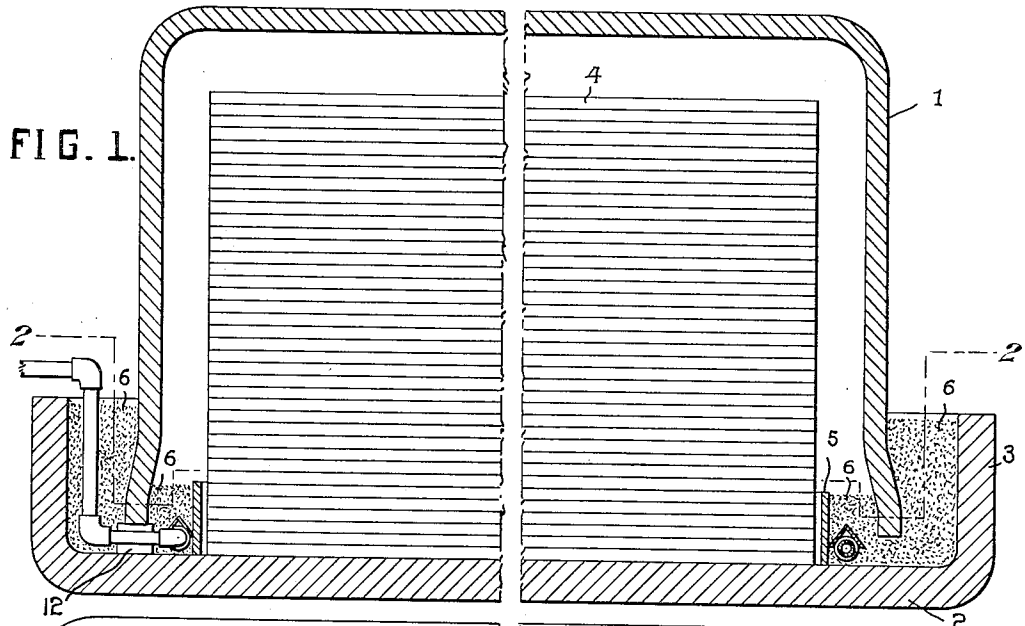
Jan. 26, 1932. L. L. LEWIS 1,843,097

ANNEALING ART AND APPARATUS

Filed Aug. 26, 1930 2 Sheets-Sheet 1

FIG. 1.



