Feb. 4, 1930. G. S. EVANS 1,745,362

ART OF ANNEALING

Filed Feb. 6, 1922 2 Sheets-Sheet 1

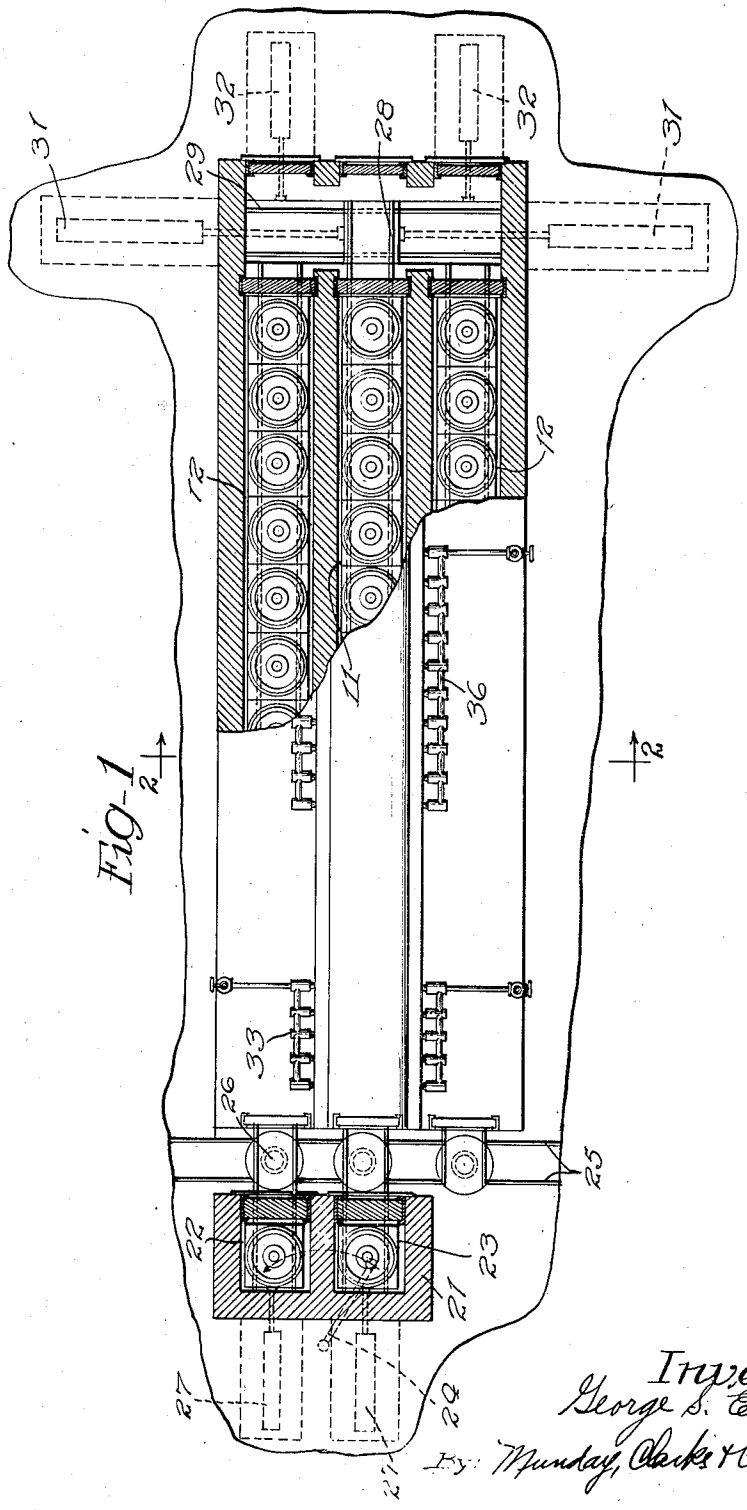


Fig-1

Inventor
George S. Evans
By: Munday, Clarke & Carpenter
Atty's.

