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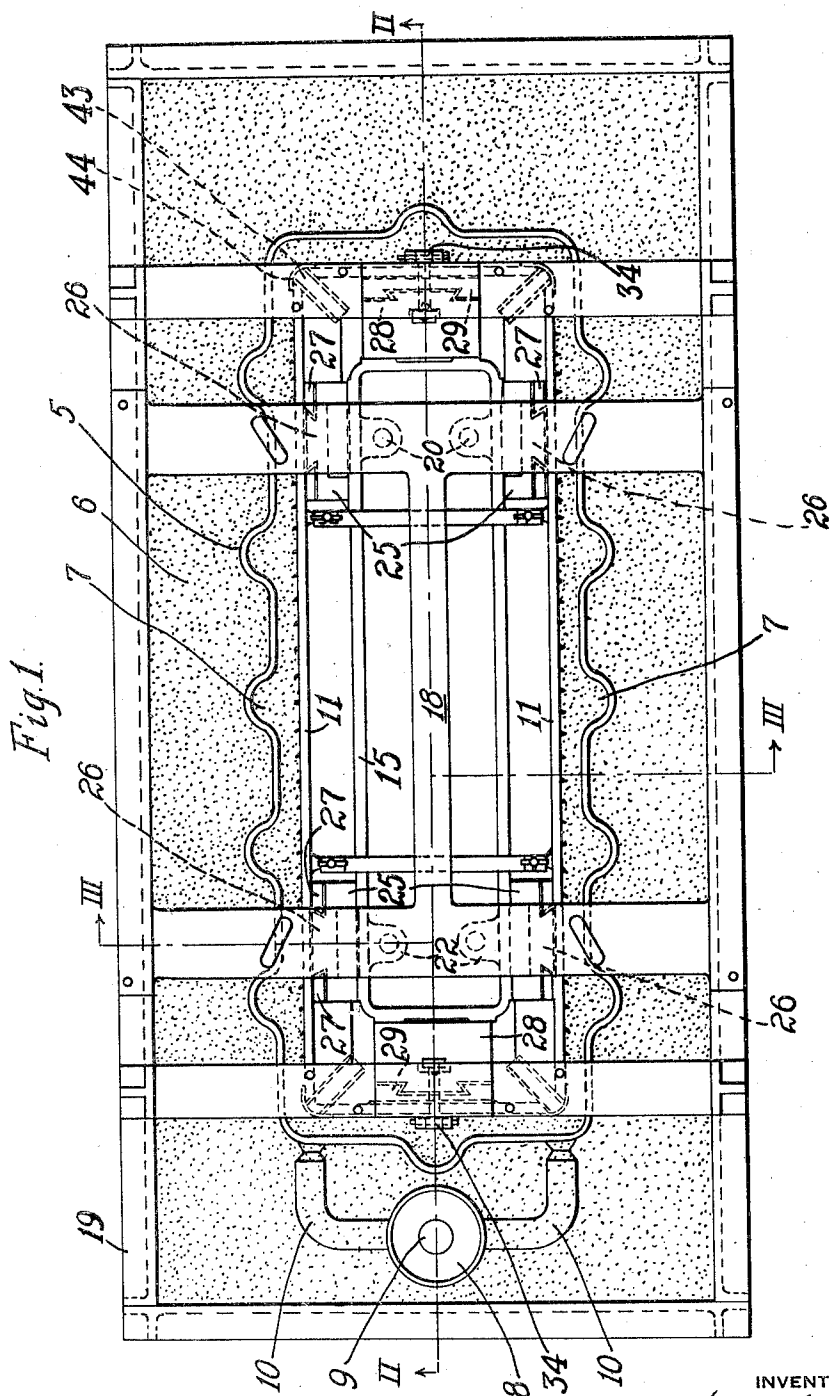
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1,800,848

