Nov. 7, 1933. F. J. PETERSON 1,934,614

FURNACE

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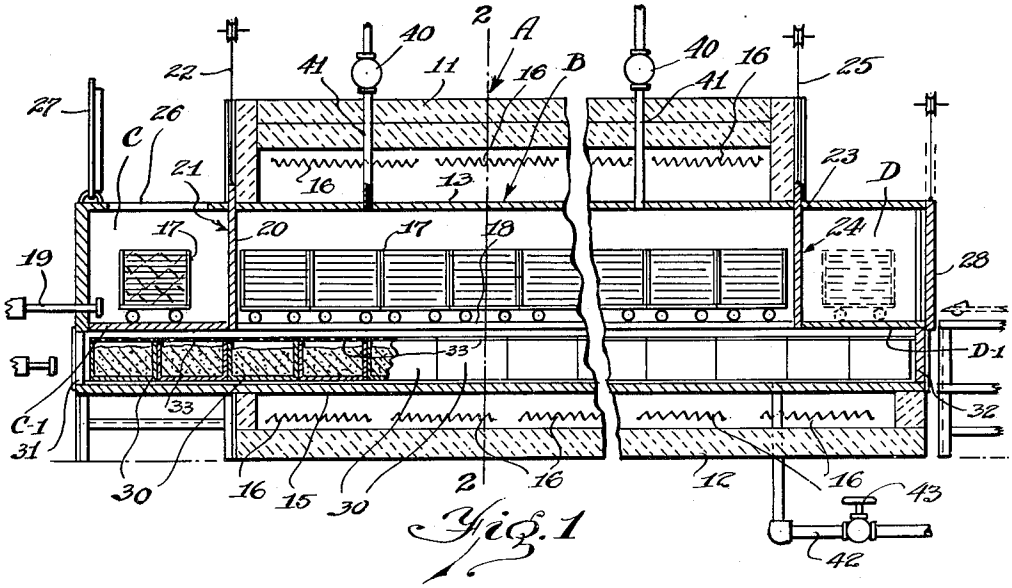


Fig. 1

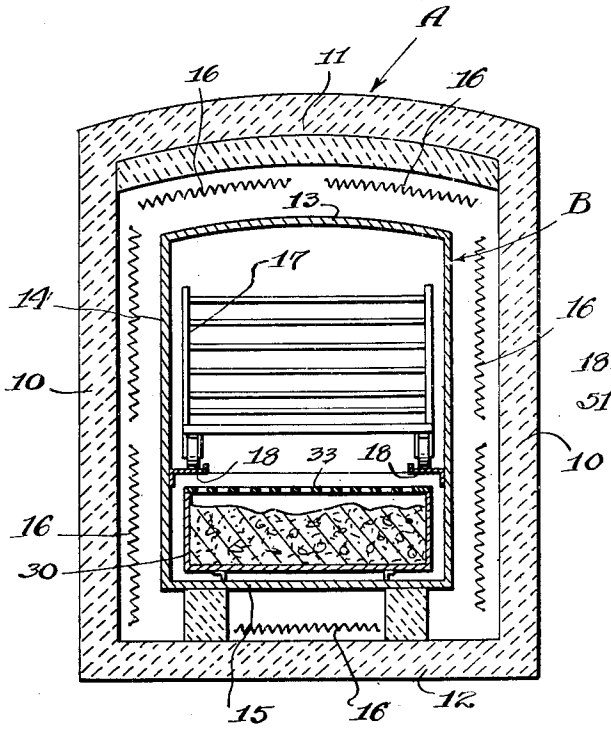


Fig. 2

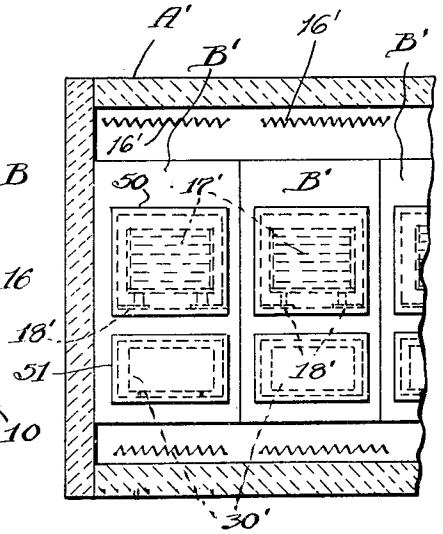


Fig. 3

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FURNACE

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10 Claims. (Cl. 266—5)

My invention relates to furnaces of the type employed for heat treating metals and other like materials, and more particularly relates to a novel furnace and assembly for carbonizing metals and like materials and to an improved continuous process for carbonizing such metals.

