Nov. 11, 1947. G. C. McCORMICK 2,430,521

MALLEABLE ANNEALING BASKET

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Fig. 1

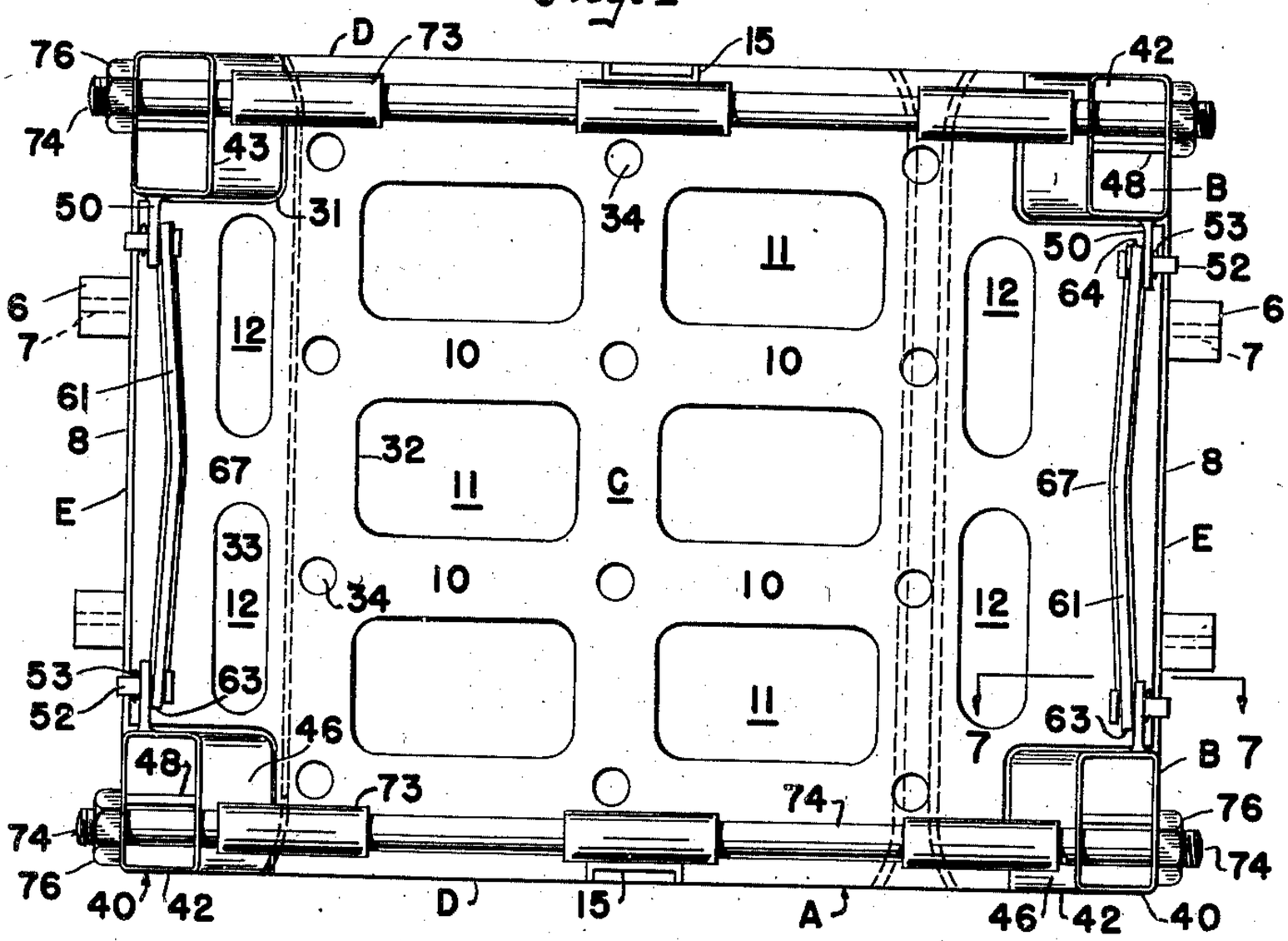


Fig. 2

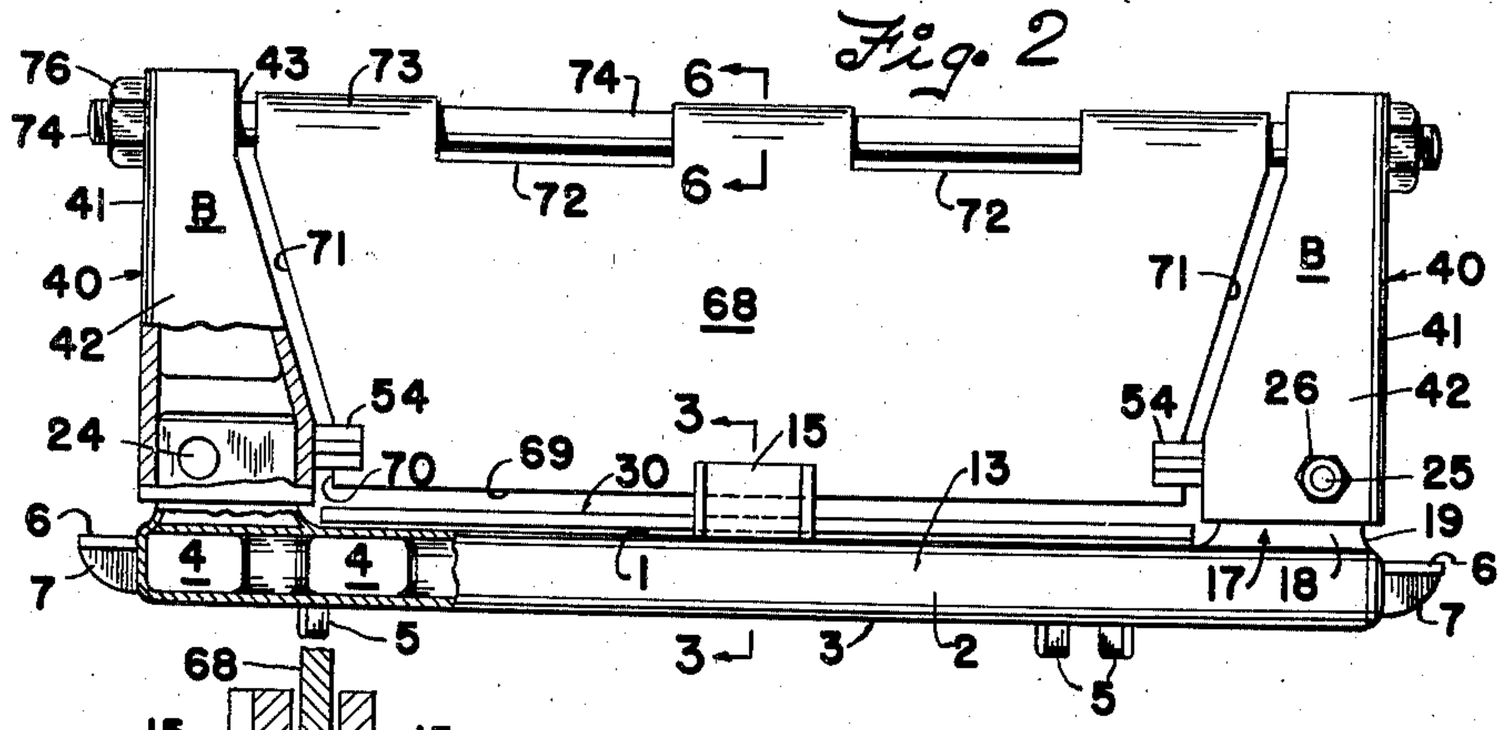
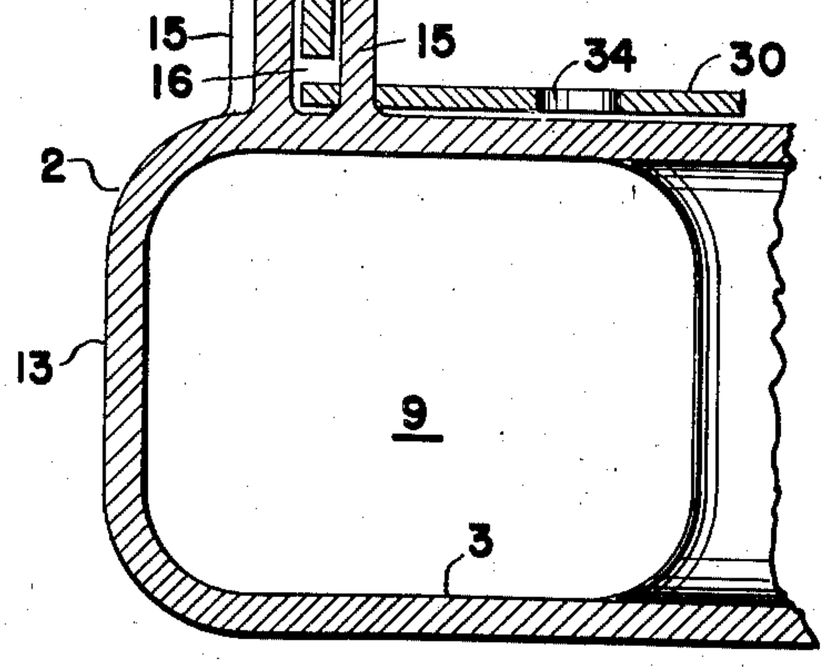


