

July 16, 1963

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3,097,837

INNER COVER FOR ANNEALING FURNACES

Filed Feb. 3, 1961

4 Sheets-Sheet 1

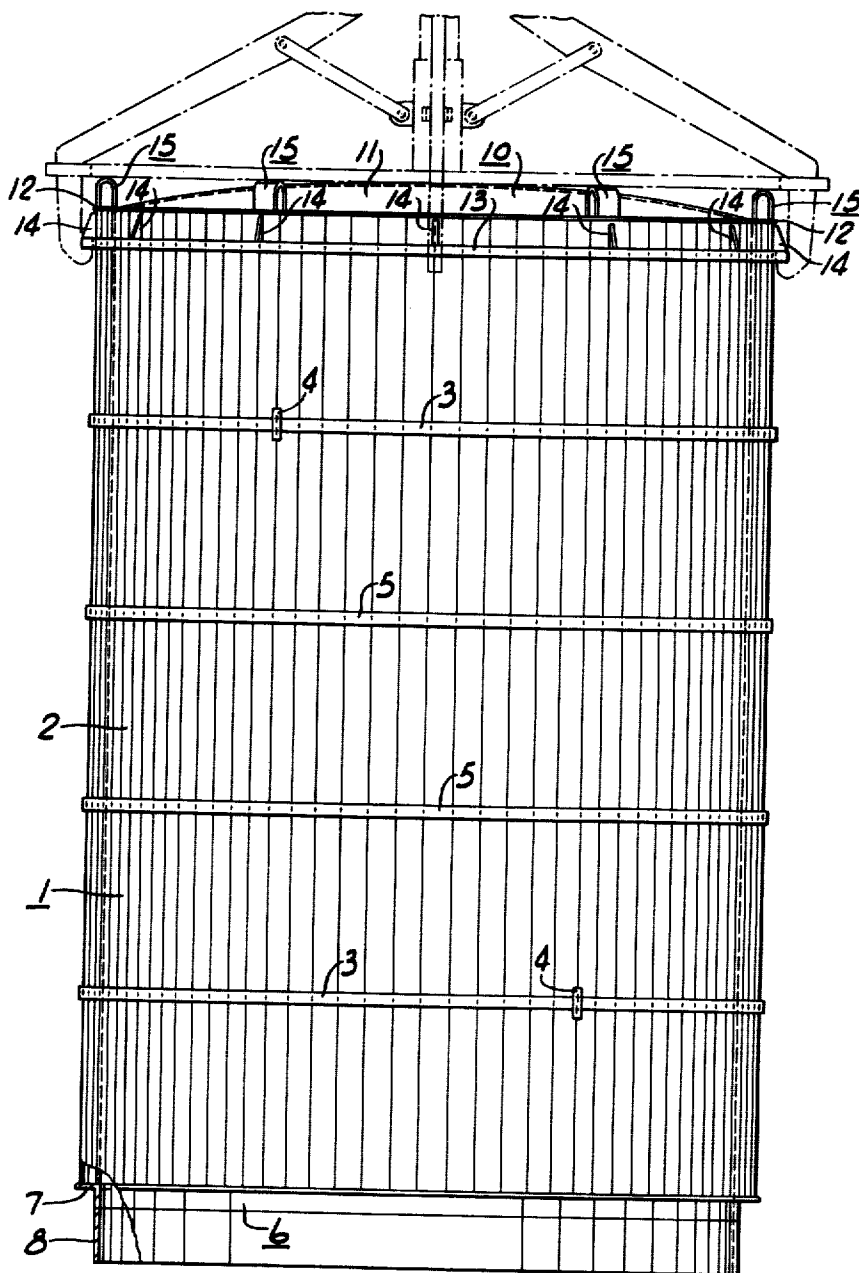


Fig. 1