In the particular art to which my invention is related it has been the general practice in the past to provide individual retorts of heat resisting material and to pack therein the articles to be carbonized together with a suitable carbonizing compound. This method as previously practiced does not lend itself readily to rapid production because these individual retorts must be carefully packed and the time required for carbonizing the work cannot be very readily decreased due primarily to difficulty in properly regulating the pressure in these retorts and maintaining a uniform quality in the finished product. It has been proposed to use gas in carbonizing furnaces, but the difficulty with this latter method has been the difficulty of obtaining gas of the proper quality. Artificial gas must be previously treated and natural gas which is most suitable is not of uniform quality and furthermore, natural gas is not available in all localities. Even with natural gas, it is preferable to treat the same previously to using the same in the furnace in order to remove undesirable impurities and other foreign matter. Due to these difficulties, it has been the practice for many years to produce the carbonizing gas from a specially prepared carbonizing compound in order to satisfactorily carbonize or case harden the material or articles.

The use of gas for carbonizing or case hardening metals lends itself more readily to speedier production since the process can be more satisfactorily controlled as to pressure, the pressure determining the length of time required to produce the finished product.

It is the object of my present invention to provide an improved product with a high degree of uniformity and to produce these finished articles more rapidly than has been done in the past by constructing an improved furnace in which this object can be obtained.

Another object of my invention is to facilitate the carbonizing of metal articles and the like by providing a furnace adapted for production output in that the articles to be heat treated or carbonized are progressively advanced through the furnace, and which may be conveniently handled with a minimum of time and labor.

Other objects of my invention reside in various features and detailed constructions, as will be hereinafter made apparent.

For a further detailed understanding of my invention reference may be had to the accompanying drawing illustrating preferred embodiments of my invention, and in which:

Fig. 1 is a vertical longitudinal sectional view of a carbonizing furnace constructed in accordance with my invention,

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1, and

Fig. 3 is a fragmentary semi-diagrammatic elevational view of a modified form of construction.

In the illustrated embodiment of my invention as shown in the accompanying drawing, A designates the furnace as a whole, which is preferably constructed of side, top and bottom walls 10, 11 and 12 respectively of suitable heat resisting material such as fire clay or the like. A retort B constructed of a suitable heat resisting alloy is preferably supported within the furnace in spaced relation with respect to the side, top and bottom walls of the furnace. The retort may be cast in one piece with integral top, side and bottom walls 13, 14 and 15 respectively, or said walls may be formed separately and welded or otherwise secured together if so desired. The retort B may be heated in any suitable manner by burners or electric heating elements, and for purposes of illustration I have shown the furnace A as being provided with a plurality of electric heating elements 16 which may be conveniently supported internally of the side, top, and bottom walls 10, 11 and 12 respectively of the furnace.

The articles to be carbonized or case hardened as well as the carbonizing compound are preferably moved longitudinally through the retort B which may be of any length found desirable under the circumstances. The articles to be carbonized, which may be of various shapes or sizes, are preferably stacked or packed in individual carriages or cradles 17 which are adapted to be pushed or moved along the tracks 18. Any suitable means may be provided for moving these carriages 17 through the retort B, but the particular manner in which I move the carriages forms no part of my invention and I do not limit my invention to any particular means. In order to illustrate one way in which the carriages can be moved, I show the furnace equipped with a ram 19 which is constructed and arranged to engage the rear end of the carriage train and push.

The front end of the furnace is provided with

a door 20, which is also preferably constructed of a heat resisting alloy, and which when closed will substantially seal the entrance opening 21 of the retort. A cable 22 or other suitable actuating device may be employed to raise or otherwise open the door 20 when desired. A door 23 closes the outlet or discharge opening 24 and is raised or otherwise opened by the cable 25 or other suitable actuating device. These doors 20 and 23 seal the ends of the retort and prevent the escape of gases or pressure from the retort.