METHOD OF CASTING ANNEALING BOX COVERS

Filed March 8, 1929

4 Sheets-Sheet 1



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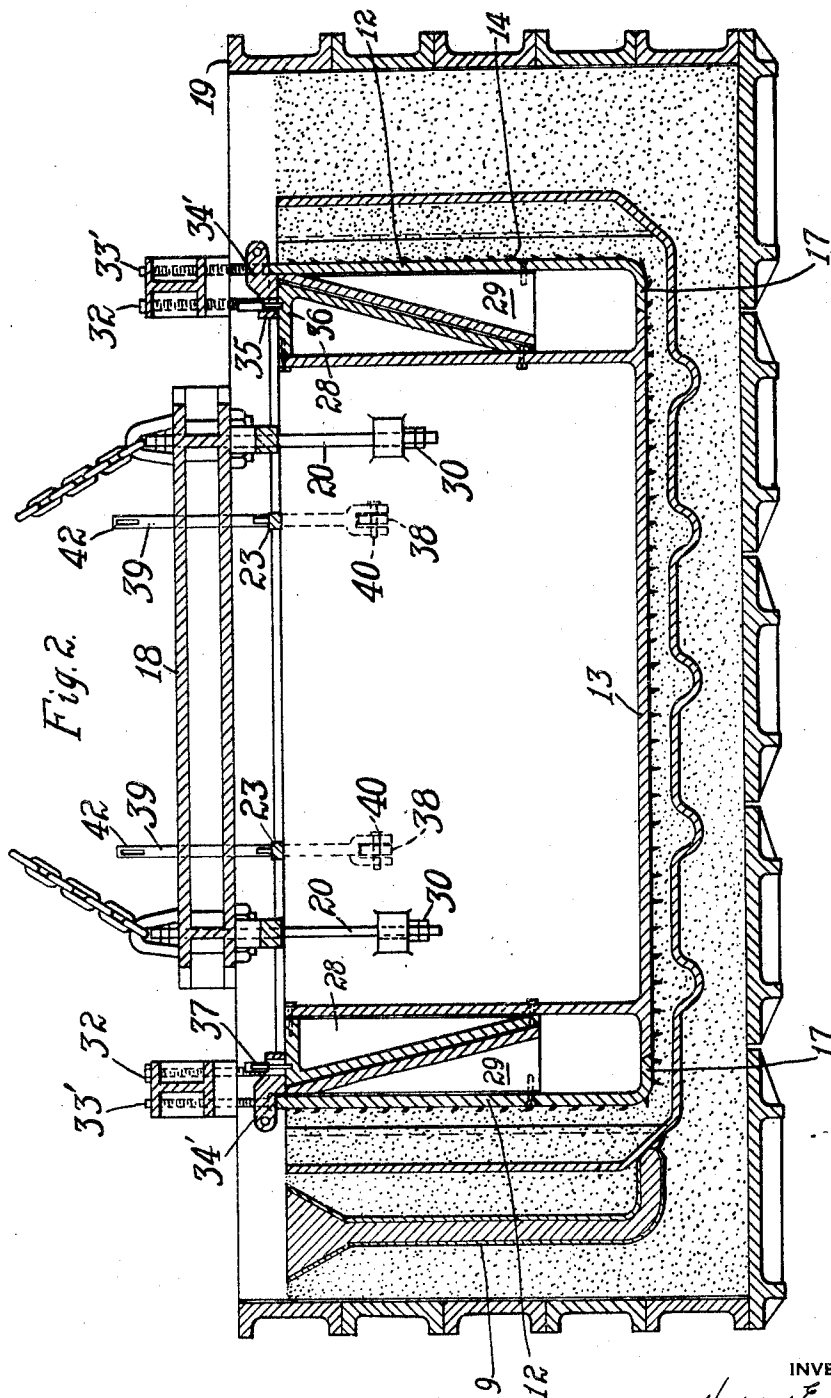
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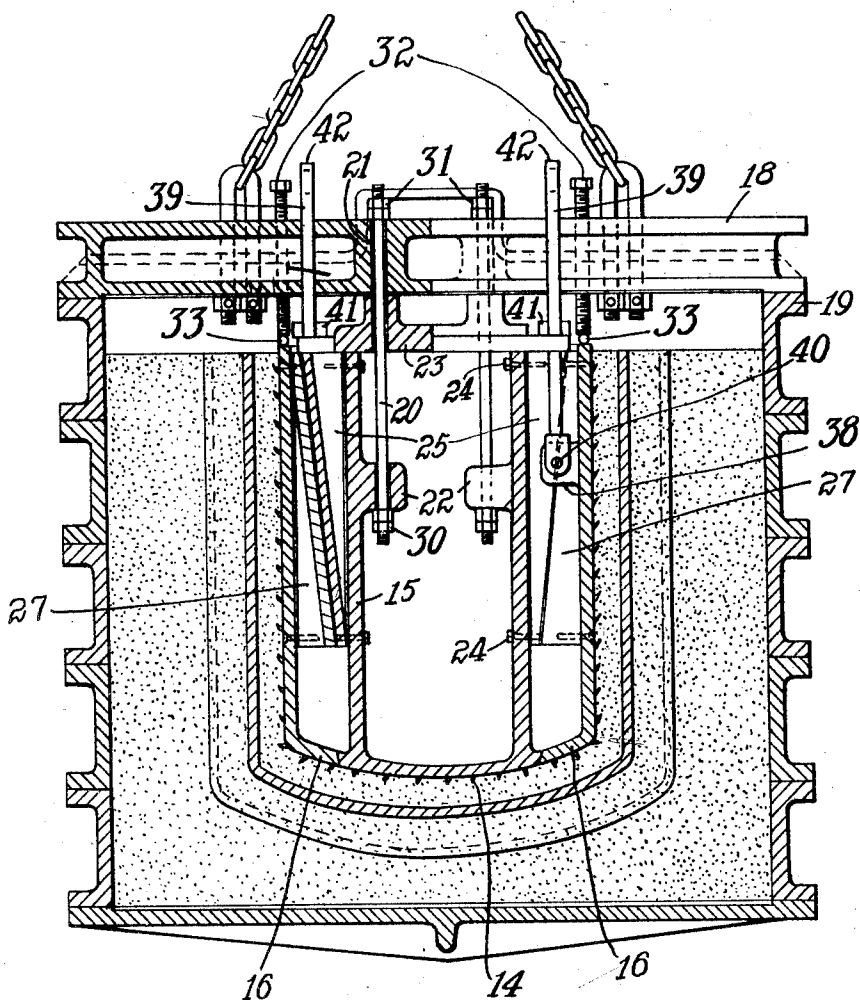
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Fig. 3.



