Dec. 19, 1944. E. E. FORSBERG 2,365,183

FURNACE

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Fig. 1.

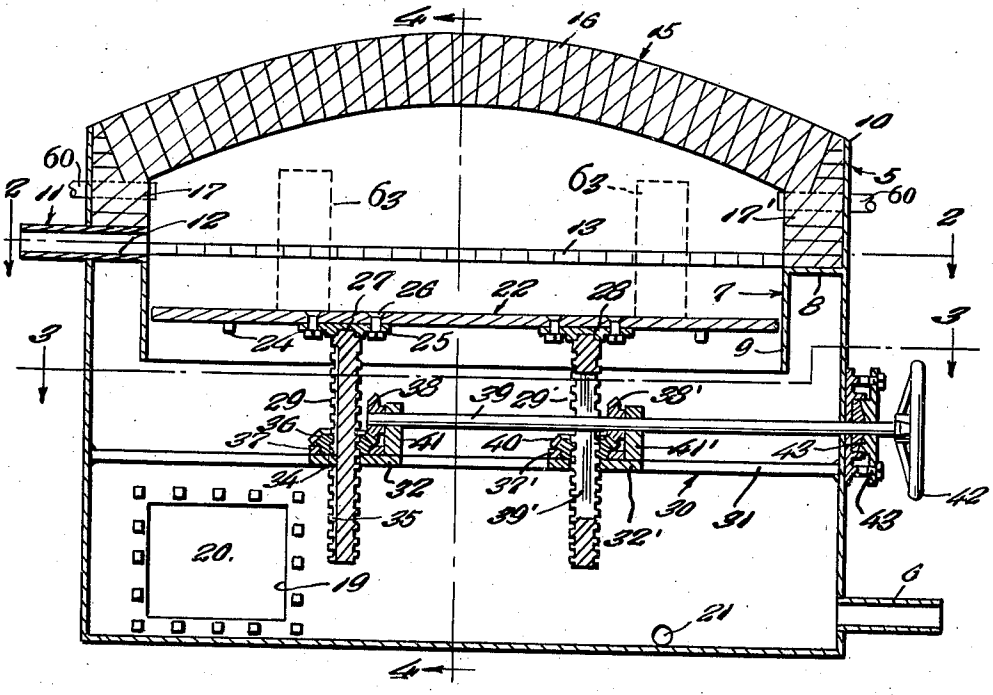
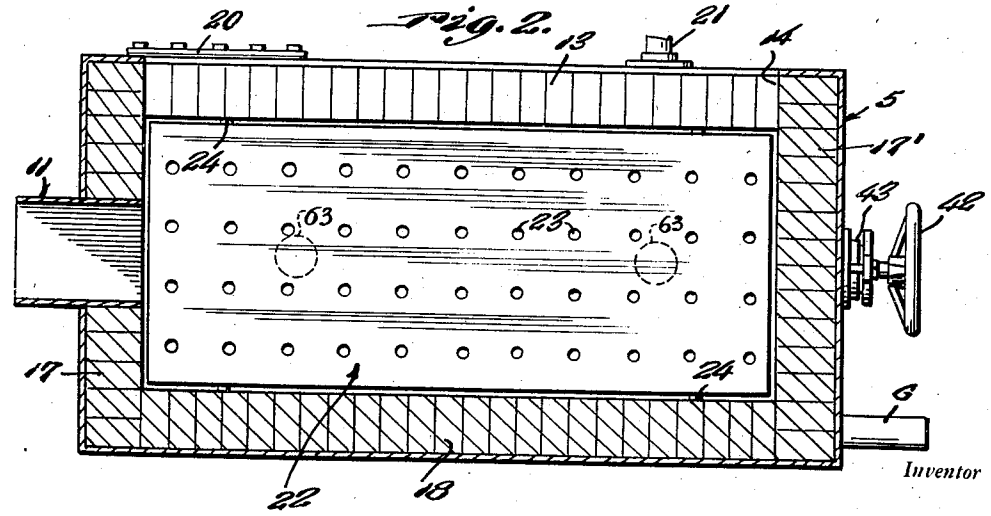


Fig. 2.