In order to minimize gas and pressure losses when loading or unloading the retort, I preferably provide loading and unloading chambers C and D respectively which may be sealed from the atmosphere at times when the doors 20 or 23 are opened. Preferably the loading chamber C is provided with an opening 26 through which the carriages or cradles 17 may be introduced, these carriages being packed or filled with the articles to be carbonized either prior to being introduced into the loading chamber or filled after the carriage is placed therein. The loading and unloading chambers are each preferably provided with a solid floor C—1 and D—1 respectively of a level substantially the same as the tracks 18 so the cradles can be readily rolled from one to the other. When the carriage, filled with the articles to be carbonized, is ready for admittance to the retort, the opening 26 is closed by a door 27 or otherwise sealed, the door 20 is opened and the ram 19 is actuated to push the carriage into the retort. These carriages are successively introduced to the retort and are periodically pushed along one behind the other in a long train. The proceedings are so timed that when the first carriage has moved the entire length of the retort, the articles therein to be carbonized, are ready to be removed. The outlet door 23 is opened and any suitable device is employed for moving the carriage to the unloading chamber, the door 23 is then closed and a suitable door 28 associated with the unloading chamber is opened, whereby the work can be removed for quenching, the articles being removed from the carriage and placed in the quenching bath, or the same may be bodily removed to be placed in the bath, carriage and all. As a carriage is removed, a new carriage packed with articles to be heat treated can be introduced into the retort, but preferably the door 20 is not opened until the door 23 is closed.

The gas employed for carbonizing the articles is preferably produced from a carbonizing compound which is introduced into the retort, which when subjected to heat causes the gas contained in the compound to be liberated. Any suitable carbonizing compound may be used, such compounds in general being composed mainly of barium carbonate, calcium carbonate, coke, barium and charcoal. This compound is preferably packed in boxes 30 which are adapted to progressively be advanced or pushed through the retort, the said boxes containing the compound being preferably moved along the floor of the retort underneath the carriages or cradles 17 containing the articles or work which is to be subjected to the action of the gas produced by the compound. The front and rear of the retort is preferably provided with doors 31 and 32 through which the boxes containing the compound may be respectively introduced and discharged. These boxes are each preferably provided with perforated covers 33, and are added to the retort as desired depending on the quantity and quality of work being carbonized.

It will be noted that the compound and work are simultaneouly heated as the same move through the retort, temperatures of 1550° F. to 1700° F. being generally employed. Pressures of from 1 oz. to 5 lbs. are generally maintained in the retort, the higher pressures being used when it is desirable to increase the speed of the carbonizing process. Usually the work is held in such furnaces from 8 to 10 hours, and in large furnaces such as I contemplate using with my invention, the operation is so timed as to give the required time necessary for providing a uniform product of the proper quality.

The pressure within the retort may be controlled by the regulating valve 40 associated with the vent or escape pipe 41. One or more of such vent pipes and regulating valves may be provided as desired. If desired I may introduce gas directly into the retort through the pipe or conduit 42, a suitable regulating valve 43 being associated therewith. This gas may be introduced into the retort to mix with and to augment the gas produced from the material contained in boxes 30 if found desirable.

In Fig. 3 I have illustrated a modified form of furnace, which comprises a plurality of retorts B', suitably supported in a furnace A'. Means, such as electric heating units 16' are provided in said furnace for heating the retorts. The retorts B' are each constructed with a door 50 through which a cradle or basket 17' containing the work may be introduced into the retort and placed on the shelf 18'. Another door 51 is preferably provided in the front wall of each retort through which boxes 30' containing a carbonizing compound may be introduced and placed under the cradle 17'. The work and carbonizing compound in the retort B' is heated to a degree and in substantially the same manner as the work and compound in the retort B as illustrated in Figs. 1 and 2.

The advantages derived from the use of a furnace constructed as heretofore described is that a fine quality of work can be produced, a relatively greater production can be handled with relatively less labor and overhead expense. The work produced is uniform in quality, and it is possible to more readily control the output of a furnace as to quantity as well as quality when constructed according to the teaching of my invention.