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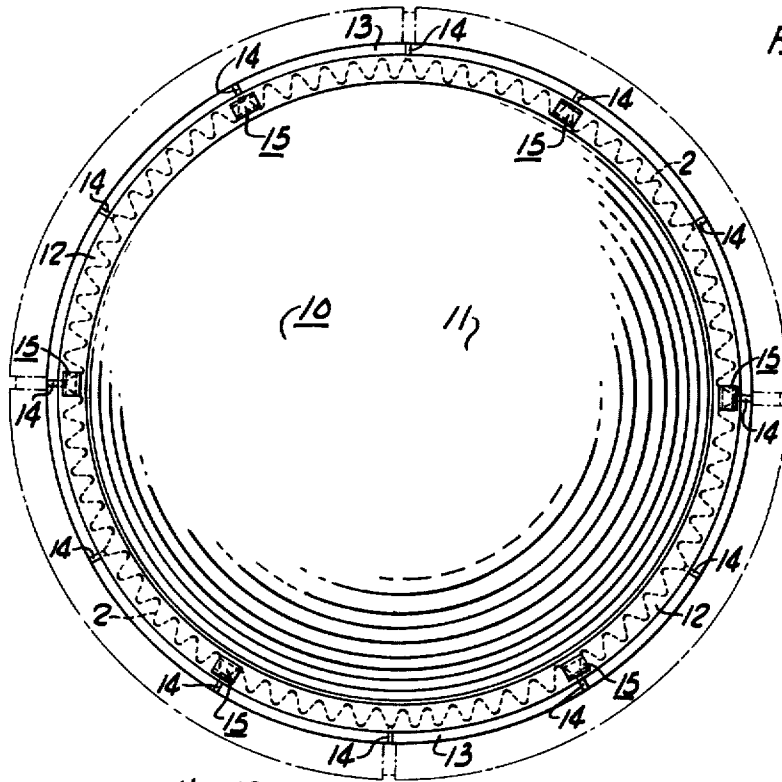


Fig. 2

Fig. 3

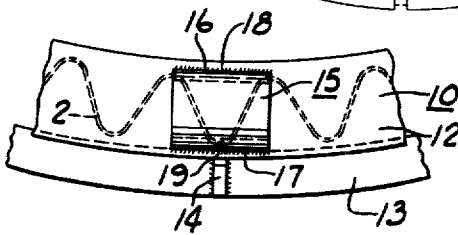


Fig. 4

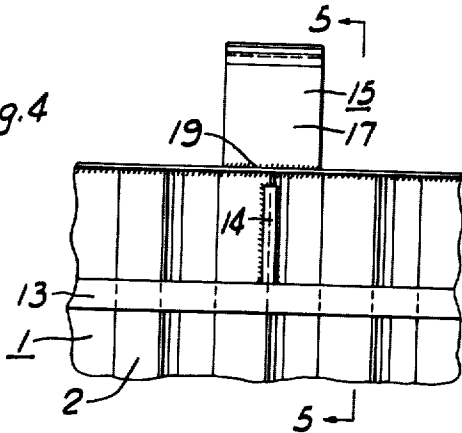
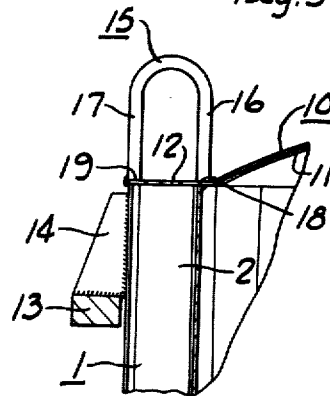