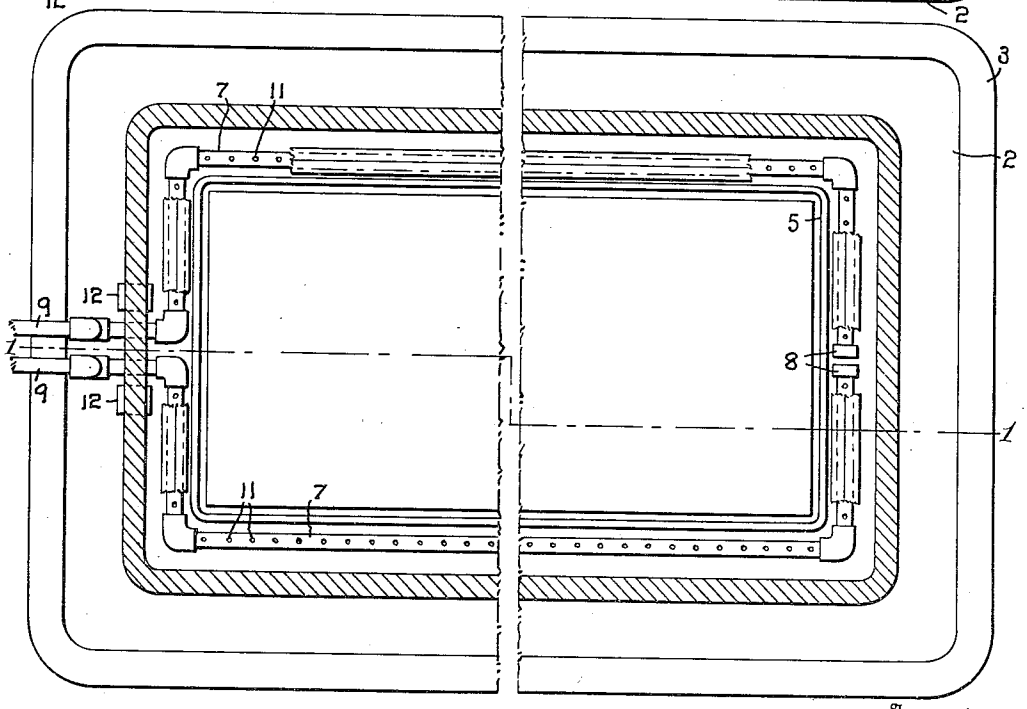


FIG. 2.

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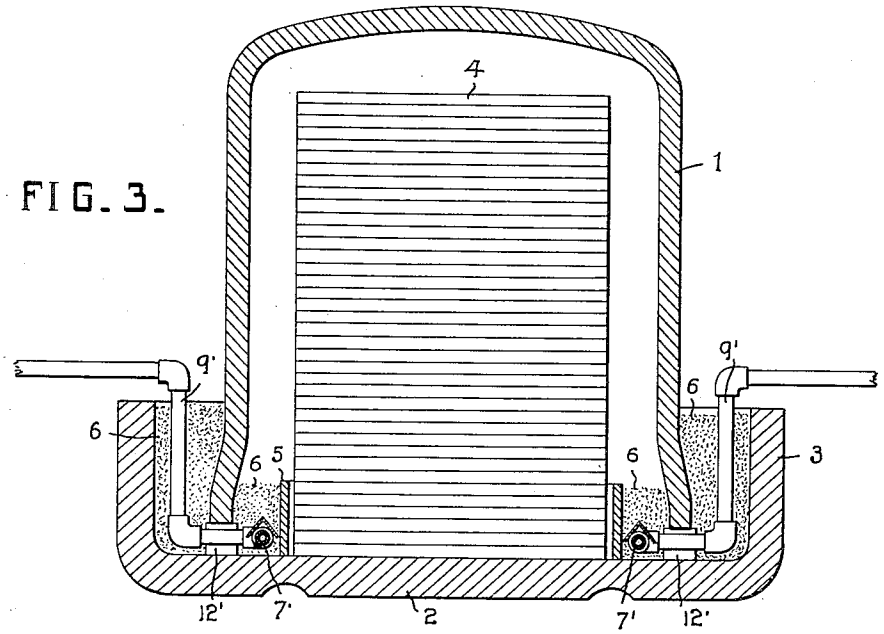
Filed Aug. 26, 1930 2 Sheets-Sheet 2

FIG. 3.



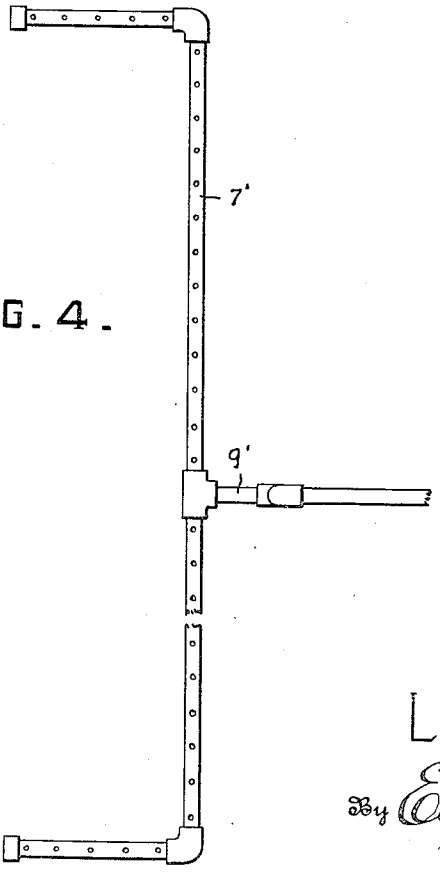
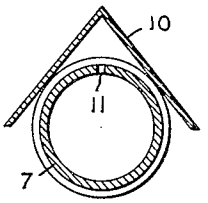


FIG. 4.

