Nov. 2, 1948. M. L. JACOB 2,452,931

ANNEALING BOX

Filed Sept. 13, 1945 2 Sheets-Sheet 1

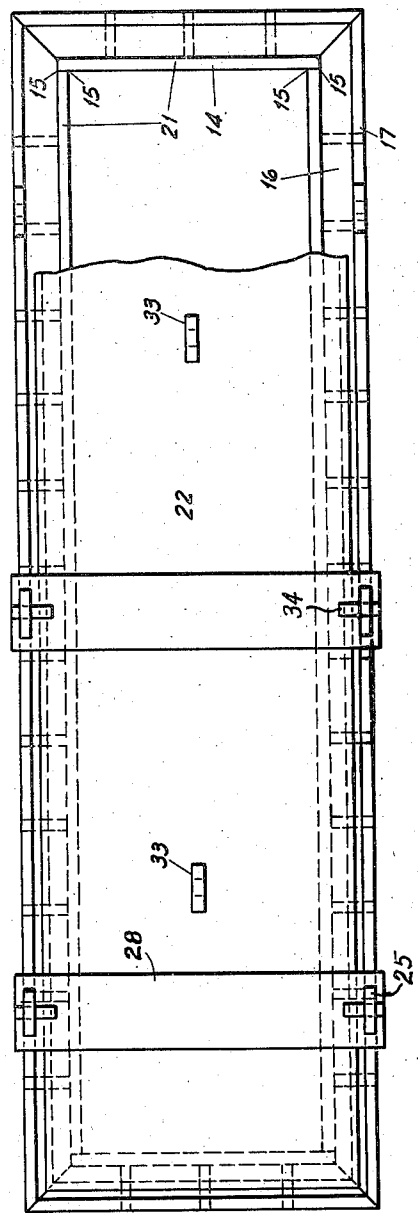


Fig. 1

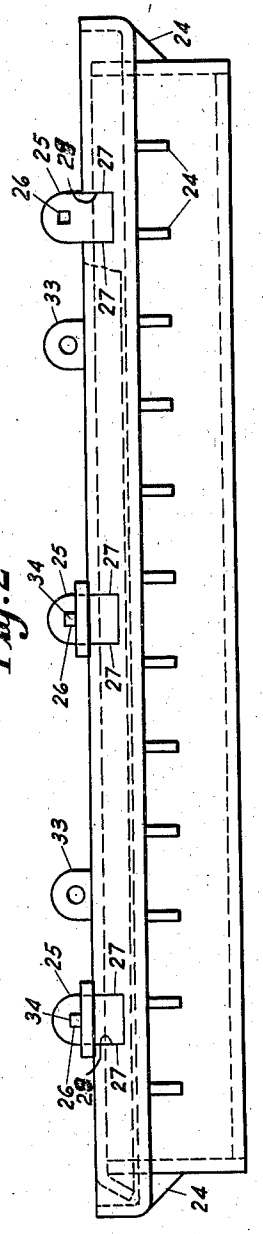


Fig. 2

INVENTOR.
Morris L. Jacob.
BY
Edward A. Laurens
his attorney.

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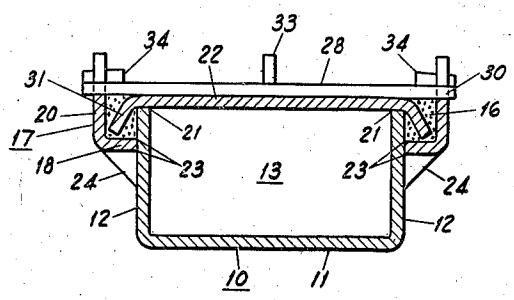