Fig. 5



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Fig. 7

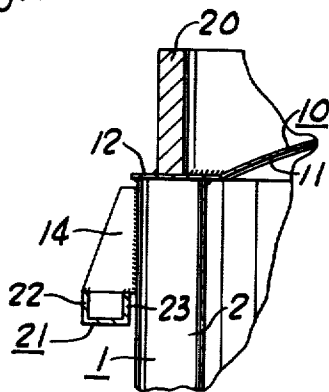


Fig. 8

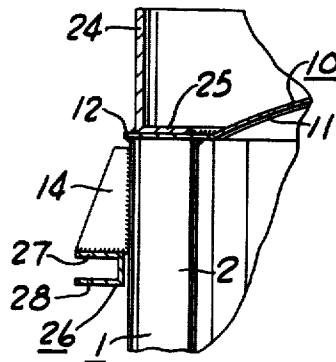


Fig. 9

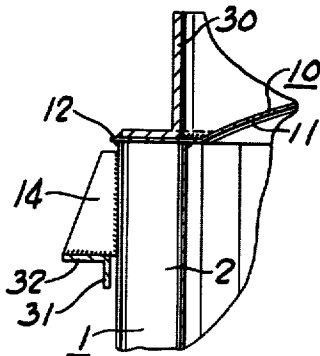


Fig. 10

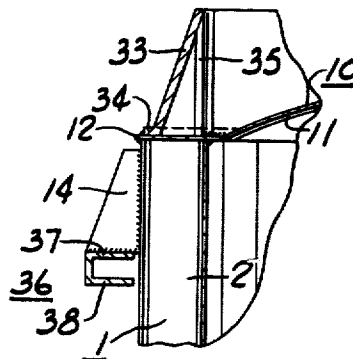
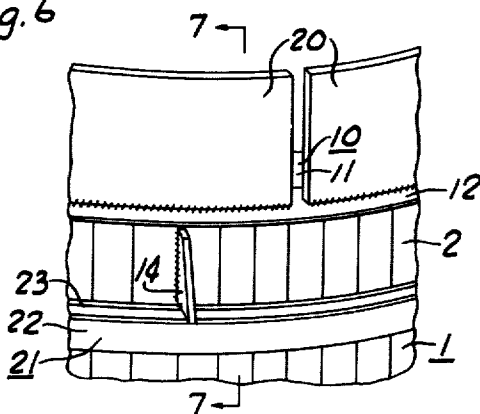


Fig. 6



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Fig. 11

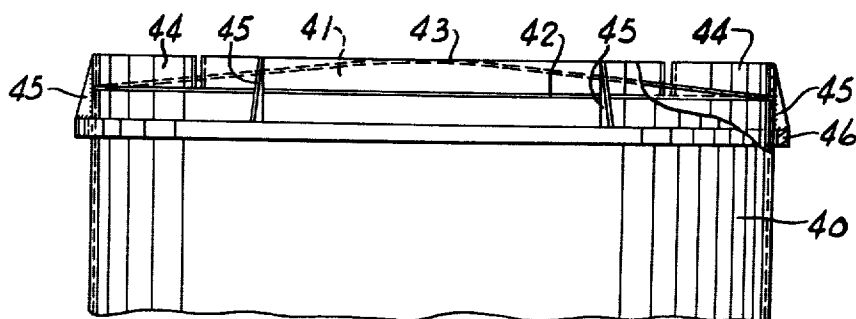


Fig. 12

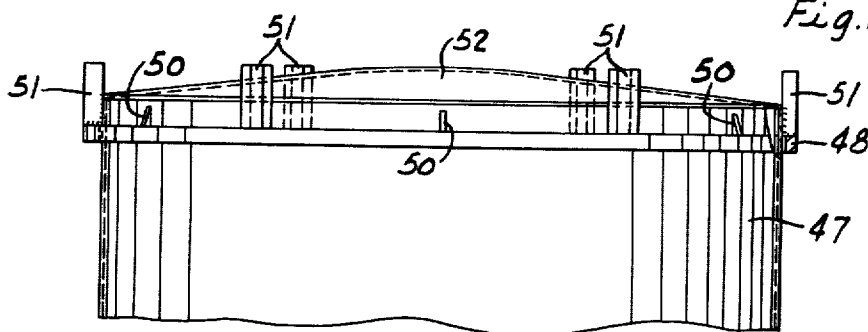
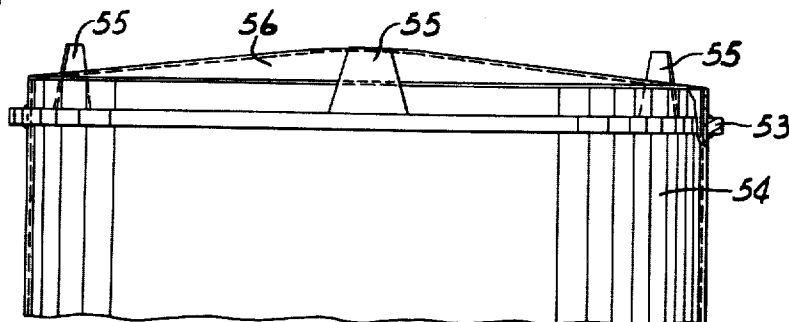