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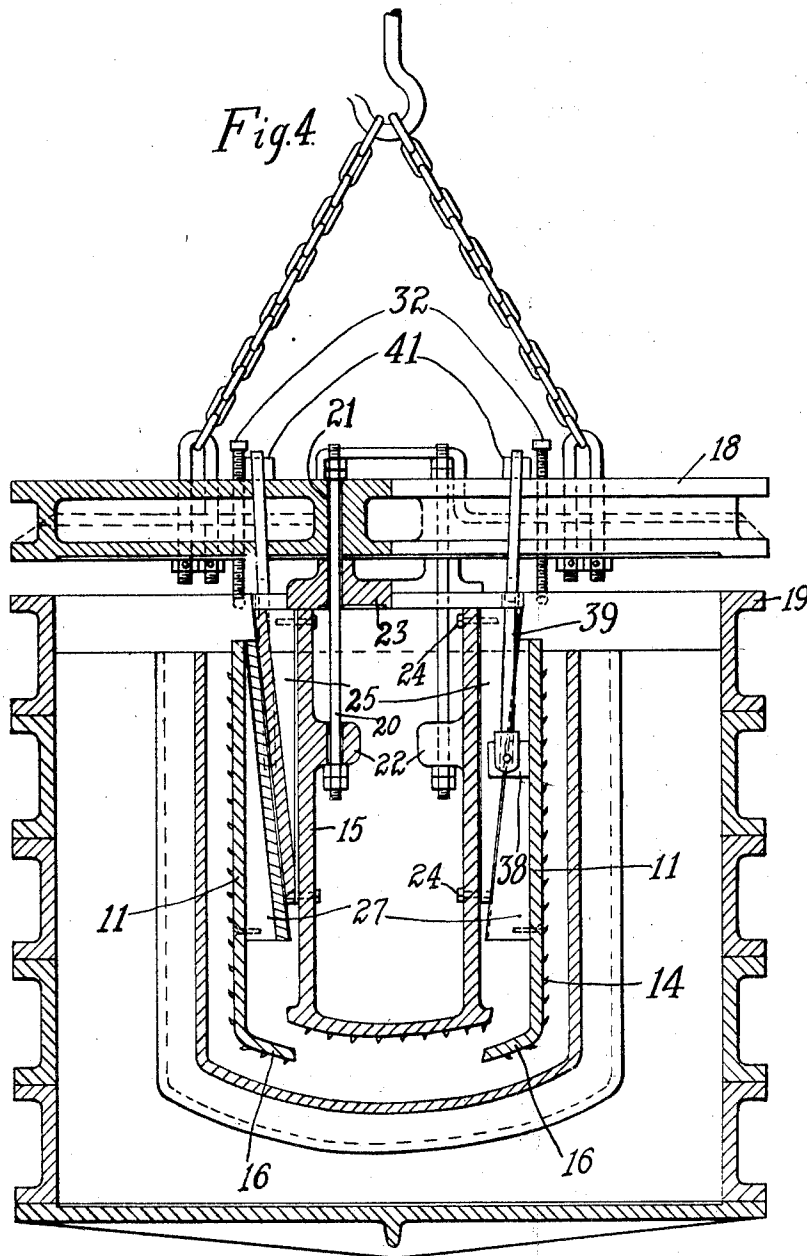
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METHOD OF CASTING ANNEALING BOX COVERS