Inventor

Edgar E. Forsberg

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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Fig. 3.

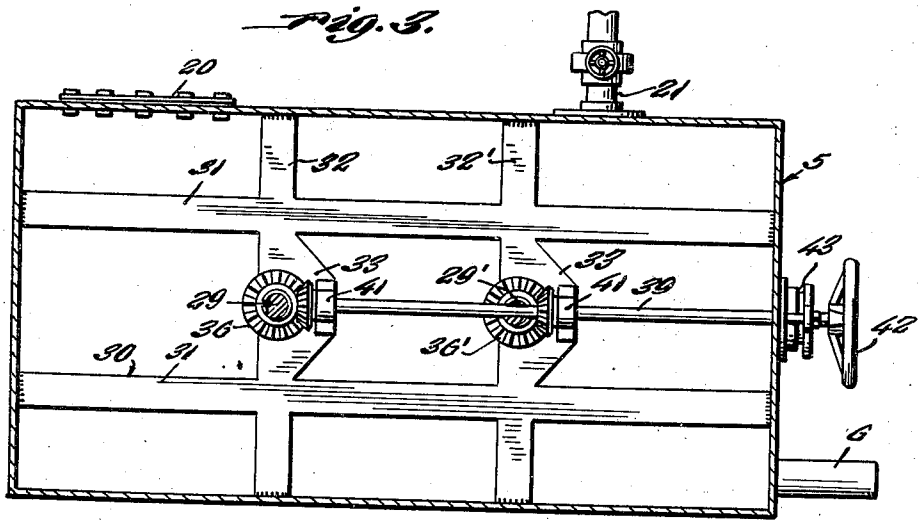
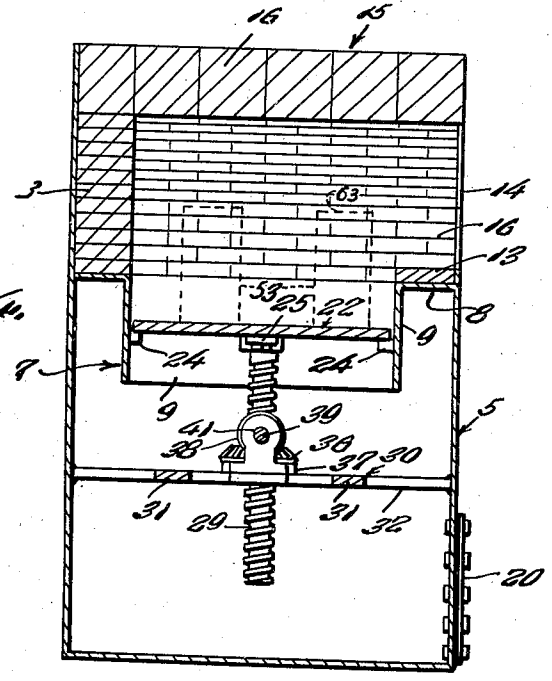


Fig. 4.



Inventor

Edgar E. Forsberg

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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Fig. 5.

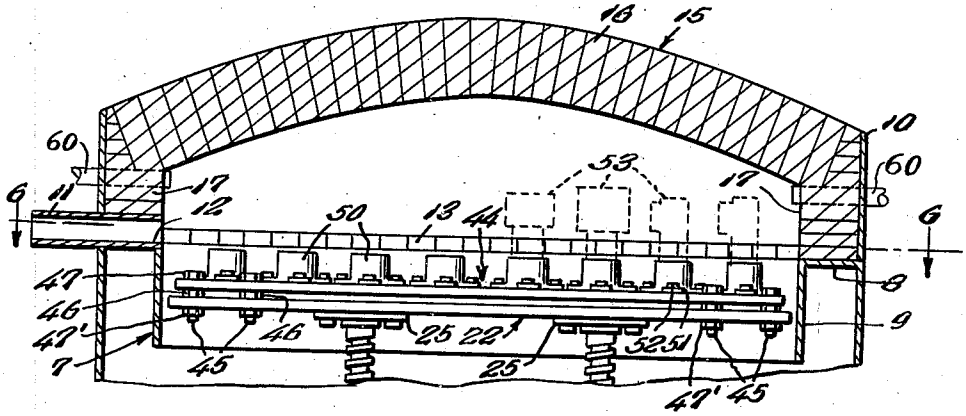


Fig. 6.

