

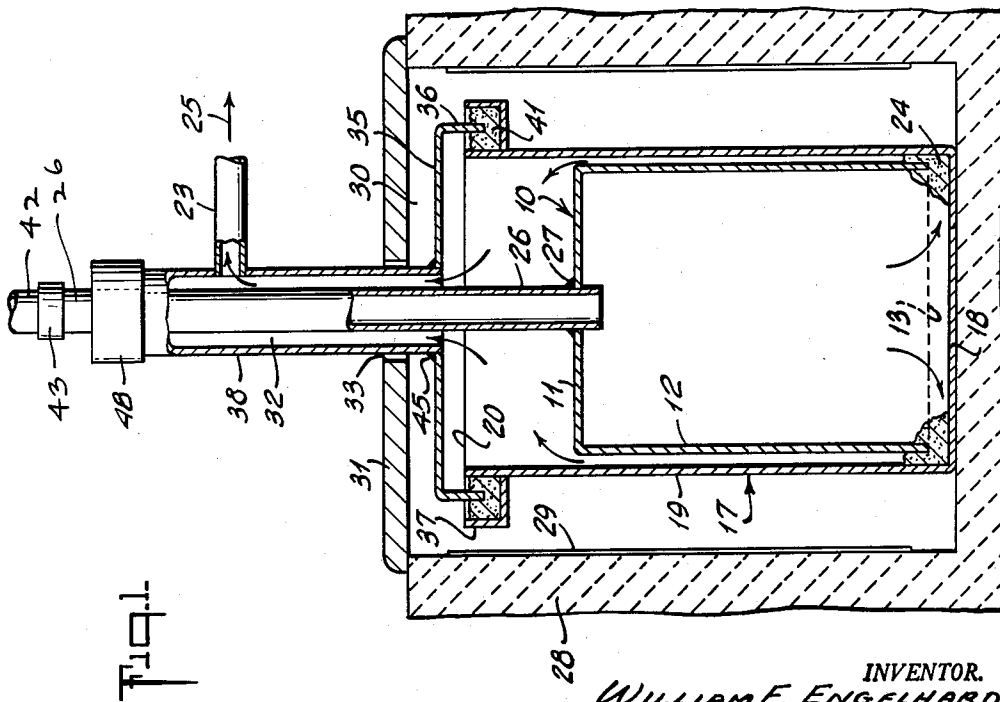
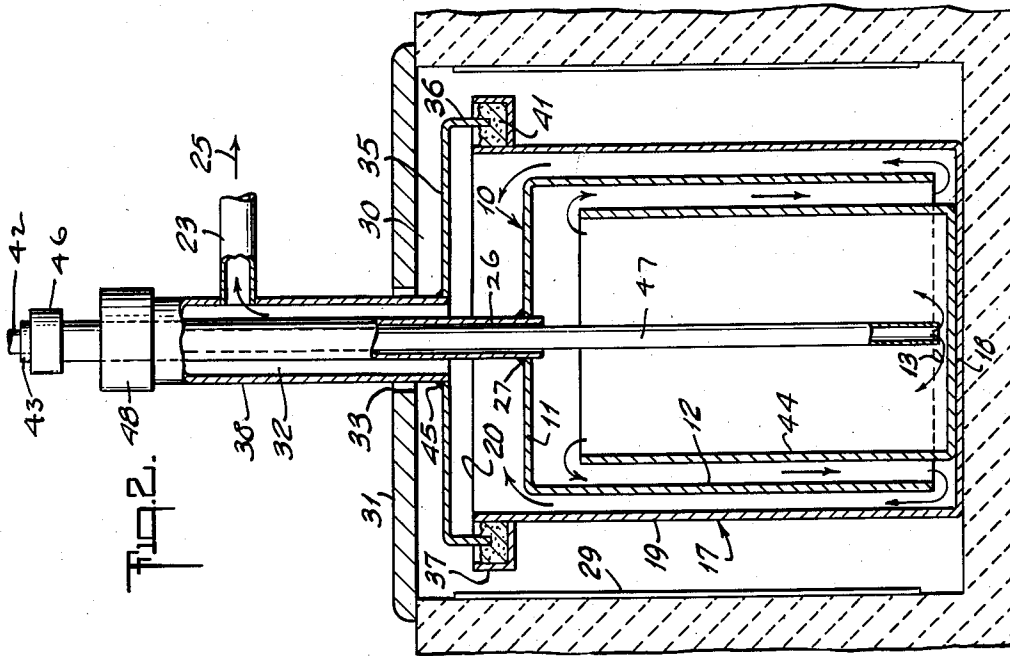
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SEALED ANNEALING APPARATUS