Fig. 3



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MALLEABLE ANNEALING BASKET

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Fig. 4

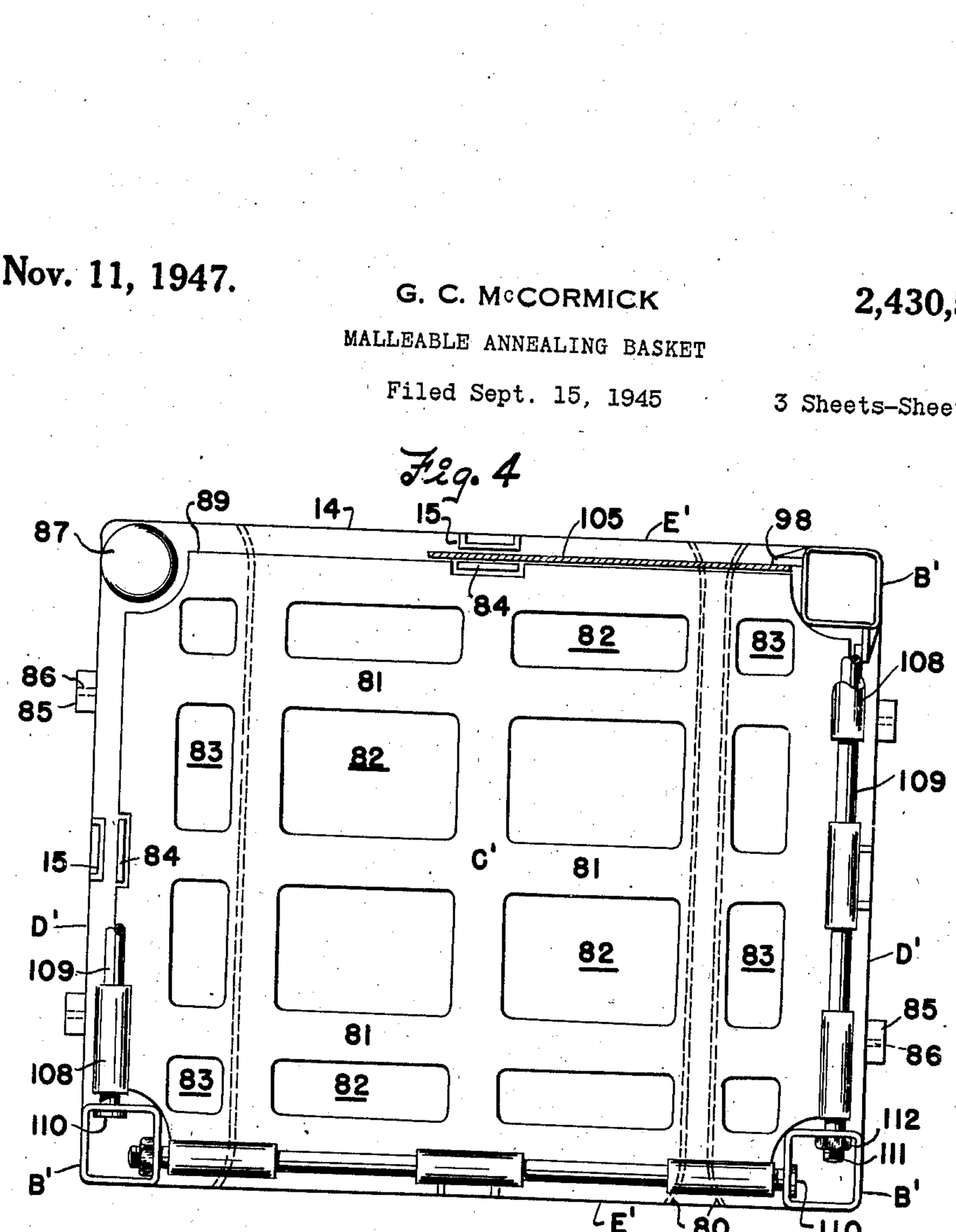


Fig. 5

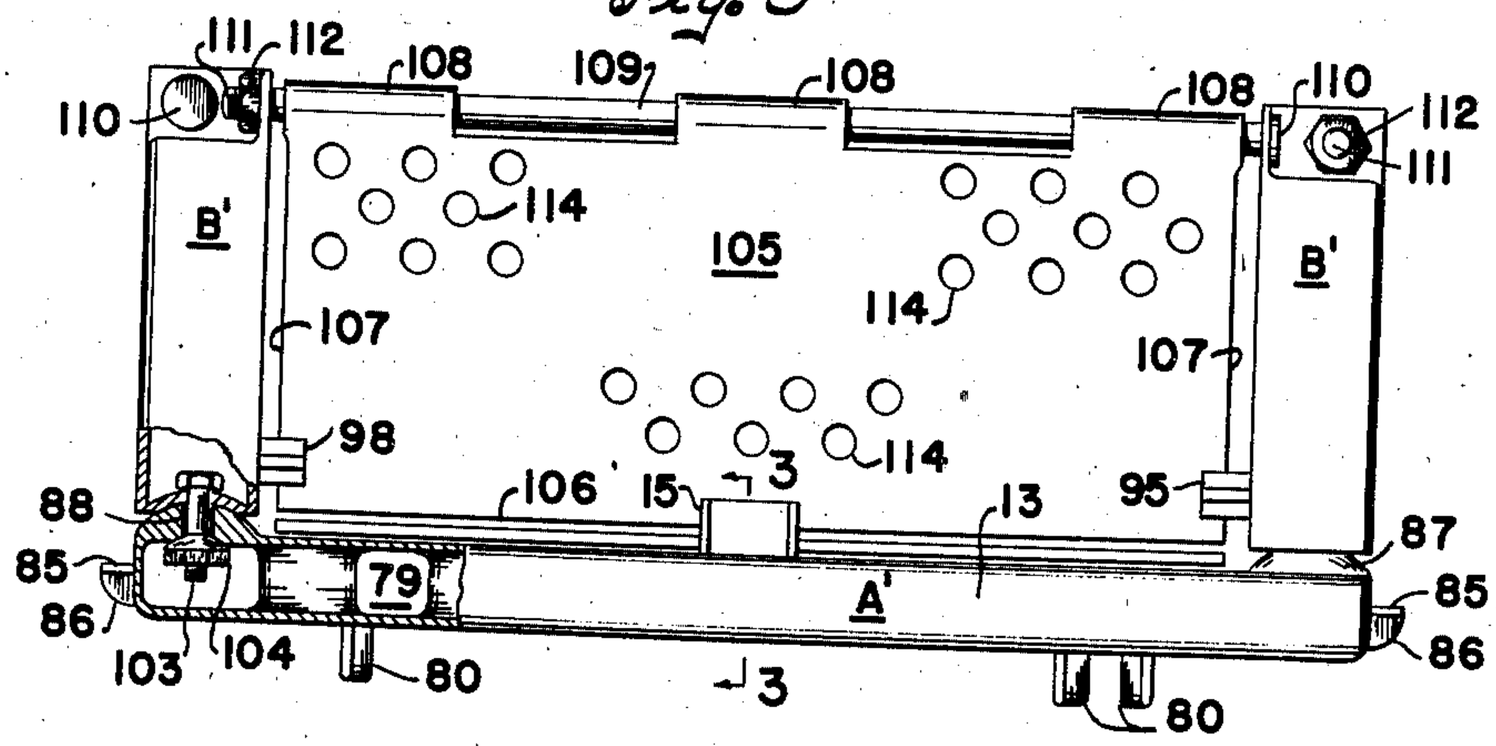
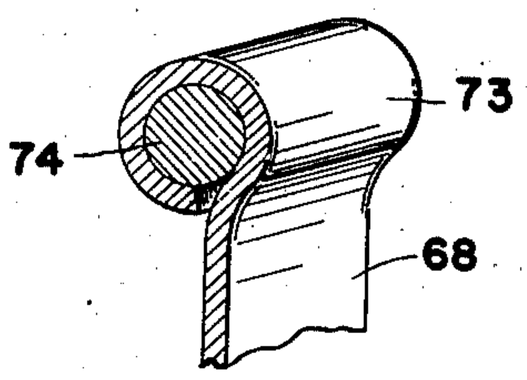