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4 Sheets-Sheet 4



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METHOD OF CASTING ANNEALING BOX COVERS

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This invention relates to the casting in sand molds of annealing box covers or tops and more particularly to the casting of relatively large tops or covers such as used in box annealing sheets.

Annealing box covers or tops used in sheet annealing of course vary in size but a typical cover is one about 134" long, 52" wide by about 61" high. It is essential that these covers be relatively thin and yet gas tight. Some tops or covers of about the above dimensions are of substantially equal thickness throughout, with such thickness not more than 1".

This relatively thin section makes an extremely difficult casting proposition as heretofore carried out for so far as I know these have always been cast with the top of the cover uppermost in the mold. The mold cavity has been vented at numerous places and bottom pouring has been resorted to. This method, which so far as I know, has been universal, has led to more or less spongy areas in the top of the cover especially if the section is thin.

An object of this invention is to provide an easy method of casting thin, relatively large, annealing box covers or tops; a method by means of which thin walled gas tight covers can be cast with a minimum of loss and from any ferrous alloy no matter how great is its linear coefficient of expansion.

This, as well as other objects, which will readily appear to those skilled in this particular art, I attain by means of the method described in the specification and diagrammatically illustrated in the drawings accompanying and forming part of this application.

The method broadly consists in forming a mold cavity conforming, except for shrinkage, to the box cover or top to be cast; in so positioning such cavity that the top of the cast cover will be in the bottom of the cavity and the sides and ends will extend to the top of the cavity which is left open for venting.

Bottom pouring is resorted to and the riser cavity connects with the mold cavity on opposite sides of one end thereof. The sand core is so supported that it may be collapsed as soon as the cast metal has set, in order to re-

move the possibility of those shrinkage strains which would be set up if the core were not collapsed.

The inner portion of the sand mold core is hollow and is separately and collapsibly supported at its sides and bottom. When the molten metal has been poured into the cavity of the mold, which cavity is formed entirely of such material as sand, and after this metal has, at least, been partially solidified, the bottom support of the core is removed, and subsequently, the side support is removed. Then, the top of the mold is covered with metal sheeting and sand until the casting has completely cooled. In this manner, a very high grade type of metal casting is produced.

As soon as the metal has set, the core is collapsed and removed, and the flask is then covered with sheet metal and sand in order to cause the casting to cool slowly. When the casting has cooled to the desired point, it is removed from the flask, the riser and the arms connecting the riser to the casting are removed and the casting otherwise cleaned and made ready for use.

In order to enable others to understand this invention, I have included drawings in this application which illustrate one apparatus which may be used in carrying out my method.

In the drawings, Figure 1 is a top plan view of a mold cavity such as may be utilized in carrying out my method. In order to illustrate the mold cavity, I have shown in top plan, the flask, the mold formed within the flask, the core frame, with the sand core thereon, suspended in proper position within the mold whereby the mold cavity is formed between the mold and the core.

Fig. 2 is a longitudinal sectional view of the elements shown in Fig. 1, but in this view it is assumed that the mold cavity is filled with molten metal. It is assumed that the view is taken at the instant pouring is finished and before the core is collapsed.

Fig. 3 is a sectional view in elevation taken on line 3—3 of Fig. 1 and it also assumes that the mold cavity is filled with molten metal.

Fig. 4 is a view in some respects similar to Fig. 3 since it is taken on the same line,

but the mold, as well as the sand core is omitted and the core supporting device is shown as it appears during the core collapsing operation.

In carrying out my method, I form a mold cavity 5 in a sand mold 6 and between the mold and a collapsible core 7. In Fig. 1, I show the mold cavity before the metal is poured. I utilize bottom pouring and pour through an opening 8 having a single vertical channel 9 (Figs. 1 and 2) and branch channels 10 which connect with the mold cavity at the bottom thereof, as shown in Fig. 2, and at opposite sides of one end thereof.