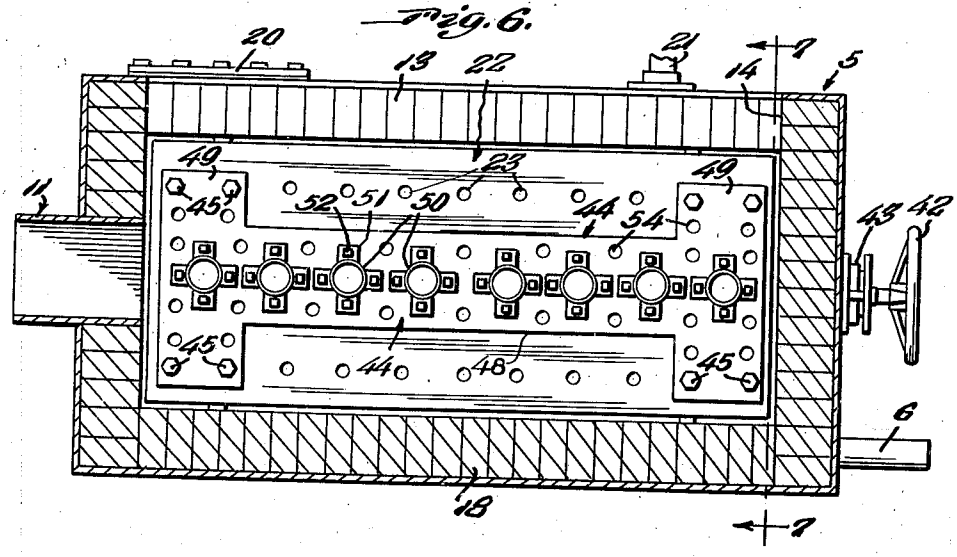
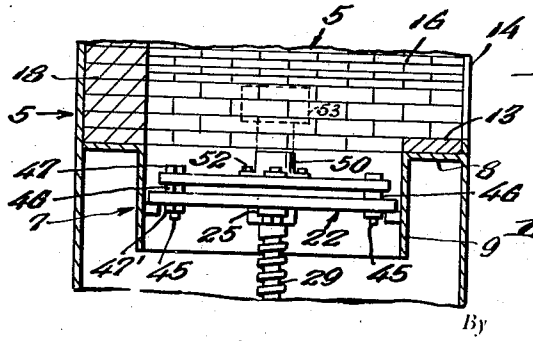


Fig. 7.



Inventor

Edgar E. Forsberg

By Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Patented Dec. 19, 1944 2,365,183

UNITED STATES PATENT OFFICE

2,365,183

FURNACE

Edgar E. Forsberg, Chicago, Ill., assignor of twenty-five per cent to Stanley Braunis, Chicago, Ill.

Application March 3, 1942, Serial No. 433,218

7 Claims. (Cl. 266—4)

The invention relates to means for use in conjunction with or to be incorporated in a furnace for supporting and water-cooling portions of metal objects while heating other portions thereof, whereby a portion of the metal object is kept at a controlled reduced temperature while another portion thereof is being subjected to the full furnace temperature, and an important object of the invention is to provide an efficient and practical arrangement of this character which greatly reduces the amount of work and the expense of certain furnace operations, especially in the heat treating of tubing.

Another important object of the invention is to provide an arrangement of the character indicated which has a floating support which is vertically adjustable to support the portion of the metal object at the desired depth below the level of the cooling water.

Other important objects and advantages of the invention will be apparent from a reading of the following description taken in connection with the appended drawings, wherein for purposes of illustration a preferred embodiment of the invention is shown.

In the drawings—

Figure 1 is a general longitudinal vertical sectional view of a preferred embodiment of the invention.