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SEALED ANNEALING APPARATUS

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This invention relates to retorts for work to be annealed in high temperature furnaces, for example in the bright hardening and annealing of stainless steels, magnetic alloys and other objects, for copper brazing, and for other work. It is applicable to any system wherein it is desirable to blanket the work in hydrogen or other gas which must be dry during the annealing or other operations.

It has been the practice heretofore to position the work in a housing having an open upper end, and then to weld a plate completely onto the upper end of the housing. Said plate would have a gas inlet pipe secured thereto for discharge into the housing; a plurality of discharge apertures were provided at the lower end of the housing. In such prior constructions, it was necessary to continuously pump substantial quantities of the gas with which the work was to be surrounded, to prevent a return flow of moisture laden air which would contaminate the work. This procedure involved not only the initial complete welding operation above referred, and subsequent breaking of the weld (both costly and time consuming operations) but also required the continuous pumping and wastage of very substantial amounts of gas.

It has also been the practice, heretofore, to provide complicated apparatus for the purpose, requiring large space for installation and operation, and requiring very special handling of the work and in the exercise of the critical controls for operating conditions. In such prior constructions, it was necessary to continuously pump substantial quantities of the gas with which the work was to be surrounded, to compensate for diffusion and contamination of the gas by moisture laden air which would spoil the work, and the inner work containing housing had to be made of expensive alloys.

Previous procedures required continuous pumping and wastage of very substantial amounts of gas during operation of the furnace, in an effort to prevent contamination. In an effort to prevent contamination of the interior work containing chamber, it has been the practice to provide elongated, partitioned horizontal sectional chambers in which the work was positioned; these chambers were sectionally isolated and cleaned; through them substantial quantities of gas had to be pumped. This required the use and wastage of considerable quantities of gas, involved elaborate and complex mechanisms, and was a costly, expensive and time-consuming operation.

The present invention obviates the objections to the practices in this art above noted and others inherent in prior methods. Improved results are attained by the method and apparatus of this invention, pursuant to which the work may be placed in the furnace and removed therefrom and the connection to the gas source made and discontinued, in a novel, ingenious, efficient and advan-

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tageous manner. Pursuant to this invention, the gas is maintained pure and dry and the dew-point kept low, factors contributing importantly to the novel and successful method of this invention. The method and apparatus of this invention enable the annealing operation to be performed in a relatively pure atmosphere of dry gas pumped through a path completely bathing the objects to be annealed, thence through a path defined by a pair of spaced walls, and discharged. Pursuant to the method and apparatus of this invention a considerable saving is effected in the apparatus and method of operation, only minor quantities of gas are required for operation, the work is kept bathed in a relatively dry gas, the inner or work containing casing may be made of inexpensive iron or other material, and the insertion of the work into the furnace and its removal therefrom may be attained in a novel and convenient manner.

These and other advantageous objects, which will appear from the drawings and from the description hereinafter, are accomplished by the structure of my invention of which an embodiment is illustrated in the drawings. It will be apparent, from a consideration of said drawings, and the following description, that the invention may be embodied in other forms suggested thereby, and such other forms as come within the scope of the appended claims are to be considered within the scope and purview of the instant invention.

In the drawings, Fig. 1 is a vertical sectional view, partly fragmentary of a method and apparatus embodying the invention, and Fig. 2 is a similar view of another form thereof.