Fig. 6



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MALLEABLE ANNEALING BASKET

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Fig. 7

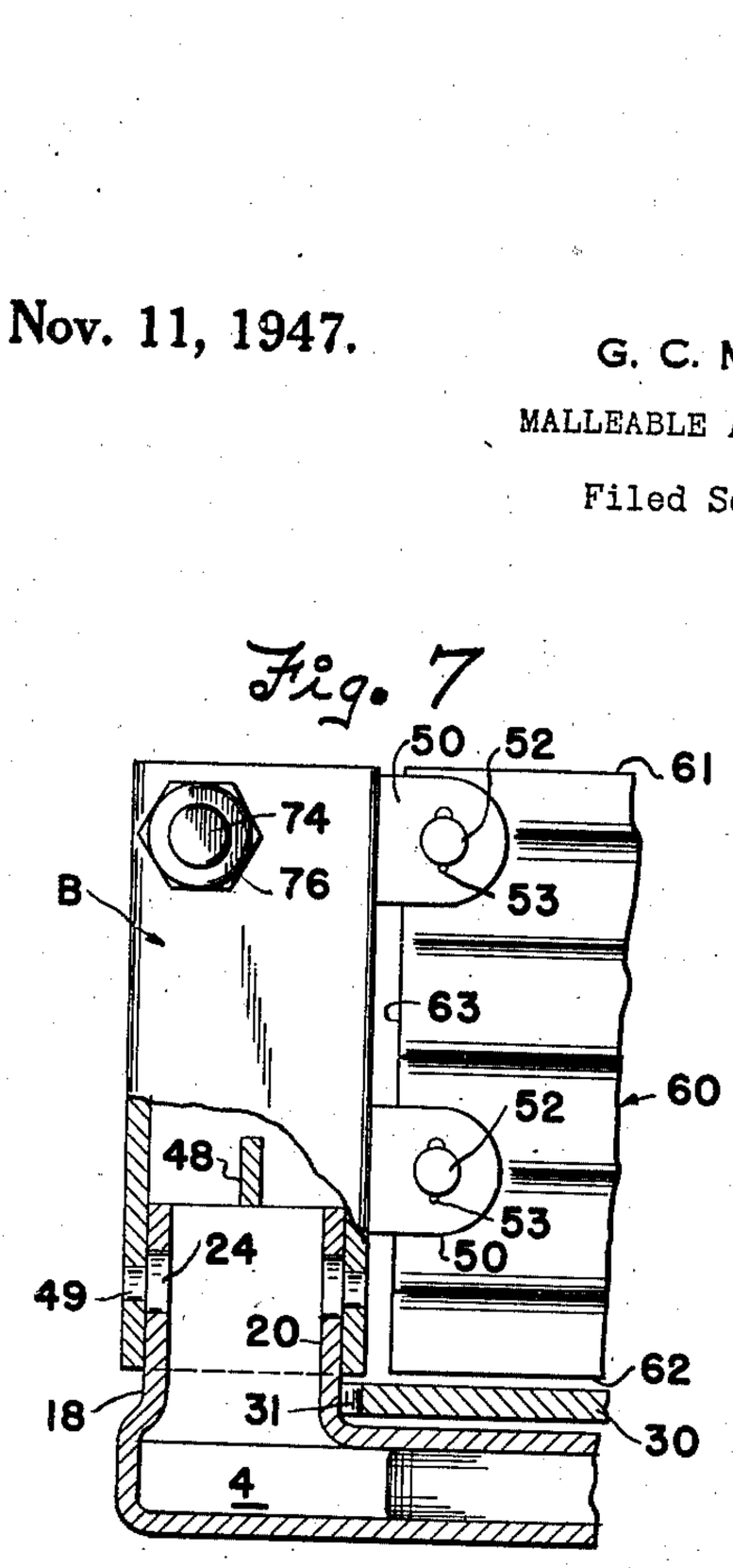


Fig. 8

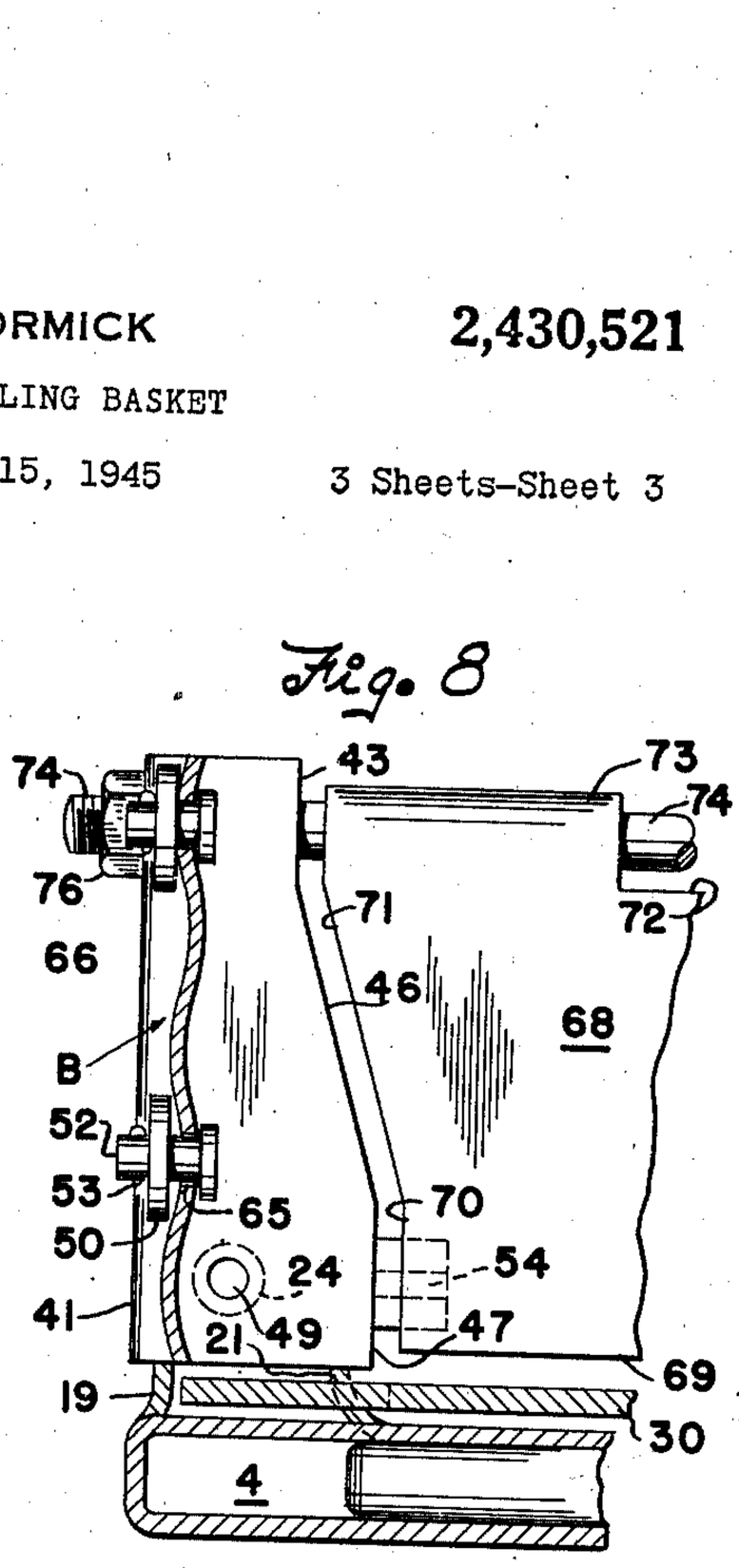


Fig. 9

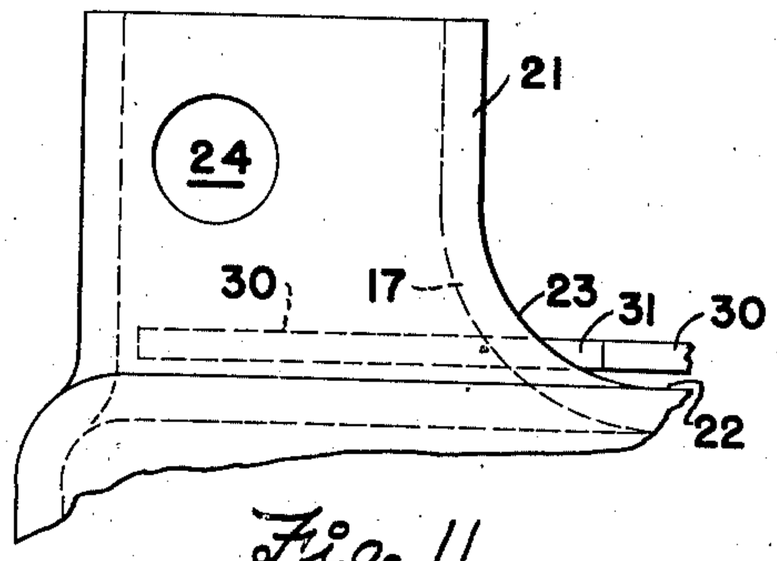


Fig. 10

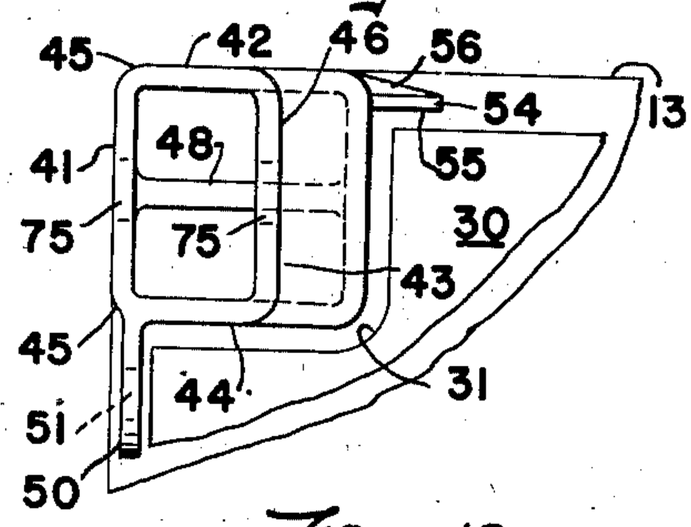


Fig. 11

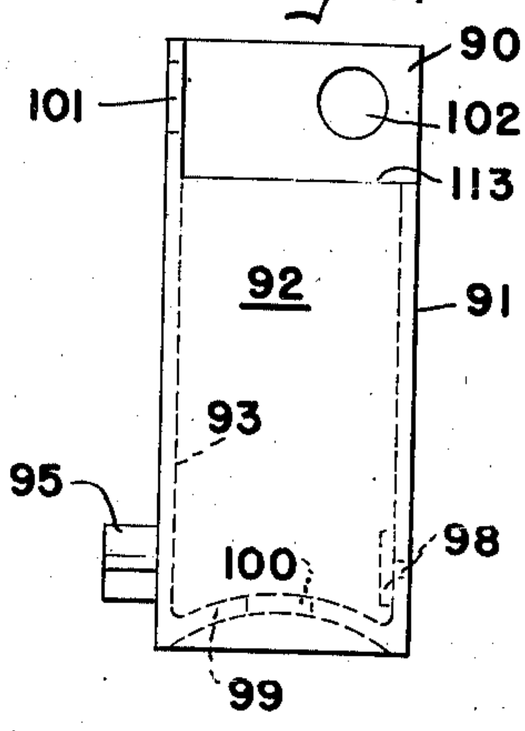
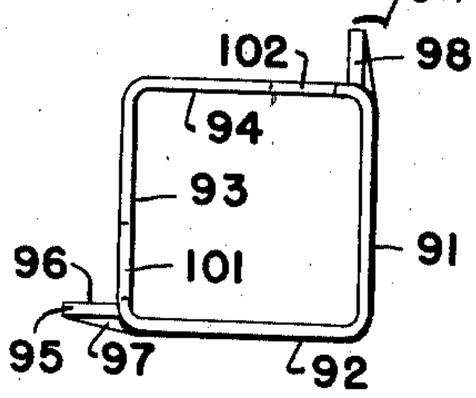


Fig. 12



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2,430,521

UNITED STATES PATENT OFFICE

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MALLEABLE ANNEALING BASKET

George Clifton McCormick, Newton, Mass.

Application September 15, 1945, Serial No. 616,524

17 Claims. (Cl. 263—47)

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This invention relates to improvements in heat treating apparatus, and, more particularly to a heat-treating malleablizing tray having a fixed base with replaceable and floating corner post sections which mount end and side wall members.

Hitherto trays which have been used for heat treating and malleablizing have had a very short life. This is due not only to the rigorous thermal conditions to which they are subjected but also to the substantial mechanical stresses imposed on the trays during the malleablizing process. As those skilled in the art know during the malleablizing treatment graphitization of the white iron occurs with consequent increase in volume of the work being processed. This expansion of the work imposes strains on the side walls of the basket or tray. The distortion of the walls occasioned by such imposed stresses is accentuated by the relatively high temperature conditions of the treatment which oftentimes approaches the softening point of the alloy of which trays are composed. Such trays therefore are subjected to severe buckling and distortion so that they are soon unfit for service.