Figure 2 is a horizontal sectional view taken through Figure 1 along the line 2—2 and looking downwardly in the direction of the arrows.

Figure 3 is a horizontal sectional view taken through Figure 1 approximately on the line 3—3 and looking downwardly in the direction of the arrows.

Figure 4 is a transverse vertical sectional view taken through Figure 1 along the line 4—4 and looking toward the left in the direction of the arrows.

Figure 5 is a fragmentary view similar to Figure 1, showing a modified form of support for the forgings and the like.

Figure 6 is a horizontal sectional view taken through Figure 5 along the line 6—6 and looking downwardly in the direction of the arrows.

Figure 7 is a fragmentary transverse vertical sectional view taken through Figure 6 along the line 7—7 and looking toward the left in the direction of the arrows.

Referring in detail to Figures 1 through 4 of the drawings, the numeral 5 generally designates the rectangular sheet metal casing which has a water inlet conduit 6 entering adjacent the bottom of the casing at one corner and through which water flows into the casing and is kept flowing to maintain the desired temperature of the water for in turn controlling the temperature of the portion of the metal object or objects immersed therein. A water jacket 7 is composed of a laterally projecting horizontal flange 8 and a depending vertical flange 9 on the inner edge of the flange 8, these flanges running around the four sides of the casing at a level substantially below the upper edge 10 of the casing as illustrated in Figure 1 of the drawings. A wide water outlet or overflow conduit generally designated 11 is provided to project laterally from the casing opposite the inlet 6 and above the flange 8, this overflow being laterally elongated as indicated in Figure 2 of the drawings and substantially centrally located. With the water properly flowed into the casing the water level 12 is somewhat above the bottom of the overflow 11 as indicated in Figure 1 of the drawings, that is, slightly above the water jacket flange 8.

The casing 5 has the opening 14 extending along one side above the level of the water jacket and a protective pavement 13 of firebrick or the equivalent is mounted on the flange 8 at the bottom of the opening to the flange 8 and the water jacket from heat injury due to contact therewith of the metal objects, portions of which are being heated and cooled simultaneously within the casing 5.

The opening 14 is defined by one side of the brick work dome which is generally designated 15 and which comprises a longitudinal arch 16 whose opposite ends rest on the firebrick walls 17 and 17' which in turn, rest on the corresponding portions of the casing flanges 8. A longitudinal firebrick wall 18 extends between the walls 17 and 17' and the arch 16. The lower front wall of the casing 5 is provided with a large rectangular inspection opening 19 which is closed by a bolted plate 20. A clean-out opening 21 is also provided in the said front wall adjacent the bottom of the casing to drain off accumulations in the casing.

Supported for vertical movement in the space defined by the depending flange 9 of the water jacket is the adjustable rest or platform 22 which comprises a relatively heavy rectangular metal plate formed at regular intervals with water passing perforations 23, said plate being adapted in its most depressed position to rest upon lugs 24 projecting laterally inwardly from the flange 9, as indicated in Figures 1 and 4.

Attached to the bottom of the platform 22 are bearing plates 25 which are riveted in place as

indicated by the numeral 26, there being in the illustrative example, two of said bearing plates disposed at longitudinally spaced intervals. The bearing plates have sockets 27 formed therein to socket the upper end 28 of the vertically adjustable screws 29 and 29'.

Supporting the screws 29 and 29' are the frame 30 which is horizontally disposed at an intermediate height in the casing 5 and consists of spaced longitudinal members 31 and connecting cross members 32 and 32', having lateral enlargements 33 between the numbers 31 as indicated in Figure 3 of the drawings. The cross member 32 has an opening provided with a key 34 entering a key slot 35 in the side of the screw 29 to keep the screw from rotating in its up and down movement. A bevel gear 36 suitably mounted on the cross member 32 is threaded on the screw 29, and a beveled pinion 38 fixed on a horizontal rotary shaft 39 is in mesh with the bevel gear 36 to turn the bevel gear and the screw 29 with the platform together with the work pieces to raise or lower the screw 29. A similar bevel gear 40 is threaded on a screw 29' and is mounted on the cross member 32' as indicated by the numeral 37', but is unkeyed to the screw 29'. The bevel gear 40 is driven by a bevel pinion 38' like the pinion 38 fixed to the shaft 39, whereby both screws 29 and 29' are adjusted the same amount by the rotation of the shaft 39. The screw 29' is slotted as indicated by the numeral 39' to pass the shaft 39.