Fig. 3

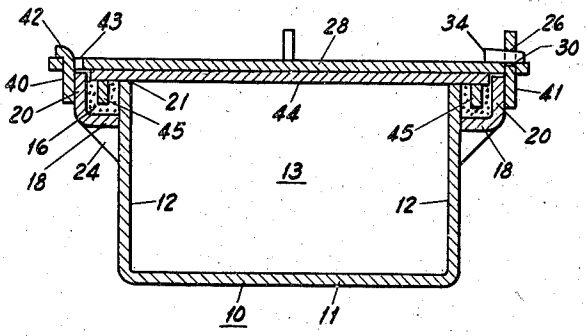


Fig. 6

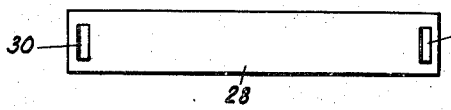


Fig. 5

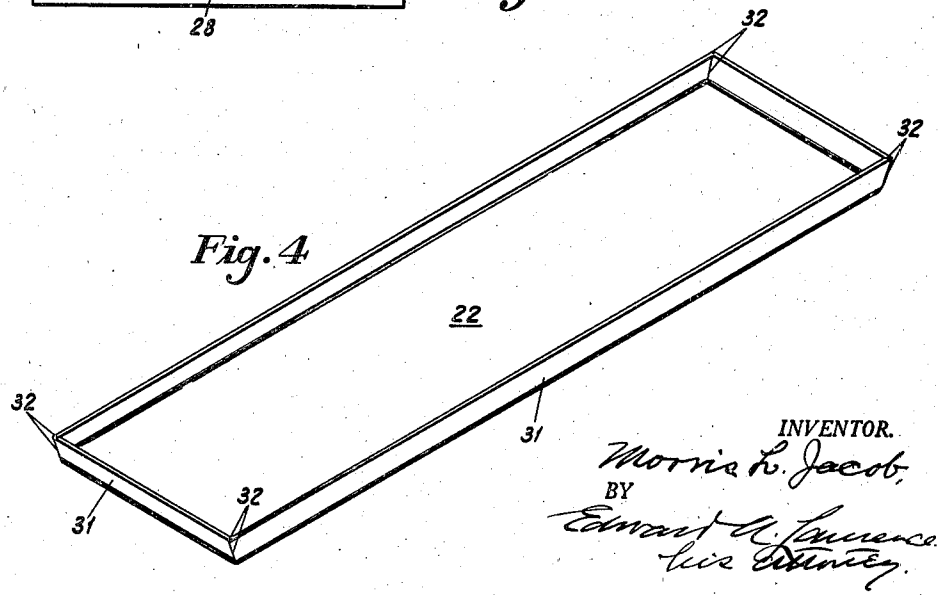


Fig. 4

INVENTOR.
Morris L. Jacob,
BY
Edward A. Laurence
his Attorney.

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UNITED STATES PATENT OFFICE

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ANNEALING BOX

Morris L. Jacob, Pittsburgh, Pa., assignor to Pittsburgh Annealing Box Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application September 13, 1945, Serial No. 616,108

6 Claims. (Cl. 263—49)

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This invention relates generally to annealing boxes for receiving steel to be annealed in open fired annealing furnaces and more particularly to fabricated annealing boxes having a clamped and sealed lid.

Upwardly open cast steel annealing boxes having lid or closure members are commonly employed to contain steel while being annealed in an open fired annealing furnace. Charcoal or a similar oxygen absorbing agent is frequently placed in the box with steel, the lid is then placed thereon and the box is loaded into the open fired annealing furnace. The annealing furnace may be provided with burners in the end walls, side walls or in the roof of the furnace chamber and the flames ordinarily impinge directly on the annealing boxes loaded into the furnace. These annealing furnaces are fired for predetermined periods of time and at different controlled temperatures ranging from 1300° F. to 1900° F. depending upon the character of the steel to be annealed, the degree of annealing desired and load or charge in the annealing furnace.