As shown in Fig. 1 of the drawings, a retort constructed pursuant to this invention comprises an inner casing 10 having a top wall 11 and side walls 12 depending therefrom and forming therewith an open lower end 13 for the inner casing. An outer casing 17 is provided, comprising a lower wall 18 and side walls 19 defining therewith an open upper end 20 through which the inner casing may be inserted. The parts are so proportioned that the inner casing may be readily positioned interiorly of the outer casing to be completely encompassed therein, with the walls 12 and 19 of the said casing preferably spaced apart for passage of the gas pumped through the apparatus, with enough room to allow for reasonable warpage and distortion of the parts at high temperatures. Illustrative Figs. 1 and 2 necessarily are not to scale. The open lower end 13 of the inner casing is disposed in spaced relation to the lower wall 18 of the outer casing. Thus there is provided a continuous path for the flow of gas from the inner casing, out of the open lower end 13 thereof and intermediate the inner and outer walls of said casings in the direction indicated by the arrows in Fig. 1. An atmospheric contamination seal to preclude entry of moisture-laden air is shown as a continuous barrier ring 24 positioned intermediate the open end 13 of the inner casing 10 and the lower wall 18 of the outer casing. By the arrangement described, the hydrogen or other gas with which the work is to be blanketed during the annealing operation may be pumped through the gas pipe 26 which is preferably fixed to the top wall 11 of the inner casing (as at 27) blanketing said work and thence through the barrier ring 24 and intermediate the walls 12 and 19 of the inner and outer casings, and to the atmosphere. The ring 24 may be made of silicon carbide wool or other material which provides restricted openings for the gas to filter through but which will not

permit the reverse diffusion of contamination-laden atmospheric air.

The gas is pumped through the pipe 26 under pressure so as to continually bathe the work in the inner casing 10 therein. The velocity of the gas passing through the openings of barrier ring 24 in the direction indicated by the arrows will be so great as to effectively prevent the back-flow of air through said ring and into the interior of the inner casing. Back flow of air would carry moisture and would contaminate both the gas in the inner casing 10 and the work being annealed. Thus the dew-point is kept to an absolute minimum, pursuant to this invention. Also, by virtue of this protection afforded the inner casing 10, the latter may be made of relatively inexpensive material, such as ordinary iron, whereas heretofore it has been necessary to make the casing which is to hold the work (the inner casing) of expensive alloys to resist contamination by the atmosphere.

The disposition of ring 24 intermediate the casings and in the path of flow of the gas, plus the spacing of the walls 12, 19 of the inner and outer casings serve to accelerate the movement of gas in the direction of the arrows, affording a further safeguard against contamination of the inner casing by atmospheric air.

The invention may be used in connection with any high temperature annealing furnace, such as that shown at 28 in Fig. 1 having heating means such as elements 29 and the opening 30 to receive the parts above mentioned. Said opening may be closed by cover 31 or the like.

A plate 35 is provided, having angularly directed marginal edges 36 adapted to be telescopically received within oppositely directed flange member 37 secured to or unitary with the upper end of side wall 19 of outer casing 17. A sleeve 38 is fixed to the plate 35 as at 45 and surrounds an opening therein, said sleeve being so proportioned as to encircle the pipe 26 and define therewith a passage 32 for the flow of the gas as indicated by the arrows in Fig. 1. Discharge pipe 23 is connected to the sleeve 38 at one end and at the other end opens into the atmosphere 25. A moisture and atmospheric air barrier ring 41 such as silicon carbide sand, may be provided within the flange member 37 so that when the marginal edge 36 of the plate 35 is seated therein, the plate 35 will effectively close the top of outer casing 17. In the arrangement described, the work may be positioned in inner casing 11 or on the lower end 18 of outer casing 17, and then the inner casing 11 is inserted into the outer casing to the position shown in Fig. 1. Plate 35 (and sleeve 38) may then be positioned on the inner casing.

Finally the cover 31 may be secured in place. The cover 31 may be formed in sections having an opening 33 for sleeve 38, for convenience of application. The plate 35, sleeve 38, and discharge pipe 23 essentially constitute a housing disposed on the upper end of the outer casing 17, defining a path for the discharge of gases pumped through barrier 24, as indicated by the arrows. The pipe 26 described may be connected to a gas source 42 by means of a suitable coupling 43 or the like and the upper end of sleeve 38 may be sealed to pipe 26 by a separable or integral stuffing box 48, in which the pipe 26 may be vertically slidable. Thus it will be seen that the invention provides a very convenient means for initially positioning the work in and removing it from the heating furnace, there is very little loss of the hydrogen or other gas, which is being pumped into the inner casing within the furnace, and the system operates efficiently at a fraction of the quantity of gas previously required for the purposes.