Fig. 13



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INNER COVER FOR ANNEALING FURNACES
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7 Claims. (Cl. 263—49)

This invention relates generally to inner covers for annealing furnaces and more particularly to reinforcing members for inner covers that provide means for lifting and transporting the same.

The problem in changing the construction of inner covers requires that their overall dimensions cannot be changed because they would not fit in the annealing furnaces. If their structure is changed within the overall dimensions then the coil chamber may not receive the stack of coils or may change the rate of heat exchange.

If the structure of the inner cover is radically changed by adding a different character of annular sections to the top of the inner cover the heat transfer characteristics as well as the internal stresses and strains shorten the life of the inner cover.

The principal object of this invention is the provision of an addition to an inner annealing cover having known approval and acceptability which will reinforce the same as well as provide a means for lifting and conveying the inner annealing cover.

Another object of this invention is to reinforce the upper portion of the inner annealing cover without changing the inner or outer dimensions and at the same time provide an annular ledge for lifting and transporting the inner cover.

Another object is the provision of several modifications that permit an existing inner annealing cover to be provided with additional reinforcement adjacent the top and a lifting ring without altering the structure of the existing inner cover or enlarging its dimensions.

Another object is the provision of a combination reinforcing member and annular lifting ledge for use on corrugated as well as smooth cylindrical annealing inner covers. It is important that either type annealing inner cover have a domed top to strengthen the cover and provide room for free circulation. A domed top requires stools to engage the under side of the lifter when hoisting the inner covers by the lifting ledge. A flat roof annealing cover sinks in and closes off the free circulation of annealing gases.

Other objects and advantages of this invention appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting this invention or the claims thereto, certain practical embodiments illustrating the principles of this invention; wherein

FIG. 1 is a view on vertical elevation of an inner cover having the structure comprising this invention.

FIG. 2 is a plan view of the structure shown in FIG. 1.

FIG. 3 is an enlarged partial plan view of the structure shown in FIG. 2.

FIG. 4 is a partial view in elevation of the structure shown in FIG. 3.

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 4.

FIG. 6 is an enlarged partial perspective view of a modified form of lifter support and reinforcing member.

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6.

FIG. 8, 9 and 10 are sectional views of modified forms of the structure shown in FIG. 7.

FIG. 11 is a view in elevation and a portion in section showing a smooth cylindrical inner cover having a broken stool.

FIG. 12 is a view in elevation and a portion in section showing a smooth cylindrical inner cover having post stools.

FIG. 13 is a view in elevation and a portion in section showing a smooth cylindrical inner cover having gusset plate stools.

Referring to FIG. 1 the inner cover 1 comprises the vertically corrugated cylindrical wall 2 reinforced by a series of annular bands 3 which in this instance are not tacked to the corrugations but are held by the strap members 4. The annular reinforcing bands 5 are not supported by the strap members 4 but are tacked directly to the corrugations of the cylindrical corrugated plate 2. Thus the bands 3 prevent expansion, whereas the reinforcing bands 5 prevent expansion and contraction of the cylindrical corrugated inner cover 1.

The bottom of the inner cover is provided with an angle bracket 6 having a horizontal flange 7 that is welded directly to the bottom of the corrugations of the cylindrical wall 2 and the other leg 8 of the angle bracket is increased in length and extends directly below the inner corrugations to form a sand seal member.