Repeated use of cast steel annealing boxes under firing conditions of this character cause them to develop fissures and deep cracks in a short time, making them unfit for further use. Again, the cast steel boxes and their lids may bulge or become otherwise distorted, preventing them from properly sealing the steel within the box which makes them unfit for further use. The development of these and other defects prevent the cast steel boxes from being used more than twenty to thirty times before they have to be scrapped.

Another disadvantage of the cast steel annealing boxes resides in the fact that their side and end walls are heavily constructed and must be tapered to permit their removal from the mold in which they are poured. This construction reduces the capacity of the load receiving chamber of the box.

The principal object of this invention is the provision of a fabricated annealing box which is not subjected to the disadvantages of the cast steel box and is capable of being used for six times as many as the cast steel boxes.

Another object is the provision of a fabricated annealing box that is constructed to prevent warpage or distortion upon repeated use.

Another object is the provision of a fabricated annealing box that is flexibly reinforced to permit it to expand and retract without warping or becoming distorted.

Another object is the provision of a fabricated annealing box having lateral reenforcing means arranged to prevent the box from bulging intermediate of its ends and also arranged to clamp and retain the lid in sealed position.

Another object is the provision of a reenforced

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annealing box providing a perimetral sand seal for the lid of the box.

Another object is the provision of an annealing box formed from steel plate and having a perimetral trough shaped reenforcing member for containing sand for the seal and also arranged to receive clamping means for holding the lid tightly in place and further aid in preventing the box from bulging laterally intermediate of its ends.

Another object is the provision of a novel lid and sand seal for an annealing box.

Another object is the provision of an annealing box fabricated from steel plate which is capable of withstanding repeated use at high temperature annealing.

Another object is the provision of a fabricated annealing box which provides an annealing chamber of maximum capacity for the over all size as compared to that of the cast steel box.

Another object is the provision of a fabricated plate annealing box simple in construction and economical to manufacture.

Other objects and advantages appear from the following description and claims.

Practical emodiments illustrating the principles of this invention are shown in the accompanying drawings wherein:

Fig. 1 is a plan view of the fabricated annealing box with a portion of the lid broken away.

Fig. 2 is a side elevation of the fabricated annealing box shown in Fig. 1.

Fig. 3 is a sectional view of the fabricated annealing box shown in Fig. 1.

Fig. 4 is a perspective view of the under side of the lid.

Fig. 5 is a plan view of the lid locking batten and reenforcing member.

Fig. 6 is a modified form of the lid and batten locking structure.

Referring to the drawing, the annealing box 10 is fabricated from steel plate. If the box is to contain steel and is to be subjected to temperatures up to 1650° F. the steel plate employed to make the box is preferably made from low carbon steel. If higher temperatures are required, such as 1650° F. to 1900° F. low alloy high tensile strength steel plate is preferred for the construction of the box.

The bottom 11 and the side walls 12 of the box are formed from one plate by sharply bending them at right angles along the bottom edges to produce a short radius or fillet thereby making the whole of the box annealing chamber 13 available for useful work. The depth and length of the side walls and the width of the bottom are made according to the length and number of the steel articles to be annealed therein.

Rectangularly shaped end walls 14 are welded to the ends of the bottom 11 and side walls 12.

The welding may be accomplished by any suitable method. Electric arc added metal welding along the inner and outer edges of the box as indicated at 15 has been found to provide a suitable weld for this purpose.

The perimetral sand seal trough 16 which is formed by the perimetral reenforcing member 17 is preferably made from a heavier plate than that from which the box is constructed. This plate is formed into an angle bar having a short horizontally disposed flange 18 and a longer flange 20. The right angle of the bar is sharply formed to provide a short radius or small fillet.