Feb. 4, 1930. G. S. EVANS 1,745,362

ART OF ANNEALING

Filed Feb. 6, 1922 2 Sheets-Sheet 2

Fig-2

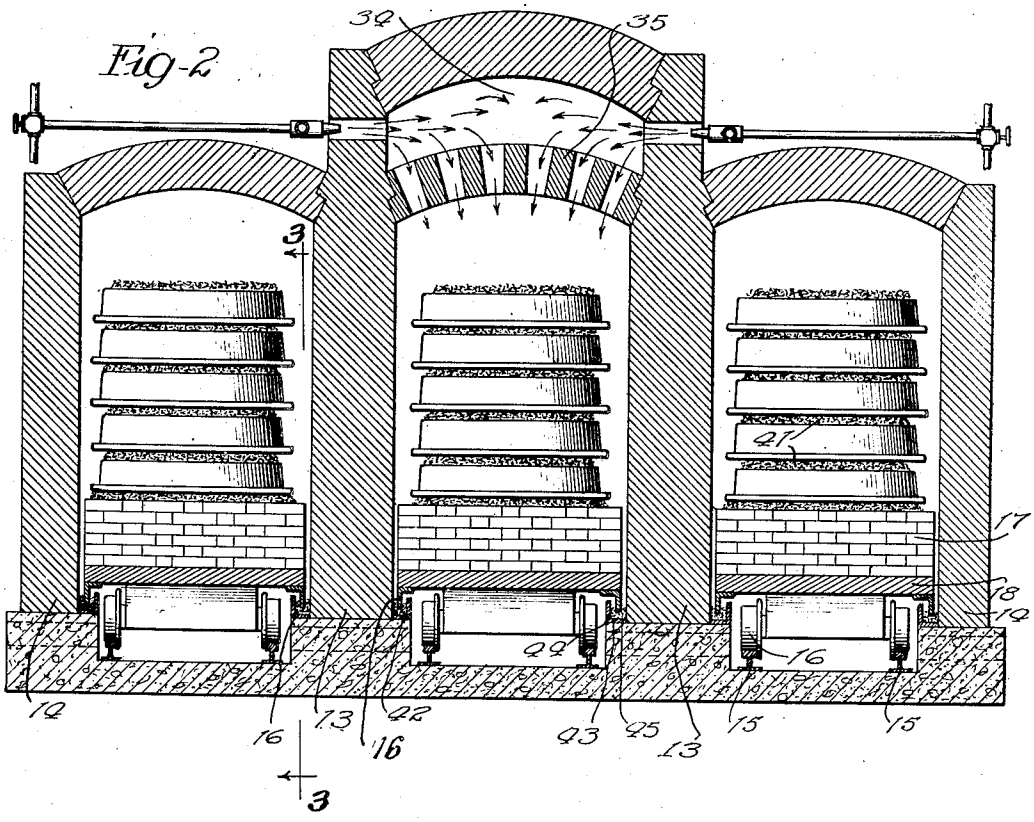
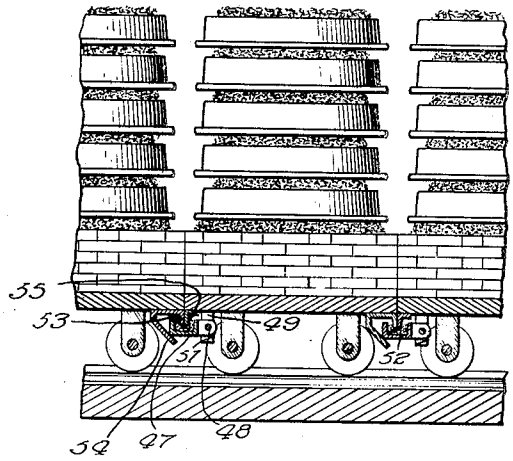


Fig-3



Inventor:-
George S. Evans
By:- Munday, Clarke & Carpenter.
Atty's.

Patented Feb. 4, 1930 1,745,362

UNITED STATES PATENT OFFICE

GEORGE S. EVANS, OF OAK PARK, ILLINOIS, ASSIGNOR TO GRIFFIN WHEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF MASSACHUSETTS

ART OF ANNEALING

Application filed February 6, 1922. Serial No. 534,392.

This invention relates in general to the art of annealing castings of iron, steel and other materials, and while the invention is shown and hereinafter described as embodied in an annealing apparatus for car wheels and the like, it will be readily understood that it has other and general application.