FIG. 5.



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Patented Jan. 26, 1932

1,843,097

UNITED STATES PATENT OFFICE

LESTER L. LEWIS, OF NEW CASTLE, PENNSYLVANIA

ANNEALING ART AND APPARATUS

Application filed August 26, 1930. Serial No. 477,953.

This invention relates to improvements in the art of annealing and apparatus for practicing such art, and relates more particularly to the treating of metal for largely eliminating discoloration and increasing ductility after the manner set forth in my co-pending applications filed, respectively, December 2nd, 1929, Serial No. 411,179; February 4th, 1930, (since patented October 7, 1931, Patent No. 1,777,978) Serial No. 425,812, and February 17th, 1930, Serial No. 429,165.

In all said co-pending applications a seal preserving gas is released in a manner to maintain exclusion of air from the interior of an annealing pot during cooling of the pot and its contents. In each instance of said co-pending applications, the gas is released exteriorly of the pot, as illustrated in the preferred embodiment of each of said patent applications, but it has always been within the intent, meaning, and purpose of my inventions to release such gas at any place where the the seal would be sufficiently effectively guarded to preserve the contained work against discoloration during cooling.

While the present inventon is an improvement in the art of annealing and in apparatus for that purpose, it must be understood that the supplying of sealing gas to the exterior of the seal is still preferred by me as giving the most desirable and most nearly completely perfect results; but in the instant invention I have succeeded in developing apparatus and a detailed method of operation which demonstrates the availability of gas distribution interiorly of the pot in a manner to protect the seal against infiltration of stain or discoloration-producing agents liable to take effect on the contained work while cooling.

In the accompanying drawings,—

Figure 1 is a longitudinal section through an annealing pot and cooperating parts incorporating an embodiment of the present invention and well adapted for carrying out the improved annealing process, intermediate portions of the pot being broken away for the saving of space.

Figure 2 is a horizontal section taken on the planes indicated by line 2—2 of Figure 1, and looking downward, parts being seen in plan, and the comminuted seal being omitted for clearness of disclosure of other parts, and also parts of the baffle plate being broken away to disclose the gas supply tube beneath.

Figure 3 is a transverse section through a slightly modified embodiment.

Figure 4 is a plan view of one of the gas jet tubes detached.

Figure 5 is an enlarged, detailed, transverse section through one of the gas jet tubes and its baffle plate.

It should be understood that in the practicing of the present invention, all of the features of construction and detailed steps of the art of annealing as set forth and disclosed on my said co-pending applications will be utilized so far as practicable, and will, therefore, not be extensively reviewed to avoid duplication here, the primary and essential distinction between the present improvement and those of my said co-pending applications residing in the fact that the gas is released within the annealing pot in the present invention as distinguished from being released exteriorly thereof in the specific embodiments illustrated in my said co-pending applications.

Referring to the drawings by numerals, 1 indicates any well known or conventional form of annealing pot mounted on the customary annealing tray 2 having the marginal, upstanding flanges 3 spaced from the vertical walls of pot 1. Mounted on the tray 2 within the pot 1 is the column or supply of work 4 to be annealed, which may consist of any appropriate plates, bars, strips, or other material to be annealed. Surrounding the work 4 and upstanding from the bottom of the tray 2 is a boxing or vertical wall 5. This boxing is preferably unattached and rests by weight on the upper surface of tray 2, but may be secured thereto, if desired. The boxing 5 is spaced inward from the vertical walls of the pot 1, and the space thus provided is filled with comminuted material 6, which material extends beneath the edges of pot 1 and fills the space between the outer surfaces of the vertical walls of pot 1 and the inner sur-