Since I cast the covers in inverted position, the pouring channels connect with the mold cover at a point which in the finished cover will be adjacent one end thereof near its top to insure that the top of the cover is cast from the hottest metal. This insures homogeneous gas tight tops, for whatever impurities there are in the metal will rise in the mold cavity to the top thereof and will appear in the covers at the bottom of the sides and ends. When the bottoms of the covers are faced off, these impurities, which could cause porous spots, are removed.

As soon as the pouring is finished and the casting "sets" the core 7 is collapsed in order to allow the metal to shrink without setting up such strains as would occur if the core were not collapsed.

In casting the cover of ferrous alloys containing relatively high percentages of certain alloy elements such for example as chromium and nickel, this is most important, because of the relatively great coefficient of linear expansion of such alloys.

In the drawings, I have illustrated one method of collapsing the core. Obviously, other methods may be employed, but since it is important that the core be collapsed quickly and effectively, I prefer to use a core support such as shown in the drawings.

This core support consists of two side members, two end members and a bottom member and means for holding said members in core supporting position and for moving the same to collapse the core. The outer surfaces of the side members 11, end members 12 and bottom member 13 are provided with gaggers 14 for facilitating adhesion between the outer surfaces of these members and the sand forming core.

Suspended in position within the space defined by the side and end members is a box-like frame 15. The top of this frame is open and the bottom which is closed, forms the bottom of the core support, or rather the central section of the bottom of the core support, since the sides as well as the ends extend inwardly at their bottoms as shown at 16 and 17.

When the frame 15 is in supporting position as shown in Figs. 2 and 3, its bottom lines

up with the inwardly extending bottom portions of the sides and ends.

Frame 15 is more or less rigidly secured to a support frame 18, which, prior to and during casting is supported on the top of the flask 19 within which the mold is formed. The connection between supporting frame 18 and frame 15 is made by means of four rods or bolts 20 which project through the support frame at 21 and through ears 22 which project inwardly from frame 15. Spacers 23, one for each pair of rods or bolts 20, are interposed between the top of frame 15 and the bottom of support frame 18, so that, even though there is a considerable space between the bottom of support frame 18 and the top of frame 15 a more or less rigid connection between these frames is secured.

In the casting operation, the supporting frame or top 18 remains in place during the pouring, and thence, the bottom core is lifted with the frame 18, permitting the hot gases to escape momentarily during the collapsing of the core. But, to prevent valuable heat from escaping and to allow the casting to cool slowly, the top may be covered with suitable sheeting.

Secured to the sides of frame 15 adjacent its opposite ends and by means of screws 24, are wedge-like members 25. These members project outwardly from frame 15 and have a dovetailed connection 26 (Fig. 1) with reversely arranged wedge-like members 27 which are secured to and project inwardly from the inner sides of side members 11.

The ends of frame 15 adjacent their centers are also provided with outwardly extending wedge-like members 28 Figs. 1 and 2, corresponding to wedge-like members 25, and these members 28 dovetail with reversely arranged members 29 which are secured to and project inwardly from end members 12.

When the mold support is in supporting condition, it appears as illustrated in Figs. 2 and 3. The central member 15 is rigidly secured to support frame 18 by means of rods 20 which carry at their lower threaded ends nuts 30 and at their upper threaded ends nuts 31.

Hold-down screws 32 threaded through support frame 18 have their lower ends hollowed out to receive balls 33. The hollowed ends are peened over so that the balls are retained in position, yet have the capability of rotating. These balls bear on the top surface of side members 11 and hold these members in core supporting position.

Screws 33' which are also threaded through support frame 18 and which are identical with screws 32, and are also provided with ball ends, bear on the top surface of end members 12 when the core support is in supporting condition.

Positioned at the center of each end mem-

ber and hinged thereto as shown at 34, Fig. 1, is a supporting dog 34. This dog at its free end is provided with an opening 35 which extends therethrough from top to bottom, and, lying within this opening is a key holder 36. This key holder is formed in the nature of a pin which is threaded into the top member of wedge 28 and is enlarged at its upper end and provided with a laterally extending slot for the reception of a key 37.

When the core support is in supporting condition as in Figs. 2 and 3, keys 37 extend through slots in members 36 and thereby rigidly hold end members 12 in supporting position and prevent the same from moving down below supporting position.

Each of the side members 11 is provided with two inwardly extending ears 38 and each of these ears supports a rod 39. The lower end of each rod 39 is bifurcated and straddles its ear 38 to which it is secured by means of a pin 40.