Four sections of the angle bars are cut to provide the side and end sections of the perimetral reenforced member 17 which extend beyond the dimensions of the box 10 to the extent of the short flange 18 and the ends are morticed so that they will fit when secured to the box. Owing to the fact that the plate employed to construct the box may be seven-eighths of an inch in thickness they may not be perfectly smooth. It therefore may be desirable to fit the edges of the short flanges 18 to the outer surfaces of the box. Particular care is made to properly place the top edge of the long flange 20 above the top edges 21 of the side and end walls of the box. The edge of the flanges 20 should be slightly less than the thickness of the cover 22 above the top edges 21 of the box. This may be accomplished by tack welding the edge of the short flanges 18 to the box and when all of the sections are properly fitted and tacked in position both sides of the flanges 18 are securely welded to the side and end walls of the box as indicated at 23, thereby permanently securing the angle bar sections to the box.

Triangular reenforcing plates 24 are welded to the under side of the flanges 18 and the side and end walls of the box. These plates 24 are preferably spaced about a foot and one-half apart along the side and end walls of the box.

Before the side angle bars are tack welded to the box, a series of oppositely disposed square notches 29 are cut out of the long flanges 20 at spaced intervals depending upon the length of the annealing box. These notches are fitted with upwardly extending lugs 25 of the same thickness of the flange 20. Each of these lugs 25 extend above the upper edge of the flange 20 and are provided with a transverse opening 26. The lugs 25 are welded along the adjacent edge surface on both sides of the flange 20 as indicated at 27. This construction provides a strong joint between the lugs 25 and the flanges 20. When the angle bar sections are secured to the box, the oppositely disposed lugs on each side thereof are in alignment and are arranged to receive the tie bar battens 28 as shown in Fig. 5. Each tie bar batten is preferably made of the same gauge steel plate as the angle bars and they are approximately one and one-half as wide as the lugs 25. Each batten 28 has a slotted opening 30 adjacent the ends thereof for receiving the upwardly projecting lugs 25. The openings 30 provide sufficient clearance to permit the batten to be dropped over the lugs when the completed box is being closed.

The lid 22 is shown inverted in Fig. 4. This is preferably made from a plate having the same thickness as the box. The four corners are notched a sufficient depth to permit the flanges 31 to be turned toward the under side of the lid and welded along the inner and outer beveled seams at each corner, as indicated at 32, to produce a continuous perimetral flange preferably depending at an angle greater than 25° from the horizontal and arranged to be contained within the perimetral sand seal 16 as shown in Fig. 3. It will be noted that the bend forming the flange is spaced outwardly from the upper edge 21 of the side and end walls of the box to insure true and flat sealing surfaces between the under side of the lid 22 and the top perimetral edge 21 of the box.

The sand seal trough 16 is practically filled with sand when the lid is lowered by the hoisting lugs 33 on to the box and the angular depending flange 31 moves the sand inwardly and upwardly to fill the void. More sand is then applied to the trough to fill the same. Tight packing of this sand seal may be accomplished by thin tampers employed to work the sand between the long flange 20 of the trough and the flange 31 of the lid.

After the lid 22 has been positioned by a crane or suitable hoist the tie bar battens 28 are dropped over their corresponding lugs 25 and low angle wedges 34 are driven by a sledge into the openings 26, thereby tightly clamping the lid 22 on the upper edge 21 of the box.

The loaded annealing box is then transported to the annealing furnace and fired for a predetermined period of time under controlled temperature conditions. Ordinarily the open fired furnace is shut off at the end of the firing period and the furnace load is permitted to slowly cool. When cooled to below oxidizing temperature, the furnace is opened and the annealing boxes may then be removed and unloaded. This process is known as a complete annealing cycle. However, the firing schedule may require on and off firing periods during which time the temperature is raised to a predetermined amount and then permitted to drop.

The short flange 18 being normal to the side and end walls of the box provides reenforcing around the perimeter of the box. The tie bar clamping battens 28 are equally spaced and when tightly clamped by the wedge blocks 34 provide further reenforcement preventing the fabricated plate box from warping or otherwise distorting when subjected to repeated use; whereas the cast steel box may be used for twenty to thirty times, the fabricated box comprising this invention has been used one hundred to one hundred and thirty times when fired at 1550° F.