It will be apparent to those skilled in the art to which my invention is related that various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

I claim:

1. The method of carbonizing metallic articles which comprises the passing of such articles through a metallic gas pressure retaining retort and the passing of a carbonizing compound through said retort in spaced relation with respect to said articles, the applying of heat to said retort to heat said articles and said compound whereby the gas liberated from said compound when subjected to heat circulates in contact with said articles.

2. In a carbonizing furnace for metal articles or other like materials, a gas pressure retaining metallic retort, means for supporting the material to be carbonized in said retort, means within the retort and spaced from the said first means for supporting a substance producing a carbonizing

gas when subjected to heat suitable for treating said articles, means for heating said retort whereby to heat said articles and to produce a gas for circulation in contact with said articles, and regulable means for introducing a supplemental supply of carbonizing gas into said retort for mixture with the other gas circulating therein.

3. In a carbonizing furnace for metal articles, a metal retort adapted for retaining a carbonizing gas under pressure and having a movable closure, means for supporting the articles within the retort, means supported within the retort in spaced relation with respect to said articles and including a substance producing gas when subjected to heat for circulation in proximity with said articles, and means for heating said retort to effect the heating of said substance and the heating of said articles sufficient to absorb said gases produced in said retort.

4. In a carbonizing furnace for metal articles, a metal retort adapted for retaining a carbonizing gas under pressure and having a movable closure, means for supporting the articles within the retort, means supported within the retort in spaced relation with respect to said articles and including a substance producing gas when subjected to heat for circulation in proximity with said articles, means for heating said retort to effect the heating of said substance and the heating of said articles sufficient to absorb said gases produced in said retort, and pressure regulating means associated with said retort for controlling the gas pressure therein.

5. In a carbonizing furnace for metal articles, a metal retort adapted for retaining a carbonizing gas under pressure and having a movable closure, means for supporting the articles within the retort, means supported within the retort in spaced relation with respect to said articles and including a substance producing gas when subjected to heat for circulation in proximity with said articles, and means without said retort for heating said retort to effect the heating of said substance and the heating of said articles sufficient to absorb said gases produced in said retort.

6. In a carbonizing furnace for metal articles, a metal retort adapted for retaining a carbonizing gas under pressure and having a movable closure, means for supporting the articles within the retort, means for moving a substance through said retort in spaced relation with respect to said articles, said substance producing a carbonizing gas for circulation through said retort in proximity with said articles when subjected to heat, and means for heating said retort whereby to heat said articles and said substance within said retort.

7. In a carbonizing furnace for metal articles, a metal retort having a movable closure and being otherwise closed to retain a carbonizing gas under pressure, means for moving articles to be carbonized through said retort, means for moving a substance through said retort in spaced relation with respect to said articles, said substance producing a carbonizing gas for circulation through said retort in proximity with said articles when subjected to heat, and means for heating said retort whereby to heat said articles and said substance within said retort.

8. In a carbonizing furnace for metal articles, a metal retort having a movable closure and being otherwise closed to retain a carbonizing gas under pressure, containers for supporting said articles, other containers containing a substance producing carbonizing gas when subjected to heat for circulation within said retort, means for progressively moving said containers through said retort, and means for heating the retort whereby to heat the contents of said containers.

9. In a carbonizing furnace for metal articles, a metal retort having a movable closure and being otherwise closed to retain a carbonizing gas under pressure, containers for supporting said articles, other containers containing a substance producing carbonizing gas when subjected to heat for circulation within said retort, means for progressively moving said containers through said retort, and means for heating the retort whereby to heat the contents of said containers, the first said containers being arranged in open communication with the interior of said retort whereby to subject said articles to contact with the carbonizing gas circulating therethrough.

10. In a carbonizing furnace for metal articles, a metal retort having a movable closure and being otherwise closed to retain a carbonizing gas under pressure, a container supporting metal articles to be carbonized, a container carrying a substance producing carbonizing gas when subjected to heat, said containers being in open communication with the interior of said retort whereby to permit the gas originating in one of said containers to circulate in contact with the metal articles in said other container, means moving said containers through said retort, and means for heating said retort whereby to heat the contents of said containers.

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