face of the upstanding flange 3 of tray 2. This comminuted material 6 comprises the seal for the pot, and may consist of sand or iron filings, or other finely divided appropriate material. Lying within the space between boxing 5 and pot 1 are gas jet tubes or pipes 7, 7, each preferably comprising a yoke or U-shaped member, two being employed to provide a substantially complete enclosure for the boxing 5. The abutting ends of the yokes or sections of tubing 7 are preferably closed by caps 8 at one end of pot 1, while the other ends of said pipes 7 connect with supply pipes 9, 9, which extend beneath the edge of the pot 1 and upward through the sealing material 6 and beyond flange 3 to any appropriate points for detachable connection with a supply of gas under pressure. Immediately above the pipes 7 are arranged baffles 10, which may be of various forms, but preferably are of inverted trough shape so as to present an apex upward and thus shield the pipes 7 against compacting of comminuted material on the pipes. Each pipe 7 is provided with jets or openings 11, 11 for the delivery of gas, and the said jets are directed upwardly within the baffles 10 so that as gas is emitted it will pass upward into the space beneath the apex of the baffle, and then spread laterally about the sides of the pipe and out beneath the edges of the baffle where it will diffuse through the comminuted seal and thus guard the seal against entrance of air or other discoloration-producing agents from the exterior. The pot 1, as clearly seen in Figure 1, preferably rests practically throughout its whole lower margin on the sealing material 6, but it is desirable at the places of the entrance of pipes 9 to provide supporting blocks 12, 12, to prevent the weight of pot 1 from injuring pipes 9. It should be understood, of course, that the sealing material 6 will be compacted all about the blocks 12 and fill the space between the pipes 9 to the upper edge of flange 3, although the showing of such material is omitted in Figure 1 for the sake of clearness of disclosure of the blocks 12.

In carrying out the present improved process in the use of the apparatus just described, the work 4 is placed on the tray 2, the boxing 5 is positioned, unless previously located, and comminuted material is supplied to the space between boxing 5 and flange 3. Only a small amount is supplied, and then the pipes 7 are located with the baffle 10 in position above the same. Then comminuted material is supplied until the space between boxing 5 and flange 3 is practically filled, and the comminuted material is tamped down to approximately this level. Then the pot 1 is lowered, usually by the employment of a crane, down to the position seen in Figure 1, it being observed that the comminuted material is materially compressed by the weight of the pot so that the edges descend somewhat into the previously supplied material. When the pot has been located thus on the tray, further comminuted material is supplied and tamped down to completely fill or substantially completely fill the space between the outer surface of pot 1 and flange 3. The pot is then moved into the furnace where it is subjected to the usual annealing heat for the required time and at the required temperature for properly annealing the work 4.

When this has been completed, the pot 1 with tray 2 and connected parts, including pipes 7 and 9, are moved out of the furnace to a place of cooling, and as it reaches such place, the pipes 9 are connected to a source of supply of gas under pressure, and the gas is delivered through the jets 7 and finds its way up into the pot and also out beneath the edges of the pot to the exterior of the seal. A neutral gas should be used, that is, a gas which will not cause discoloration of the work, and I have found natural gas as well as artificial or producer gas, (when properly treated as by being dried) and various other gases, as set forth in my said co-pending applications, effective for the purpose. Because of the high temperature of the parts, the gas, if inflammable, ignites at the exterior of the pot and continues to burn. The object, however, is to supply the gas under pressure sufficient to exclude discoloration agents from finding their way through the seal 6, and this is continued until the work 4 has cooled below the point of danger of discoloration. When thus cooled, the gas supply is turned off and pot 1 is lifted from the work, and the work is ready for such other treatment or use, as desired.

In Figures 3 and 4 is illustrated a further embodiment in which the parts are modified to the extent of supplying the gas through supply pipes approaching at the sides instead of at the ends, and the structure being otherwise identical, the same reference numerals have been applied and the same description will apply except for the gas supply pipes. The gas supply pipes consist of jetted tubes 7′, 7′, similar in construction and arrangement to the gas tubes 7, and differing therefrom only in having both ends capped and the supply pipe 9′ connected midway in the length instead of at the end of the pipe. Thus the supply pipes 9′ are arranged at opposite sides of the pot 1, and blocks 12′, 12′ are provided for each pipe 9′ to prevent the pot 1 from injuring the respective pipes.