A principal object of the invention is the provision of a process and apparatus for annealing articles, such as car wheels and the like, by a continuous process and by subjecting all of the output to identical conditions. Prior to my invention it has been generally the custom to anneal car wheels and the like by taking them from the molds and depositing them in pits, piling them one on the other until a considerable accumulation has been obtained and then undertaking to maintain a slow rate of cooling. In this procedure it has been substantially impossible to maintain an even heat action or cooling action on the wheels,—those at one part of the pit cooling more rapidly than those at another. My invention contemplates the conduction of the car wheels or other articles through an annealing oven as a substantially continuous process so that conditions may be accurately controlled in the various stages of the annealing and be identical upon successively cast articles.

Another object of my invention is the provision of an apparatus of this character and a process for annealing which may be economically employed and by the use of attendants of relatively unskilled character.

The invention has for a further purpose the provision of an apparatus for carrying out my improved process, which will not be excessively costly to install and which will be of efficient operation and unlikely to require frequent repair or replacement of parts.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings,

Figure 1 is a view partially in plan and partially in horizontal section, of an apparatus embodying my present invention;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1; and

Fig. 3 is a section taken substantially on the line 3—3 of Fig. 2.

For the purpose of illustrating my invention I have shown on the drawing an apparatus which I at present prefer. This apparatus comprises a cooling oven through which the car wheels or other articles are carried as an incident to the annealing and cooling, first from one end to the other and then back to the starting end. The oven comprises a central passageway 11 and two side passageways 12 defined by two central walls 13 and two side walls 14. These walls may be of any preferred form or construction and may be of any preferred material. It is, however, desirable that they be of high heat insulating quality.

In each passageway are located two tracks 15 for the wheels 16 of trucks having bodies 17 of heat resistant material, such as brick work, upon a support 18. Adjacent the off end of the oven I provide a preheater 21 for the trucks, this preheater in the present instance comprising two chambers 22 and 23. A crane 24 is provided for loading the wheels or other articles upon the trucks as they are received from the foundry proper and while the trucks are in the preheater. A pair of tracks 25 extend across the oven and between it and the preheater and in these tracks are preferably provided three turntables 26, one in front of each oven passageway, the two preheaters being arranged in alinement with the central and one of the end passageways.

A pusher 27, preferably of the fluid pressure type, is provided back of each preheater to push the truck and its load out onto the turntable and into the oven or onto the tracks 25 depending upon which preheater chamber is employed. If the truck and its load is pushed upon turntable 26 the truck is turned, moved along the tracks 25 to in front of the central passageway and then into this passageway. The trucks are square or rectangular in shape and as each is pushed into the central passageway it pushes ahead those

already previously positioned and advances them one step or truck length toward the exit of the oven. As the trucks are advanced one after another they are pushed out of the passageway 11 at the opposite end and onto a truck carrier 28 adapted to run on tracks 29 under the influence of pushers 31. These pushers alternately deliver the trucks with their load to the side passageways and through them they are moved back similarly by pushers 32, each in turn pushing out the truck at the opposite end of the line as the next is added.

The central passageway is divided into a heating zone and a slow or hot air cooling zone. Considering the side passageways and the central passageway as together constituting a single passageway through the apparatus, it may be stated that the trucks travel through a heating zone and slow cooling zone and rapid cooling zone. The heating zone receives heat from burners 33 burning into an upper chamber 34 separated by an openwork arch 35 from the passageway itself. Hot air is admitted from similar burners of lower intensity or by the introduction of hot air itself from pipes or inlets 36 located intermediate the ends of the central passageway. The car wheels pass more rapidly through the center passageway than through the end passageways, i. e. they stay longer in the zone of more rapid cooling so that as the temperature is gradually reduced the rate of reduction of temperature is reduced. In the action of the apparatus the hot air moves along from the entrance of the central passageway to its exit and then out in the branches back through the two side passageways in this manner producing the desired rate of cooling and materially increasing the efficiency by maintaining the walls 13 in somewhat heated condition from the side passageway.

The wheels mounted upon the brickwork 17 are supported thereon upon sand 41 and sand is interposed between each car wheel web and the web next above it. This sand serves to keep the car wheels spaced apart and also acts as a heat insulating material to slow down the cooling itself to prevent setting up of the strains of the material and to obtain best annealing results.