When the parts are assembled, these rods extend up through holes formed therefor in support frame 18. Each rod immediately above spacer 23 is provided with a laterally extending slot for the reception of a key 41, and, adjacent its top is provided with another laterally extending slot 42.

With the assembly in supporting condition, keys 41 are in the lower slots as shown in Fig. 3, but when pouring is completed, keys 41 are removed from their lower position and are inserted in slots 42, so that when support frame 18 is moved to the position shown in Fig. 4, keys 41 will contact with the top surface of support frame 18, and lift side members 11 with the center member 15.

At the same time, keys 41 are placed in the upper slots of rods 39, keys 37 are removed from their slots. By removing keys 37 dogs 34 are allowed to swing upwardly about their pivot pins as the support frame 18 is lifted, thus allowing end members 12 to move inwardly or downwardly with relation to the upward moving center member 15. In other words, as center member 15 is raised, because of its attachment to support frame 18 as said frame is raised, the end and side members move inwardly or toward center member 15, thus collapsing the core support and the core carried thereby.

The end and side members are so formed that when the assembly is in supporting condition, or position, a space is left at the mitre joints between these members and this space, which is shown by dotted lines at 43 Fig. 1, is closed or covered by means of sheet metal strips 44. These strips are bent so as to close the corner openings and lap over the sides and ends, and, are formed so as to extend underneath the core supporting surfaces of the side and end members at the corners, as shown in Fig. 1 at 43. These are held in place by the sand forming the core, and, when the

core is collapsed, they are easily forced out of place.

In preparing for a cast the mold 6 is formed within the flask in the manner in which dry sand molds are usually formed. The mold surfaces are swept and the mold baked.

The mold support suspended from support frame 18 is covered with sand 7 and brought to the proper contour in the usual manner as by sweeping and is then baked.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The method of casting an annealing box cover which consists in preparing a sand mold, in separately supporting the sides and bottom of the core of the mold, in bottom pouring molten metal into the mold, and when the metal begins to solidify, in removing the support of the bottom of the core of the mold, and subsequently, in removing the support of the sides of the core of the mold.

2. The method of casting an annealing box cover which consists in preparing a sand mold, in separately supporting the sides and bottom of the core of the mold, in pouring molten metal into the cavity of the mold, in collapsing the bottom support of the core of the mold, and subsequently, in collapsing the side support of the core of the mold, and in covering the top of the mold until the metal is completely cooled.

3. The method of casting an annealing box cover which consists in preparing a sand mold, in separately supporting the sides and bottom of the core of the mold, in bottom pouring molten metal into the mold, and when the metal begins to solidify, in removing the support of the bottom of the core of the mold, and subsequently, in removing the support of the sides of the core of the mold, and in covering the top of the mold during the cooling of the metal.

4. The method of casting an annealing box cover which includes preparing a sand mold, supporting the sides and bottom of the core of the mold, pouring molten metal into the mold, and when the metal begins to solidify, in separately removing the support of the bottom of the core of the mold and the support of the sides of the core of the mold.

5. The method of casting an annealing box cover which includes preparing a sand mold, supporting the sides and bottom of the core of the mold, pouring molten metal into the mold, and when the metal begins to solidify, separately removing the support of the bottom of the core of the mold and the support of the sides of the core of the mold, and covering the top of the mold during the cooling of the metal.

6. The method of casting an annealing box cover which includes preparing a sand mold,

separately supporting the sides and bottom of the core of the mold, bottom pouring molten metal into the mold, and when the metal begins to solidify, separately removing the support at the bottom of the core of the mold and the support of the sides of the core of the mold.

7. The method of casting an annealing box cover which includes preparing a sand mold, separately supporting the sides and bottom of the core of the mold, pouring molten metal into the mold, and when the metal begins to solidify, removing the support of the bottom of the core of the mold, and subsequently, removing the support of the sides of the core of the mold.

8. The method of casting an annealing box cover which includes preparing a sand mold, separately supporting the sides and bottom of the core of the mold, pouring molten metal into the cavity of the mold, collapsing the bottom support of the core of the mold, and subsequently, collapsing the side support of the core of the mold.

9. The method of casting an annealing box cover which includes preparing a sand mold, separately supporting the sides and bottom of the core mold, pouring metal into the mold, and when the metal begins to solidify, separately collapsing the support of the bottom of the core of the mold and the support of the sides of the core of the mold.

In testimony whereof, I have hereunto subscribed my name this 5th day of March, 1929.

HARRY E. SHELDON.