In the past attempts have been made to avoid or minimize these undesirable results such for example, as temporarily diminishing the volumetric capacity of the tray and permitting subsequent increase in the capacity of the tray as by the use of combustible wedges and the like. Such expedients have not been found to be effective.

It has now been found that heat treating and malleablizing trays may be made from heat resisting alloys and the like, if the parts which are normally subject to the greatest abuse are mounted so as to be free floating on a fixed base.

It is an object of this invention to provide a heat treating and malleablizing tray having structural parts severally removable and interchangeable between different units.

It is a further object of this invention to provide heat treating and malleablizing trays having a relatively fixed or stable base with a superposed liner and replaceable stanchion sections and side wall and end wall members.

Other objects of novelty and advantage of the present invention include knock-down heat treating and malleablizing trays having interchangeable parts permitting the stocking up of those parts which require replacement more often than others.

With these and other equally important and related objects in view the invention comprehends the concept of providing a tray or similar heat

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treating container comprised of a base and a superstructure comprised of standardized, interchangeable and readily replaceable parts the association being such that the superstructure has a wide permissive floating movement with respect to the base to adequately accommodate expansion of the work. The novel structure is so devised that the major stresses set up in the tray are taken up in readily replaceable and relatively inexpensive units thus prolonging the serviceable life of the larger and more expensive elements of the tray.