Since the box is constructed from plate material it may be straightened and reconditioned after one hundred and thirty annealing cycles and they have been used for thirty to fifty times at temperatures of from 1650° F. to 1700° F. without failure. The success of this box is believed to be due to its construction as well as to the fact that plate material is employed to fabricate the same.

The clamping stress placed on the tie bar battens 28 is believed to aid their being capable of retaining the box in shape after so many annealing cycle uses. The long flanges 20 are also believed to flex during the expansion and contraction of the metal due to alternate heating and cooling. This resilience is believed to represent an important object of this invention.

After long use these boxes may become distorted and warped. Owing to the fact that they are made of plate material, they may be readily straightened and reused without the formation of cracks and fissures which is impossible with the cast steel annealing boxes. This is also believed to be an important improvement in this art.

In the modified form of this invention shown in Fig. 6, the lugs 25 are replaced by the lugs 40 and

41 which are constructed in pairs and are welded to the outer or inner face of the long flange 20 and the lug 40 is provided with a short flange 42 whereas the opposite lug 41 of the pair is similar to the lug 25. The lugs 40 and 41 may be welded to the outer surface of the flange 20 as shown. The tie bar batten 28 is provided with the slotted opening 43 sufficiently large to permit it to be threaded over the flanged head 42 and the opening 30 at the other end of the batten may then be dropped down over the lug 41 and locked by the wedge block 34 as before. Thus, only one wedge block need be used to tightly clamp the lid 22 in place.

The lid 44 of Fig. 6 may be used with either type of tie bar batten lock. This lid is merely a flat plate which closely fits the inner perimetral surface of the long flanges 20 adjacent the upper edge. A properly positioned perimetral depending flange 45 is welded on both marginal edges to the under side of the lid 44 so as to be centrally positioned and deeply inserted into sand retained by the perimetral trough 16 to properly produce a sand seal.

When the lid 44 is used with either form of lug locking structure, the tie rod battens 28 prevent the box walls from bulging and the flat lid 44 prevents them from buckling. Thus, the movement of the metal due to expansion and contraction is limited in both directions by flat metal parts which is an important object of this invention.

I claim:

1. In an annealing box the combination of, a box having a bottom with side and end walls to provide a chamber and a top rim disposed in a single plane, a perimetral reenforcing member having two flanges, one flange being disposed normal to the walls of the box and secured to the outer surface below the rim, the other flange extending upwardly to form a perimetral trough with walls of the box, upwardly projecting lugs extending above the rim and secured at oppositely disposed positions in said other flange, a lid

covering the rim of the box and disposed between said lugs, a flat batten bar having openings adjacent its ends to receive the upwardly projecting lugs, and means to removably secure the batten to the lugs to tightly clamp the lid on the box rim and retain the opposed walls of the box against distortion due to heat.

2. The structure of claim 1 characterized in that said lugs are inserted in and secured to the said other flange of the reenforcing member.

3. The structure of claim 1 characterized in that said means comprises a wedge arranged to be driven in a hole through the lug to forcibly hold the lid against the rim of the box.

4. The structure of claim 1 which also includes a series of spaced triangular brace members secured to the under side of said one flange of the reenforcing member and the box walls.

5. The structure of claim 1 which also includes a perimetral flange on the lid spaced from the rim and depending into the trough.

6. In an annealing box the combination of an upwardly open box having a bottom with side and end walls to provide a chamber and a flat rim disposed in a single plane, a lid engaging said rim to close the box, upwardly projecting lugs extending above the rim and secured at oppositely disposed portions on the sides of the box, a batten bar having openings adjacent its ends to receive the upwardly projecting lugs, and means to removably secure the batten to the lugs to tightly clamp the lid on the box rim and retain the opposed walls of the box against distortion due to heat.

MORRIS L. JACOB.

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