The upper end of the corrugated cylinder 2 has welded thereto the top member 10 the central portion 11 of which is conical or spherical and is provided with a flat annular rim 12 that is welded to the top edges of the corrugated cylindrical wall 2 thus completely enclosing the upper end of the inner cover 1. When the seal leg 8 is properly sealed the inner cover is gas-tight and provides a completely enclosed chamber.

The conical or spherical top member is dished as illustrated to provide additional strength and the heavy plate from which this top is made aids in reinforcing the perimeter of the corrugated cylindrical wall 2. As an additional reinforcing member an annular bar 13 is provided with its greatest dimension disposed radially to the corrugated cylindrical wall 2. This bar 13 as shown in FIG. 5 is actually free of the outer corrugations in the cylindrical wall 2 and is spaced therefrom to act as a lifting member for handling of said cover. To support this reinforcing bar and to make it effective on the inner cover 1 an annular series of brackets 14 are welded to the outer arcuate edge of selected of the corrugations as illustrated in FIG. 3. The brackets 14 are welded to this outer arcuate surface of the corrugations on both sides of the bracket and at the top and the bottom thereof the bracket as shown in FIG. 5 has considerable length but stops short of the flat perimetral portion 12 of the top member 10. This permits the flat part 12 to be inspected and re-welded if any leaks develop around the corrugations between the top 10 and the corrugated cylindrical wall 2. As shown in FIG. 2 there are twelve brackets supports 14 provided to secure the annular bar 13 to the corrugated cylindrical wall 2. These twelve brackets although specifically located on the outer curved surface of a corrugation provide material strength to the structure owing to their length and to the fact that they are welded to the heavy corrugated plate structure in the annular wall 2 vertically or longitudinally of the corrugations. This arrangement provides a very strong reinforcing member for the cover and the under side of the bracket 14 extends for the full depth of the bar 13 which represents the maximum dimension of this bar.

The bar 13 is not only a reinforcing member to the corrugated annular wall but also provides a shoulder under which lifting members may be inserted for hoisting the inner cover 1 and transporting the same. In view of the fact that some of the lifting members require the lifting head to rest on top of the inner cover it is necessary to provide a series of stools 15 at various positions around the perimeter of the flat portion 12 of the top 10. These stools 15 are U-shaped with their flanges spaced so that

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they may engage the flat section 12 of the top 10 immediately above the outer and inner curved portions of the corrugations of the cylindrical wall 2. As shown in FIG. 3 the stools 15 with its legs 16 and 17 are located so that the flange 16 is over two of the inner corrugations as indicated at 18 and the flange 17 is over the single corrugation as indicated at 19 and just above one of the brackets 14. Thus the hoist may be placed over the cover and lowered until it engages the stools 15 at which time the fingers may be actuated to engage under the annular bar 13 for the purpose of lifting the inner cover 1. If on the other hand the fingers of the hoist are required to be threaded around the inner cover and under the shoulder formed by the annular bar 13 there is ample room to allow for such a hoist.

When the hoist is raised regardless of its type all of the weight of the inner cover is transmitted from the hoist to the annular bar 13 and through the brackets 14 to the corrugated cylindrical cover 2. There is no pressure between the bar 13 and the corrugated cylindrical wall because of the clearance between this bar and the corrugated cylindrical wall. Again any tendency for the cover to expand or contract adjacent the top thereof is counteracted by the forces distributing themselves through the brackets 14 to the annular bar 13.

The stools 15 are preferably made just as high or slightly higher than the dished top 10 so that when the hoisting mechanism or any other member spanning the top of the inner cover will be carried by the stools 15 rather than the dished portion 11 of the top 10.

Referring to FIGS. 6 and 7 the stools 15 are replaced by the annular upstanding rib 20 which may not be made completely annular in view of the fact that it is only approximately as high as the stools 15. This upstanding rib 20 may be made in sections and is welded continuously or it may be tack welded to the annular flat portion 12 of the top 10.