The form of invention shown in Fig. 2 essentially corresponds with that of Fig. 1 (like parts being correspondingly numbered for facility of reference) except that the inner casing 10 in Fig. 2 is shown telescopically disposed on a work receiving and holding open housing 44, shown disposed on the bottom wall 18 of the outer casing 17. The gas pipe 26 in the Fig. 2 construction is extended

downwardly preferably through the top wall 11 of inner casing 10 and may be extended to a point adjacent the lower wall 18 of work receiving housing 44 as by providing a pipe 47 telescopically arranged therein, the upper end of pipe 47 being connected to the gas source 42 through a suitable coupling 43 and being slidably sealed to pipe 26 through stuffing box 46. The path of the gas is marked by arrows in Fig. 2; after reversing its course, from the lower end of pipe 47, the gas bathes the work and flowing out of the top of housing 44, passes downwardly intermediate the wall 12 of casing 10 and housing 44, thence upwardly between walls 12 and 19 etc. (as in Fig. 1). The sleeve 38 is sealed to gas pipe 26 by stuffing box 48. In the Fig. 2 form the parts 38 and 35 might be connected together at 45 as one unit, essentially, and pipe 26 and casing 10 another unit, at 27 if desired. Other variations of the specific form of method and apparatus will become apparent from a consideration of the disclosure herein; all such other forms, coming within scope of the appended claims, shall be deemed to be covered thereby.

In performing the method of the invention shown in Fig. 1, starting with simply the furnace 28 open at 30 and the outer casing 17 positioned therein, the work is placed on the lower end 18 of the outer casing 17, or positioned interiorly of the inner casing 10, then said inner casing (with gas pipe 26 affixed thereto as at 27) is positioned in the outer casing, with the lower end 13 of the inner casing disposed on the barrier ring 24. Sleeve 38 and affixed plate 35 are positioned over pipe 26 and flange 36 of the plate 35 is positioned in the sand seal 41. Then the cover 31 is positioned atop the furnace opening 30, closing around the opening 33 for sleeve 38. Connection of pipe 26 with a gas source 42 may be made by a suitable coupling 43 so that the source 42 may be swingably disposed relative thereto; in this fashion rapid connection and disconnection of the parts may be attained.

In the Fig. 2 form a similar procedure is followed, except that the pipe 47 is provided to carry the gas down to a point adjacent the bottom of the work receiving housing 44.

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

1. A device for annealing work in a gas atmosphere, in the opening of a high temperature furnace, said opening having a bottom and side walls, said device comprising an outer casing adapted to be positioned on the bottom wall of the casing opening and having side walls extending upwardly from the bottom wall of the casing opening in spaced relation to the side walls of said opening, said side walls of the casing defining, at their upper ends an opening, an inner casing adapted to be positioned within the outer casing through said opening, said inner casing having a top wall and side walls depending therefrom, a gas inlet pipe fixed to the top wall of the inner casing and projecting into the interior of the inner casing, a cover plate for the outer casing, complementary means on the upper ends of the side wall of the outer casing and on the perimeter of said cover plate for sealing said upper end and perimeter said cover plate having a medial opening, a sleeve fixed to the cover plate in registry with the opening therein and a gas discharge pipe secured to the sleeve at a point substantially above the point of connection of the sleeve with the cover plate, said pipe discharging into the atmosphere, and means for connection of the gas inlet pipe to a source of supply of gas, whereby gas may be pumped through said pipe and thus through the inner casing, between the inner and outer casing walls and thence between the sleeve and gas inlet pipe and out of the gas discharge pipe to the atmosphere.

2. In a device for annealing work as set forth in claim 1, a barrier ring intermediate the lower end of the inner casing and the side wall of the outer casing, through which the gas must pass.

3. In a device for annealing work as set forth in claim 1, a work receiving housing disposed interiorly of the inner casing comprising a bottom wall adapted to be disposed on the bottom wall of the outer casing and side walls proportioned to extend parallel to the inner casing and short of the top wall of the inner casing, so that said gas will be pumped through the work receiving housing and thence between the walls of said housing and the inner casing walls, and thence as set forth in claim 1; between inner and outer walls, sleeve and gas inlet pipe and out of the gas discharge pipe.

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