It should be apparent that other modifications of details are easily available so long as the essential features are preserved. And, it should be borne in mind that while I still prefer the supplying of gas to the seal exclusively at the exterior of the annealing pot,

as set forth in my above-identified co-pending applications, the present invention is characterized by demonstrating the feasibility of successfully practicing the art of annealing in accordance with the inventions of my said co-pending applications without being limited to the delivery of gas directly or exclusively to the exterior of the seal. It should also be understood that, since the gas introduced is not such as to create discoloration of the work 4, it is probable that the pot 1 becomes more or less filled with gas as the parts cool, but I have no way of demonstrating for the present to what extent gas ascends in the pot 1 when the cooling operation first begins. The fact that a flame is maintained at the surface of the seal 6 between pot 1 and flange 3 throughout the cooling operation demonstrates the constant discharge of gas through the seal and indicates to me that air or other discoloration producing agents cannot enter during such escape of gas, and the absence of such agents enables the production of a practically unstained and unspotted supply of work with each annealing operation, except for the possibility of some slight marginal coloring due to residual oxygen from air initially in the pot at the time of lowering over the work before introduction to the furnace.

Generic claims for the broader aspects of the process invention of this application are presented in my copending application Serial No. 479,051, filed August 30, 1930, as a division of my above-identified application, now Patent No. 1,777,978.

What is claimed is:—

1. In the art of annealing, the step of cooling work raised to annealing temperature in a receptacle sealed by a comminuted seal, and guarding the receptacle by delivering to the interior of the receptacle through parts of the comminuted seal gas under pressure sufficient for penetrating and escaping to the exterior of the receptacle through the seal, and maintaining such delivery of gas until the work has cooled below the temperature of discoloration.

2. The art as claimed in claim 1 wherein the gas is discharged within the body of the comminuted material of the seal within the receptacle.

3. The art as claimed in claim 1 wherein the gas is supplied within the body of the comminuted material of the seal within the receptacle and the seal is formed of comminuted substance extending from within the receptacle to the exterior of the same.

4. In annealing apparatus, the combination, with a tray and a pot, of a comminuted seal between the tray and pot extending from the exterior into the pot, and means for supplying gas from the exterior of the pot to the comminuted seal within the pot.

5. The combination as claimed in claim 4 wherein the comminuted seal extends beneath the edge of the pot and to the exterior of the pot, and the gas supply means extends from the exterior of the pot to the interior thereof and is adapted to deliver the gas within the body of the seal within the pot under pressure sufficient for causing the gas to penetrate the seal and escape at the exterior thereof.

6. In annealing apparatus, the combination, with a tray and an annealing pot therefor, of a comminuted seal located interiorly of the pot and extending beneath the edges of the pot to the interior thereof, and means for supplying gas from the exterior of the pot to that part of the seal within the pot.

7. In annealing apparatus, the combination, with a tray and a pot therefor adapted to contain work, of a comminuted seal within the pot and extending beneath the edges thereof and extending substantially from the work to the interior surface of the pot, and means for delivering gas under pressure to within the body of the comminuted material of the seal within the pot and between the pot and work.

8. In annealing apparatus, the combination, with a tray and an annealing pot, of a boxing upstanding from the tray within and spaced from the walls of the pot, a seal occupying the space between the boxing and pot, and means for supplying gas under pressure to said seal.

9. In annealing apparatus, the combination, with a tray and an annealing pot, of a seal between the tray and pot and extending interiorly of the pot, a gas supply pipe extending beneath the edge of the pot, and a gas-distributing pipe arranged in said seal and communicating with said supply pipe.

10. In annealing apparatus as claimed in claim 8 in which the gas supply means extends from the exterior of the pot and delivers the gas within the body of the seal between the boxing and pot.

In testimony whereof I affix my signature.

LESTER L. LEWIS.