The shaft 39 is supported in bearings 41 and 41' rising from the extensions 33 on the cross members 32 and 32', and the shaft 39 extends outwardly of the adjacent end of the casing as indicated in Figure 1 of the drawings where it is provided with a hand wheel 42 enabling the desired adjustment from outside of the casing.

The shaft 39 passes through a packing gland 43 as it emerges from the end of the casing as indicated in Figure 1 of the drawings.

With the water lever 12 established in the casing 5, the forging or tube of which a portion to be cooled while another portion thereof is subjected to the heat of the furnace, is entered into the furnace by passing it through the opening 14 and rested upon the platform 22, which has previously been adjusted to the required elevation, and the flow of the water through the casing is kept up at proper rate to effect the desired cooling. Objects such as relatively large diameter tubes 63, see Figures 1 and 2 having a sufficiently wide base to be self-supporting on the platform are placed directly thereon without additional holding or stabilizing means. In order to either enter or remove the work pieces 53 or 63, the platform 22 should be raised to the level of the protective pavement 13 over which the work pieces are passed in or out of the furnace.

However, where the objects to be treated in the furnace are of irregular shapes as at 53, or have bases too small to provide adequate self-support for the objects on the platform 22, a supplementary plate 44 (shown in Figures 5, 6 and 7 of the drawings) is mounted on the platform 22 by means of bolts 45 passing vertically through corner portions of the plate 44 and through appropriate openings in the platform 22, with nuts 46 between the ends of the bolts to space the plate 44 upwardly from the platform 22. Heads 47 on the upper ends and nuts 47' on the lower ends of the bolts 45 hold the plate 44 assembled to the platform.

The plate 44 may be of any suitable shape, but a preferred shape for use with small forgings and tubes, involves the relatively narrow longitudinal part 48 having the cross heads 49 on its opposite ends. Distributed along the part 48 and along the cross heads are tubular holders 50 having lateral lugs 51 bolted to the plate 44 as indicated by the numerals 52. The forgings and small tubes or irregular shapes exemplified by the dotted outlines 53 are stood up in the holders 50 as indicated. The plate 44 has water holes 54 to ensure proper circulation of cooling water through the supplementary plate 44 and between the plate 44 and the platform 22. It is obvious that the furnace heat is applied as for instance by gas jets from pipes 60, Figure 1, to the objects above the water line 12. For heating the furnace may be used either gas heat, electricity or oil as being cheapest or best available in the locality where the furnace is located.

Although there is shown and described herein the preferred embodiment of the invention, it is to be definitely understood that it is not desired to limit the application of the invention thereto, except as may be required by the scope of the subjoined claims.

Having described the invention, what is claimed as new is:

1. A furnace comprising means for water-cooling a portion of an object while another portion thereof is being heated in the furnace, said means comprising a water containing casing, a protective water jacket extending around the inside of the upper part of said casing, water inlet and outlet means for said casing to maintain water circulation in said water jacket to approximately the height of the upper part of the water jacket, a heat resistant hood enclosing the upper part of said casing above said water jacket, the front of the hood and the casing being open to permit placing the object into furnace in the space within said water jacket, an object supporting platform within said water jacket, and adjustable support means to position said platform at a desired element below the water level to support the object with the lower portion in the water and its upper portion above the water in the casing.

2. A furnace according to claim 1 wherein said adjustable support means comprises a horizontal frame fixed across said casing below said platform, vertical screws mounted for up and down movement on said frame, said screws having their upper ends connected with said platform, an operating shaft projecting through the wall of said casing for turning from a point exterior of said casing, and gear means operatively connecting said shaft with said screws for simultaneously raising or lowering said screws to change the elevation of said platform.