The truck body forms the bottom of the air path through the passageways and to this end I have provided for the insulation of the space beneath the body from the space above it. At each side, upon raised ledges or bottoms 42, I have mounted an angle member 43 having an upstanding flange 44 to confine a sealing material, as sand 45, and along each side of each truck body I provide a downwardly depending flange 46 adapted to enter into the sealing sand and form an hermetic connection. Means are also provided for sealing the space between adjacent trucks. This means in the present instance comprises a channel member 47 pivoted at 48 in brackets 49 depending from an end of a truck, a shoulder 51 being provided to limit the downward pivotal movement of the channel. Within this channel which forms the container is provided similar sealing means, as sand 52. On the opposite end of each truck is provided a downwardly extending flange 53 and an inclined flange 54, the inclined flange 54 being so arranged that it will engage the forward edge of a channel member 47 and lift it up so that the flange 53 will enter the sealing material to form an hermetic connection at 57. I also provide a similar flange 55 above the container and on the same truck to enter into the sand with the flange 54. The trucks are so introduced into the oven that two adjacent trucks have their adjacent ends one provided with the container and the other with the flange 54 and complete sealing or substantially complete sealing is thus effected to separate the space above from the space beneath the truck and to confine the moving hot or warm air into intimate contact with the articles being annealed.

While it is believed that the process embodying my invention will be understood from the above-described apparatus adapted for its practice, it might be well to mention that the trucks are preferably first positioned in the preheater, there loaded with car wheels still hot from the molds and as soon after the shaking out as is practical; they are then introduced immediately into the central passageway and intermittently advanced therethrough to the opposite end, being first subjected to a slight reheating and then pass through a slow cooling zone. As they leave the central passageway they are alternately diverted to the right and to the left and brought back through the side passageways for delivery from the annealing furnace.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The process of annealing articles of the character described, which comprises passing them continuously through an oven heated to different temperatures at different parts, and moving said articles more rapidly through the parts of higher temperature.

2. The process of annealing articles of the character described, which comprises passing them through an oven of graduated temperatures, and protecting the thinner parts with heat insulating material by arranging the

car wheels adjacently in a vertical pile and inserting heat insulating material between the adjacent web portions, leaving the rims exposed.

3. The process of annealing car wheels, which comprises moving the car wheels through an oven having a slow cooling zone and a rapid cooling zone, and controlling the temperature of the rapid cooling zone from the slower cooling zone.

4. The process of annealing articles of the character described, which comprises passing them through an annealing oven having a heating zone, a slow cooling zone, a rapid cooling zone and supplying heat to the rapid cooling zone from the heating zone and slow cooling zone.

5. The process of annealing car wheels in a furnace having a central and side cooling ovens, which comprises advancing said car wheels through the central oven for slow cooling, and passing said car wheels alternately back through ovens on each side of said central oven for rapid cooling.

6. The process of annealing articles of the character described, which comprises removing the article from the mold in which it is cast and while still hot passing it through a slow cooling oven and introducing heat into the entrance end of said oven.

7. The process of annealing car wheels, which includes, removing the car wheels from the casting mold, and passing them through an annealing oven through which heated air is passed in the direction of movement of said wheels whereby to produce slow cooling of said wheels.

8. The process of annealing articles of the character described in an apparatus comprising central and side cooling ovens, which comprises removing said articles from the molds in which they were cast and while the articles are still hot passing them through a central slow cooling oven and back through side slow cooling ovens and at the same time maintaining an air circulation from the entrance of said central oven to the exit of said side ovens, whereby to maintain a desired and relatively high temperature in the partitions between said central and said side ovens.

9. An annealing oven, comprising walls defining a passageway from end to end, tracks in said passageway, means introducing hot products of combustion at the beginning of said passageway, and means for producing hot air introduction intermediate the ends of said passageway.

10. An apparatus for annealing articles of the character described, comprising an oven having walls defining an elongated passageway, tracks in said passageway, trucks movable on said tracks and for supporting said articles, and means hermetically sealing the space above the bodies of the trucks from the space therebeneath, said means including a container for a sealing member on the end of a truck, a flange on an adjacent end of an adjacent truck, and a member on said end of said adjacent truck for maintaining said container in position to cause said sealing material to be engaged by said flange.

11. A cooling apparatus, comprising a cooling oven having three or more passageways, means for advancing trucks carrying articles to be cooled through a central passageway and then alternately returning said trucks through side passageways.

12. An apparatus for annealing articles of the character described, comprising an elongated passage through which trucks carrying said articles may pass, a truck preheater arranged adjacent said oven, and means for loading said articles upon said truck while in said preheater.