In order to more clearly define the invention a preferred illustration is shown in the accompanying drawings in which:

Fig. 1 is a plan view of a novel tray.

Fig. 2 is an end elevation of the tray.

Fig. 3 is a vertical section taken on lines 3—3 of Figs. 1 and 2.

Fig. 4 is a plan view of a modified and simplified tray embodying the principles of the invention.

Fig. 5 is an end elevation of the tray structure shown in Fig. 4.

Fig. 6 is an enlarged sectional detail taken on lines 6—6 of Fig. 2.

Fig. 7 is a cross-sectional detail taken on lines 7—7 of Fig. 1.

Fig. 8 is a cross-sectional detail of the corner post construction shown in Fig. 7.

Fig. 9 is an enlarged elevation of the stub post of the tray shown in Fig. 7.

Fig. 10 is a horizontal sectional view taken through the upper part of the vertical post shown in Fig. 8.

Fig. 11 is an enlarged detail of the corner post unit of the modification shown in Figs. 4 and 5, and

Fig. 12 is a top plan of the corner post units of Fig. 11.

The novel tray of the present invention comprises a base member A, corner posts B, a tray liner sheet C, end walls D and side walls E. The several parts are interfitted and interconnected by bolts and suitable fastenings to permit replacement of the parts when desired.

Considering the structural features more in detail, the fixed base A comprises a main top or floor section 1 having edge flanges 2 terminating in inturned bottom flange sections 3. A plurality of integral, spaced tubular sections 4 extend along the length of the member and beneath the floor section. Curvilinear skids 5 are provided underneath the tray and are cast integral with

the same. Lugs 6 are formed at the sides of the base and are stiffened with integral webs 7 cast integral with the lugs and the sides 8 of the base. The lugs 6, with the supporting stiffening web 7, form generally T-shaped projections extending outwardly from the sides of the units and serve as engagement lugs for control of dumping or other handling after its passage through the heat treating or malleablizing furnace. A plurality of transverse tubular sections 9 meet the longitudinal tubular sections 4 in the central tray area to form a plurality of bridge sections 10 which define apertures 11 of generally rectangular shape in the center of the tray. Along the side edges of the tray there are formed a plurality of longitudinal slots 12. The front end 13 of the tray and the rear end 14 are provided at the upper edge portions with a plurality of spaced upstanding lugs 15, severally defining grooves 16 therebetween, to receive end walls, as will be described more in detail hereinafter. At the four corners of the upper surface of the tray there are provided integral stub post sections 17 shown in detail in Figs. 5 and 6. These sections comprise outer corner walls 18 and 19 extending vertically upward and inside walls 20 and 21 which are joined to web 22 of the tray by curvilinear sections 23. The walls sections 18 and 20 of the stub post are provided with aligned apertures 24 adapted to receive corner pins 25 held in place in any suitable manner, as by nuts 26.

As noted in Figs. 1 and 2, a liner sheet 30 overlays the tray section of the base. This sheet has cutout corners 31 adapted to clear the stub posts 17, and is provided with apertures or slots 32 and 33 generally conforming to sections 11 and 12 of the base member and extending inwardly of the apertures formed by the base sections. Additionally, the liner may or may not be provided with a plurality of circular apertures 34 in the center of the liner sections superposed over the bridging sections 10 of the base.

It will be seen that the liner sheet overlays the top surface of the base, and, due to its spaced apertures, insures even heating of the contents of the tray while, at the same time, providing a complete protective apron or surfacing for the base proper. By so protecting the base section, the metal of the latter is not subjected to blows from the contents of the tray during loading and discharging of the tray.

The stub posts described immediately above serve as supports and points of attachment for the removable corner pots 40. These posts, as shown in detail in Figs. 6 and 7, comprise castings having a smooth vertical back wall 41 of generally rectangular configuration, an outer side wall 42, an inner side wall 43, and a lateral side wall 44. Side walls 42 and 43 have vertical rounded edges 45 common with vertical wall 41 at the sides thereof. Additionally, the two walls have a slanting upper section 46 terminating in a vertical bottom section 47 which is slightly higher than the heighth of the stub posts 17. An inner stiffening web 48 is formed between walls 41 and 43 immediately above the vertical section 47 of wall 43. Walls 42 and 44 are provided near the bottom with the aligned holes 49 adapted to register with holes 24 in stub section 17 and receive corner pins 25. Wall 44 is provided with spaced lugs 50 adjacent vertical edge 45 and these lugs are apertured, as indicated at 51. These lugs serve as supports for the side walls which are bolted thereto by pins 52 usually secured with cotter pins 53. A T-shaped knuckle 54 is formed

integrally with section 47 of the corner posts and as an extension of side 42 thereof. This member has a vertical face or stop surface 55 and a stiffening or supporting web section 56. These members serve, in conjunction with members 15, to align and hold the bottom edges of the end walls in position when the tray is fully set up.

It will be noted that the posts B are not rigidly connected to the stub posts so that considerable play is permitted to and between the parts.

The side wall plates 60 are generally rectangular having top and bottom edges 61 and 62, side edges 63 and 64. Apertures 65 are adapted to register with apertures 51 in upper lugs 50 of the corner posts and the plates are secured to the lugs by end pins 52, previously described. The plates 60 are transversely corrugated, as indicated at 66, and are cambered inwardly of the tray, as indicated at 67. It will be noted that the side edges and the bottom edge of the end walls are spaced from the posts and the upper surface of the liner of the tray. In addition, there is considerable play at the lugs 50 so that plates 60 are freely movable in all directions when set up in the tray.

The side plates may be provided, adjacent their side edges, with a plurality of holes to permit uniform heating of the contents of the tray without interfering with its operative functions.

The end wall plates D are comprised of specially conformed plates 68, including the bottom edge 69, a vertical side edge portion 70 conforming generally to the vertical section 47 of the corner post and an angular edge 71 conforming to the tapered side 46 of the corner post. The upper edges of plate 68 are formed with the cutout portions 72 and the upstanding tubular portions 73. As will be observed, the tubular portions are adapted to receive the tie rods 74. These end wall plates are suspended from the tie rods 74 as shown in Figs. 1 and 2. In use, the side plates are hung loosely from the tie rods 74 and are held in aligned relation at the bottom by the lugs 15 and lugs 54. Here again, due to the relatively loose connection between the supporting posts and the walls there is permitted a maximum of play between the several parts of the assembled tray. As will be observed from an inspection of Figs. 1 and 2 the tie rod passes through transverse apertures 75 in the upper sections of walls 41 and 43. The tie rods may be passed through these apertures and thence through the tubular sections of the side plate 68 to suspend the side plates in position. The tie rod is secured in position by means of the bolt 76.

