrugations running transversely of the curvature of said sections, and a plurality of corrugations which do not intersect said first corrugations running in the direction in which said sections are curved.

24. In a grain bin a side wall comprising a plurality of curved sheet metal sections, the major portion of each of said sections being corrugated, said corrugated portion comprising two sets of non-intersecting corrugations, one of said sets comprising corrugations running transversely of the curvature of said sections, and the other of said sets comprising a plurality of corrugations running in the direction in which said sections are curved, said last mentioned corrugations comprising marginal corrugations and corrugations spaced a substantial distance from the margins of the sections.

25. In a grain bin, a side wall comprising a plurality of curved sheet metal sections, each of said sections having a plurality of series of vertical corrugations spaced apart endwise of said corrugations, and a plurality of curved corrugations extending substantially perpendicular to said vertical corrugations, certain of said curved corrugations lying in the spaces between said vertical corrugations, and being spaced from said vertical corrugations.

26. In a grain bin, a curved side wall having a plurality of series of vertical closely spaced corrugations therein, said series being arranged in vertically spaced circumferential bands, and a plurality of longitudinally curved corrugations extending circumferentially of said side wall, said circumferentially extending corrugations alternating with and being interposed between the series of vertical corrugations.

27. In a grain bin, a curved side wall having a plurality of series of vertical closely spaced corrugations therein, said series being arranged in vertically spaced circumferential bands, and a plurality of longitudinally curved corrugations extending circumferentially of said side wall, said circumferentially extending corrugations alternating with and being interposed between

the series of vertical corrugations, said circumferentially extending corrugations having base portions surmounted by narrower central rib portions.

28. In a grain bin, a side wall comprising sheet metal sections each having closely spaced vertically extending corrugations and circumferentially extending corrugations therein much more widely spaced than said vertically extending corrugations, certain of said circumferentially extending corrugations of adjoining sections nesting, said circumferentially extending corrugations having transversely curved base portions surmounted by narrower transversely curved central rib portions.

29. In a sheet metal structure, a plurality of sections having spaced nesting corrugations therein, said corrugations each having a base portion surmounted by a rib portion narrower than said base portion and side wall portions converging toward said rib, whereby said corrugations have wide nesting portions and narrow nesting portions at each nesting joint of said structure, and said sections having corrugations in said spaces extending transversely to said nesting corrugations.

30. In a curved wall structure, sheet metal sections each having closely spaced vertically extending corrugations and circumferentially extending corrugations therein much more widely spaced than said vertically extending corrugations, certain of said circumferentially extending corrugations of adjoining sections nesting, said circumferentially extending corrugations having base portions and rib portions narrower than said base portions surmounting said base portions.

31. In a wall structure, sheet metal sections each having closely spaced vertically extending corrugations and horizontally extending corrugations therein much more widely spaced than said vertically extending corrugations, certain of said horizontally extending corrugations of adjoining sections nesting, said horizontally extending corrugations having transversely curved base portions and transversely curved rib portions narrower than said base portions surmounting said base portions.

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