13. An apparatus for annealing articles of the character described, comprising an elongated passage through which trucks carrying said articles may pass, a truck preheater arranged adjacent said oven, means for loading said articles upon said truck while in said preheater, and means for transferring said trucks from said preheater to said ovens.

14. An annealing oven, comprising, walls forming a main passageway and a plurality of connecting branch passageways, means for advancing a succession of trucks carrying articles thereon through said main passageway and for then moving each successive truck through a different branch passageway to effect slower cooling of the articles.

15. An annealing oven, comprising, walls defining a main passageway and a plurality of connecting branch passageways, means for heating the main passageway to a higher temperature than the branch passageway, and means for advancing a succession of trucks carrying heated articles thereon through said main passageway and for then moving each successive truck through a different branch passageway to effect slower cooling of the article in said branch passageways.

16. An annealing oven having walls defining an elongated passageway, and comprising means for heating a portion of said passageway to a higher temperature than another portion, and means for passing heated articles more rapidly through said portion of higher temperature than through the other said portion of said passageway to effect slow cooling of the article.

17. An annealing oven, comprising walls forming a central passageway and two branch passageways, one on each side of the central passageway, said branch passageways communicating with the central passageway at one end thereof, means for heating the interior of the central passageway so that the heated medium will pass into the branch passageways and means for passing a succession of trucks carrying heated articles thereon

through said main passageway and thence alternately through said branch passageways for effecting slow cooling.

18. An annealing oven, comprising, a main oven, the walls of which provide a central passageway and two branch passageways, one lying on each side of the central passageway, the walls of said main oven being closed at the end but arranged to form communications between said central passageway and said branch passageways, tracks in said passageways and a track in the oven at the end connecting the central with the branch passageways, said track being disposed transversely to the track in said central passageway and means for shifting a truck from said central passageway to either of the branch passageways and while on said tracks.

19. An annealing oven, comprising, a main oven, the walls of which provide a central passageway and two branch passageways, one lying on each side of the central passageway, the walls of said main oven being closed at the end but arranged to form a communication between said central passageway and said branch passageways, tracks in said passageways and a track in the oven at the end connecting the central with the branch passageways, said track being disposed transversely to the tracks in said passageway and means for shifting a truck from a central passageway to either of the branch passageways, a track at the opposite end of said oven and lying transversely to the tracks in the passageways, a turn-table on said latter track and lying opposite the end opening of each passageway, a preheating oven spaced from the main oven, said preheating oven having two compartments, one opposite the central passageway and the other opposite a branch passageway and lying adjacent to the said second transverse track and means for pushing a truck from either compartment of the preheating oven onto a turn-table on said track and for pushing said truck into either the central passageway or a branch passageway.

20. An apparatus for annealing articles, comprising, an oven having walls defining an elongated passageway, tracks in said passageway, trucks movable along said tracks, means for substantially hermetically sealing the space above the bodies of the trucks from the space therebeneath, comprising depending flanges on the ends of a truck adapted to engage similar flanges of an adjacent truck, a sand container shiftably mounted on the end of one truck and positioned beneath the depending flange of that truck and a latch member forming an inclined surface arranged on the end of the other truck adjacent its depending flange and adapted to engage and force said sand container upwardly to enclose said adjacent depending flanges when two trucks come together, whereby the two depending and contacting flanges project into the sand in the container.

21. An apparatus for annealing articles, comprising an oven having walls defining an elongated passageway, tracks in said passageway, trucks movable along said tracks, and means for substantially hermetically sealing the space above the bodies of the trucks from the space therebeneath comprising a depending flange formed on the opposed ends of the truck and adapted to engage a similar flange arranged on an adjacent truck sand holding container shiftably mounted on the bottom of the truck adjacent said flange and a cooperating latch arranged on another truck adapted to engage and move said container to a position enclosing the engaged flanges of adjacent trucks when said trucks are brought together.

22. An apparatus for annealing car wheels and the like, comprising an oven having walls defining an elongated passageway, tracks in said passageway, trucks movable on said tracks for supporting articles and means hermetically sealing the trucks above the bodies of the trucks from the space therebeneath, said means including a depending flange and a sand holding container and means for automatically causing said flange and said container to shift relatively one to the other when said cars come together, whereby to cause the end of the flange to be projected into the sand.

GEORGE S. EVANS.