It will be seen that the side walls and end walls may be of standardized construction and may be simply and individually replaced. With this type of assemblage, as will be observed, the diagonally positioned corner posts are of identical construction, hence two standard corner post units can be provided to insure simple replacement in an operating tray.

As has been previously explained, the invention comprehends the provision of an annealing tray comprising a base and a superstructure so associated as to insure a substantial flexibility of movement of the components of the superstructure with respect to the base to thereby prevent distortion of the elements of the superstructure upon thermal expansion of the work or contents of the tray. With this concept in view it will be appreciated that a number of specifically different mechanical structures may be devised to insure the described desirable result. As has been

described, the structure shown in Figs. 1 to 7 involves the mounting of the side and end walls of the tray on the base through the medium of corner posts or stanchions which latter are so connected to the base as to permit a considerable degree of relative movement therebetween while insuring the desirable overall structural rigidity of the tray. As will be appreciated, other types of mounting of the corner post on the base structure may be utilized to insure such flexible connection.

An eminently simple and effective type of such mounting may comprise the utilization of curvilinear bearing surfaces on the base structure and similar curvilinear surfaces on the portions of the corner posts which abut the base structure. In other words, the connection between the base and the supporting corner posts may comprise any simple type of ball and socket joint or equivalent swivel or universal joint mountings.

A simplified structure embodying such a swivel type connection is shown in Figs. 8 to 13 inclusive. This modification, like that previously described, comprises as the major units a base A', comprising an integral casting of suitable heat resistant steel which forms the base and floor section of the tray, corner posts B', a liner sheet C', side walls D' and end walls E'. The base section, as previously described, is cast with the spaced integral tubular sections 79 extending longitudinally of the base and similar tubular sections (not shown) extending transversely of the base. The base is also provided with the integral cast skids 80 adapted to support the tray on the floor or rails of the furnace. These tubular sections merge in the central tray area to establish the bridge sections 81 and a series of apertures 82 in the floor of the tray. Adjacent the side edges of the tray there are established a plurality of longitudinal slots 83. The base of the tray is formed with a plurality of pairs of spaced lugs 84 of the type shown in detail in Fig. 3, which serve to receive the side and end walls therebetween to form positioning guides for such walls. As in the modification previously described, the side walls of the base section of the tray are formed with integral projecting lugs 85, stiffened by flanges 86 to form T-shaped projections to serve as engagement lugs for movement and control of the tray.

As intimated previously, the base section of the tray is provided with integral stub sections at the corners thereof which form a base upon which the corner posts B' are mounted. As shown, particularly in Fig. 13, the corner sections of the base portion of the tray are formed with the curvilinear surface 87 which projects above the major horizontal plane of the floor section of the base. This corner section, as shown, presents a curvilinear upper surface adapted to contact a similarly conformed surface on a corner post in a manner more particularly to be described. This elevated curvilinear section is cored at 88 to receive means for attaching corner post. The tray liner 89 is formed with cutout corner portions to clear the sections 87. The tray liner similarly is cutout to provide apertures conforming generally to the apertures in the base or floor section of the tray to thus permit circulation of heat through the work.

As shown in Figs. 10 and 11 the corner post comprises a hollow elongated unit 90, preferably of rectilinear cross-section. Such posts include the walls 91, 92, 93 and 94. Adjacent its base portion the post is formed with the integral projection or lug 95 formed with the flat plate engaging surface 96 and the rigidifying or stiffening web 97. Similarly, the wall 94 is formed with the projecting lug 98 which is similar in construction and function to lug 95. The base portion of the column or post, as will be observed from an inspection of Figs. 10 and 11, is formed with the integral curved bearing section 99 which is cored at 100. The curved surface 99 is cast or otherwise shaped to conform to the spherical supporting section 87 of the base of the tray. The upper section of the corner post is apertured so as to receive tie rods for supporting the end and side plates. The wall section 93 is provided with the aperture 101 and the wall section 94 is similarly provided with the aperture 102.

The assemblage and operation of the tray will have been appreciated from the foregoing description. In assembling the tray the corner posts 90 are mounted in vertical position so that the curved bearing surfaces 99 abut the correspondingly curved surfaces 87. The posts are secured to the tray proper through the medium of the bolt 103 and nut 104. As shown, the bottom surface of the head of the bolt of the upper surface of the nut are shaped to register or conform with the curvatures of the adjacent or abutting portions of the corner post and spherical support segment of the tray respectively. The side flange of the bottom portion of the tray is cut away to permit insertion of the nut 104. The bolt thus passes through the aperture 100 in the corner post and the aperture 88 in the bearing section of the floor tray. By providing a given tolerance between the bolt shank and the apertures 88 and 100 a considerable degree of permissive movement is established between the base of the tray and the corner post.

The corner post, as will particularly be observed, is a simple unit and is so designed as to be readily removable and interchangeable in any corner position of the tray.

The side and end plates D' and E' similarly may be of standard construction so as to be readily replaceable and interchangeable. As shown in Fig. 9 such plates may comprise a main body portion 105 formed with the straight lower edge 106 and the straight side edges 107. The upper edge of the plate, like that described in the earlier modification, comprises a series of spaced tubular extensions 108.

In assembling, the lower edge of the plate is inserted between the positioning flanges 84, and the edges 107 thus fit inside the lugs 95 of one corner post and the lug 98 of the opposite corner post. These lugs in conjunction with the flanges 84 thus serve to position the lower portion of the plate and provide a rugged lateral support for the plate enabling it to retain the work in the tray. These plates, as shown, are suspended from and wholly supported by tie rods 109. Such tie rod is provided with a head 110 at one end and a threaded portion 111 at the other. In mounting the plate, as shown in Fig. 9, the tie rod is inserted through the aperture 101 of the right-hand corner post, thence through the tubular upper edge 108 of the plate and through aperture 102 of the opposite corner post. By attaching the nut 112 the plate is established and secured in position and is suspended from the tie rod so that clearance is established between the edges of the plate and the tray floor and posts. The other plates are mounted in a similar manner. As will be observed from an inspection of Fig. 8 the upper portion of each corner post receives the headed end of 110 of one tie rod and the nut 112 of

the other tie rod. The upper portions of walls 91 and 92 are cut away at 113 so as to permit ready insertion of the tie rods and the application of nuts 112. In order to insure free circulation to the work the side and end plates of the tray may be provided with a series of apertures 114.