The annular reinforcing member shown in FIGS. 6 and 7 is in the form of the upwardly open channel 21 having its flanges 22 and 23 welded to the underside of the brackets 14. This merely decreases the weight of the annular bar 13 and provides a sufficiently strong box member as the lifting ring and reinforcing ring for the inner cover 1.

Modifications of the upstanding rib and lifting ring are shown in FIGS. 8, 9 and 10 wherein the upstanding member which receives the hoisting mechanism in FIG. 8 is an angle bracket 24 which is annular but is preferably not joined as illustrated by the upstanding rib 20. This L-shaped member 24 has its short flange 25 welded to the flat surface 12 of the top 10 and is recessed from the perimetral edge of the flat surface 12.

The brackets 14 in FIG. 8 supports the annular reinforcing member 26 which is in the form of an outwardly open channel member having its upper flange 27 secured to the underside of the brackets 14 and its lower flange 28 providing the lifting surface of the annular reinforcing ring 26.

In FIG. 9 the stool members 15 are replaced by the annular angle iron 30 which has its long flange extending upwardly to the height of the dome 11 and its shorter horizontal flange secured to the flat surface 12 of the top 10. Here the bracket members 14 support the annular angle iron member 31 which has its horizontal flange 32 welded to the underside of the brackets 14 and its vertical flange 31 spaced from the corrugated cylindrical wall 2 of the inner cover.

The structure in FIG. 10 employs as a stool the annular member 33 which is frusto conical in shape and its foot 34 is welded to the flat portion 12 of the dished top 10. A series of vertical supports 35 reinforce the conical member 33 in positions similar to that shown by the location of the stools 15 in FIG. 2. The stool member 33 is of course as are all these members sufficiently high to support the inner cover lifting means so that it

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does not crush or otherwise disturb the dome 11 of the top. The brackets 14 in FIG. 10 support the inwardly faced channel member 36 with its upper flange 37 welded to the under sides of the bracket members 14 and the lower flange 38 forming the lifting surface of the bar in the form of this channel member 36. The ends of the annular flanges 37 and 38 are of course spaced from the corrugated cylindrical wall 2 of the inner cover.

Although twelve brackets 14 are shown it is obvious that more or less in number may be employed to suit the need for supporting the lifting ledge 13.

Referring to FIG. 11 the smooth cylindrical inner cover 40 has a dome or conical top 41 welded around its perimetral surface 42 to the upper cylindrical end of the cylinder. An upstanding stool in the form of two arcuate sections 43 and 44 are also welded to the top of the cylinder and in effect extend this cylindrical surface upwardly. A plurality of vertically disposed brackets 45 are welded along their longitudinal edges of the outer surface of the cylinder as well as the outer surface of the upstanding stools 43 and 44. There may be any desired number of these brackets such as six, eight or twelve. The bottom of each bracket is welded to the annular lifting bar 46 which like the bar 13 is free of the cylindrical surface, there being ample clearance therebetween. Thus the whole support is through the brackets 45.

In the smooth cylindrical inner cover 47 of FIG. 12 the lifting ledge 48 is constructed quite similarly to that of FIG. 5 in that it is supported by the brackets 50 similar to that of the brackets 14. In addition to these brackets the stool bars 51 aid in supporting the ring 48. The brackets 50 and the bar stools 51 are welded longitudinally to the sides of the cylinder to provide a long and strong engagement. The ring 48 is in turn welded to the bottom of the brackets 50 as well as to the bottom of the stools 51 but is held free and in spaced relation to the cylindrical surface of the inner cover. As with all stools these stools 50 are as high if not slightly higher than the dome 52.

In the structure of FIG. 13 the annular lift ring 53 is welded directly to the cylindrical wall of the inner cover 54 and three gusset plates 55 are welded to the top of the ring 53 as well as to the cylindrical wall and are as high if not higher than the dome 56. The ring 53 may be continuously welded or spot welded to the cylinder.