3. A furnace according to claim 1 wherein said adjustable support means comprises a horizontal frame fixed across said casing below said platform, vertical screws mounted for up and down movement on said frame, said screws having their upper ends connected with said platform, an operating shaft projecting through the wall of said casing for turning from a point exterior of said casing, gear means operatively connecting said shaft with said screws for simultaneously raising or lowering said screws to change the elevation of said platform, said frame being located below the water jacket, and lugs on sides of said water jacket to prevent the platform from subsiding below the water jacket.

4. A furnace comprising means for water-cooling a portion of an object while another portion

thereof is being heated in the furnace, said means comprising a water containing casing, a protective water jacket extending around the inside of the upper part of said casing, water inlet and outlet means for said casing to maintain water circulation in said water jacket to approximately the height of the upper part of the water jacket, a heat resistant hood enclosing the upper part of said casing above said water jacket, the front of the hood and the casing being open to permit placing the object into furnace in the space within said water jacket, an object supporting platform within said water jacket, and adjustable support means to position said platform at a desired elevation below the water level to support the object with the lower portion in the water and its upper portion above the water in the casing, a supplementary object supporting plate, means mounting said supplementary plate upon said platform in upwardly spaced relation thereto to permit the water to circulate between the platform and the supplementary plate, and object holders secured to and distributed along the upper surface of said supplementary plate.

5. A furnace comprising means for water-cooling a portion of an object while another portion thereof is being heated in the furnace, said means comprising a water containing casing, a protective water jacket extending around the inside of the upper part of said casing, water inlet and outlet means for said casing to maintain water circulation in said water jacket to approximately the height of the upper part of the water jacket, a heat resistant hood enclosing the upper part of said casing above said water jacket, the front of the hood and the casing being open to permit placing the object into furnace in the space within said water jacket, an object supporting platform within said water jacket, and adjustable support means to position said platform at a desired elevation below the water level to support the object with the lower portion in the water and its upper portion above the water in the casing, a supplementary object supporting plate, means mounting said supplementary plate upon said platform in upwardly spaced relation thereto to permit the water to circulate between the platform and the supplementary plate, and object holders secured to and distributed along the upper surface of said supplementary plate, both said platform and said supplementary plate being formed with water passing perforations.

6. A furnace comprising means for water-cooling a portion of an object while another portion thereof is being heated in the furnace, said means comprising a water containing casing, a protective water jacket extending around the inside of the upper part of said casing, water inlet and outlet means for said casing to maintain water circulation in said water jacket to approximately the height of the upper part of the water jacket, a heat resistant hood enclosing the upper part of said casing above said water jacket, the front of the hood and the casing being open to permit placing the object into furnace in the space within said water jacket, an object supporting platform within said water jacket, and adjustable support means to position said platform at a desired elevation below the water level to support the object with the lower portion in the water and its upper portion above the water in the casing, a supplementary object supporting plate, means mounting said supplementary plate upon said platform in upwardly spaced relation thereto to permit the water to circulate between the platform and the supplementary plate, and object holders secured to and distributed along the upper surface of said supplementary plate, said object holders comprising members providing spaced vertical walls between which the objects are supported in vertical position on said supplementary plate.

7. A furnace comprising means for water-cooling a portion of an object while another portion thereof is being heated in the furnace, said means comprising a water containing casing, a protective water jacket extending around the inside of the upper part of said casing, water inlet and outlet means for said casing to maintain water circulation in said water jacket to approximately the height of the upper part of the water jacket, a heat resistant hood enclosing the upper part of said casing above said water jacket, the front of the hood and the casing being open to permit placing the object into furnace in the space within said water jacket, an object supporting platform within said water jacket, and adjustable support means to position said platform at a desired elevation below the water level to support the object with the lower portion in the water and its upper portion above the water in the casing, a supplementary object supporting plate, means mounting said supplementary plate upon said platform in upwardly spaced relation thereto to permit the water to circulate between the platform and the supplementary plate, and object holders secured to and distributed along the upper surface of said supplementary plate, said object holders comprising vertical cup-like members having lateral lugs secured on the top of the supplementary plate.

EDGAR E. FORSBERG.