It will be appreciated that this type of structure is eminently simple and rugged. The corner posts, side and end walls and tie rods are so designed that they may be utilized on any side of the tray. By stocking such standard units users of the tray may quickly replace any unit of the superstructure. Such replacement can be made rapidly because of the ease with which the tray may be knocked down and assembled.

It will now be appreciated that the described structures present many advantages and eliminate the serious inherent disadvantages of prior art structures. In each modification the provision of suspending side walls from tie rods and establishing a permissive movement between the base and the superstructure insures a maximum of play between the several parts of the tray. The structure thus minimizes trouble arising from displacing or moving the trays while under high temperatures which would normally cause distortion in wall or post members in solid cast trays. In the structure shown in Figs. 1 to 7 inclusive, the provision of corrugated walls insures a reduction in wall thickness of these members without detracting from their structural efficiency in use. It is apparent with the type of structure described that when the parts have become unduly distorted a particular member may readily be removed and quickly replaced by a similar standard member without requiring the scrapping of the entire tray unit. Marked longevity of the tray as a whole is thus achieved. The pronounced freedom of movement between the several parts insures adequate take up for expansion of the work or the contents of the tray without building up undue stresses either in the walls of the tray structure or in the parts under treatment. Since the free floating condition of the movable walls and corner posts permits the ready accommodation of the several parts to any imposed stresses or strains arising from use.

It will now be appreciated that there is herein provided a novel knock-down, heat-treating and malleablizing tray in which the parts are severally removable and replaceable and, because of their novel design and assemblage, permits a maximum of movement for the parts under conditions imposed by expansion or other conditions arising from high temperature operation.

While preferred modifications of the invention have been described it is to be understood that these are given didactically to illustrate the underlying principles involved and not as limiting the useful scope of the invention to the particular illustrative embodiments.

I claim:

1. A heat treating tray comprising, in combination, a base, a liner sheet on the base, stub posts at the corners of the base, stanchions removably secured to the stub posts and removable side and end walls secured to and between the stanchions.

2. A heat treating tray comprising, in combination, a base, an apertured liner sheet on the base, stub posts at the corners of the base, stanchions removably secured to the stub posts and removable side and end walls secured to and between the stanchions.

3. A tray structure according to claim 2 in which the end walls and side walls are transversely corrugated.

4. A tray structure according to claim 2 in which the end walls are fastened between stanchions and are cambered inwardly of the tray.

5. A tray structure according to claim 2 in which the side walls are transversely corrugated and are hung from tie rods fastened between the stanchions.

6. A tray structure according to claim 2 in which the side walls and liner are spaced from the corner posts.

7. A tray structure according to claim 2 in which the bottom liner is apertured to conform to the base and is spaced from the stub posts.

8. A tray structure according to claim 2 in which the side walls are hung from tie rods by annular sections at the top edges of the walls.

9. A tray structure according to claim 2 in which the end walls and side walls are apertured adjacent their respective side edges.

10. A tray structure according to claim 2 in which the side walls are transversely corrugated and have top edges formed as integral tubes, the tubes receiving tie rods mounted between stanchions and upon which the side walls are hung and the bottom edges of the side walls being loosely fitted in grooved members in the base section.

11. A heat-treating tray comprising an inversely dished apertured flat base, integral, upstanding stub posts at the corners of the base, hollow stanchions removably and loosely secured on and over the stub posts, transversely corrugated end walls secured to and between the stanchions, side-wall hanger rods also secured to and between the stanchions, side-wall-receiving sections in the base and in the stanchions, and side walls hung on the hanger rods and received in the base and stanchions.

12. A heat-treating tray comprising an apertured flat base, a conformed liner on and over the base, integral, upstanding stub posts at the corners of the base, stanchions removably and loosely secured on and over the stub posts, transversely corrugated side walls secured to and between the stanchions, end wall hanger rods also secured to and between the stanchions, side-wall-receiving sections in the base and in the stanchions, and end walls hung on the hanger rods and received in the base and stanchions.

13. A heat-treating tray comprising an apertured flat base, tubular strengthening members or ribs within and integral with the base, cambered guide skid members integral with the inside of the base and opposed side walls of the base, stub posts on the top of the base and integral therewith, stanchions removably and loosely secured on and over the stub posts, corrugated end walls secured to and between the stanchions, side-wall hanger rods also secured to and between the stanchions, side-wall receiving sections on the top side edges of the base and in the bottom side sections of the stanchions, and side-walls hung on the hanger rods and received in and by the base and stanchions.

14. A heat-treating tray comprising an apertured flat base, a conformed liner on and over the base, tubular strengthening members on ribs within and integral with the base, cambered guide skid members integral with the outside of the base and opposed side walls of the base, stub posts on the top of the base and integral therewith, stanchions removably and loosely secured on and over the stub posts, corrugated end walls secured to and between the stanchions, side-wall

hanger rods also secured to and between the stanchions, side-wall receiving sections on the top side edges of the base and in the bottom side sections of the stanchions, and side-walls hung on the hanger rods and received in and by the base and stanchions.

15. A heat treating tray comprising a base, stub posts formed integrally with the base, said posts being provided with a curvilinear upper bearing surface, stanchions removably secured to the posts, said stanchions being provided with curvilinear bottom sections adapted to abut the curvilinear bearing surfaces on the post and means to support side and end walls on the stanchions.

16. A heat treating tray comprising a rectangular base, stub posts formed integrally with the base at the corners thereof, said posts being cored and formed with a curvilinear upper bearing surface, elongated interchangeable stanchions mounted upon and removably secured to stub posts, the stanchions being provided with curvilinear bottom sections conforming to and adapted to abut the said curvilinear sections of the corner posts, tie rods attached to and extending between the upper ends of the several stanchions and removable side and end walls mounted on and suspended from the tie rods.

17. A heat treating tray comprising a polygonal base, stub posts formed integrally with the base at the corners thereof, said posts being cored and formed with a curvilinear upper bearing surface, elongated interchangeable hollow stanchions mounted upon and removably secured to the stub posts, the stanchions being provided with a curvilinear section at the bottom which conforms to and abuts the curvilinear section of the stub posts; the upper end of the stanchions being provided with laterally projecting flanges; tie rods attached to and extending between the stanchions, and side and end walls suspended from the tie rods and adapted to be retained in position by the said flanges on the stanchions.

GEORGE CLIFTON McCORMICK.

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