I claim:

1. An inner annealing cover for an annealing furnace, comprising, in combination, a substantially vertical enclosure wall forming a complete perimeter and enclosing a space, a top secured to the upper end of said wall to close the upper end of said space, a substantially perimetral lifting member in surrounding and laterally spaced adjacency to said wall, and a plurality of perimetally spaced supports secured to said wall adjacent said top and having their respective lower parts secured to said lifting member.

2. An inner annealing cover for an annealing furnace, comprising, in combination, a substantially vertical enclosure wall forming a complete perimeter and enclosing a space, a top secured to the upper end of said wall to close the upper end of said space, a substantially perimetral lifting member in surrounding and laterally spaced adjacency to said wall, and a plurality of perimetally spaced supports secured to said wall adjacent said top and having their respective lower parts secured to said lifting member, said top further having a raised central portion and said supports rising substantially to the height of said portion.

3. An inner annealing cover for an annealing furnace, comprising, in combination, a corrugated vertically extending cylindrical wall, a top welded to the upper edge of said wall to close the upper end of said cover, said top having a raised central portion and a flat annular rim,

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said rim having a width substantially that of the depth of the corrugations in said wall, an annular lifting member surrounding said wall and positioned closely adjacent to but radially spaced from said wall, said lifting member having a generally flat underside portion to provide a downwardly facing handling ledge extending radially inwardly from the outer edge of said underside portion, a plurality of generally radially extending circumferentially spaced brackets having a vertical edge welded to said wall closely adjacent to but below said upper edge thereof, said lifting member having an upper portion welded to the bottom of said brackets, and a plurality of vertically extending annularly arranged stool supports on which a handling mechanism is adapted to rest, said supports being welded to said rim to project thereabove inwardly of said lifting member and rising substantially to the height of the highest portion of said central portion of said top.

4. An inner annealing cover for an annealing furnace, comprising, in combination, a vertically extending cylindrical wall, a top welded to the upper part of said wall to close the upper end of said cover, annular lifting means surrounding said wall in secured relation thereto and positioned closely adjacent to but radially spaced from said wall, and a plurality of vertically extending stool supports arranged around the perimeter of said top within a vertical projection of the outside of said annular lifting means, said stool supports extending upwardly as high as the highest part of said cover.

5. An inner annealing cover for an annealing furnace, comprising, in combination, a corrugated vertically extending cylindrical wall, a top welded to the upper edge of said wall to close the upper end of said cover, said top having a raised central portion and a flat annular rim, said rim having a width substantially that of the depth of the corrugations in said wall, an annular lifting member surrounding said wall and positioned closely adjacent to but radially spaced from said wall, said lifting member having a generally flat underside portion to provide a downwardly facing handling ledge extending radially inwardly from the outer edge of said underside portion, a

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plurality of generally radially extending circumferentially spaced brackets having a vertical edge welded to said wall closely adjacent to but below said upper edge thereof, said lifting member having an upper portion welded to the bottom of said brackets, and means on which a handling mechanism is adapted to rest welded to said cover and rising substantially at least to the height of the highest portion of said central portion of said top.

6. An inner annealing cover for an annealing furnace, comprising, in combination, a vertically extending cylindrical wall, a top welded to the upper edge of said wall to close the upper end of said cover, said top having a central portion and a rim portion, an annular lifting member surrounding said wall and positioned closely adjacent to but radially spaced from said wall, said lifting member having an underside portion to provide a downwardly facing handling ledge, and a plurality of generally radially extending circumferentially spaced lifting member supports welded to said wall, said lifting member having an upper portion welded to the bottom of said supports.

7. An inner annealing cover as set forth in claim 6 in which said cylindrical wall is corrugated, said rim portion overlies said cylindrical wall, said lifting member has a relatively standard structural shape in cross section and there are a plurality of vertically extending annularly arranged inverted U-shaped stool supports welded to the upper side of said rim to project thereabove inwardly of the outer edge thereof to an upward height substantially equal to the highest part of said cover, said inverted U-shaped stool supports having the width of their respective legs transverse to a radius of said cover and generally covering at least the width of one corrugation.

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