

UNITED STATES PATENT OFFICE.

ALFRED M. HEWLETT, OF KEWANEE, ILLINOIS.

METHOD OF ANNEALING IRON OR STEEL CASTINGS.

SPECIFICATION forming part of Letters Patent No. 716,894, dated December 30, 1902.

Application filed January 31, 1902. Serial No. 91,990. (No specimens.)

To all whom it may concern:

Be it known that I, ALFRED M. HEWLETT, a citizen of the United States, residing at Kewanee, in the county of Henry and State of Illinois, have invented certain new and useful Improvements in Methods of Annealing Iron and Steel Castings, of which the following is a specification.

My invention relates to the annealing of steel or iron, and has for its object to provide an improved process of annealing castings by which the castings may be economically and satisfactorily annealed in large quantities and without the heavy loss through oxidation both to the castings and to the pots incident to the use of processes heretofore generally employed.

In annealing steel or iron castings the articles to be annealed must be heated to a temperature in the neighborhood of 1,800° Fahrenheit, and when at this high temperature if they are exposed to air or other oxidizing atmosphere they oxidize so rapidly that they become very rough and unfit for ordinary use. It is therefore necessary to protect them in some way from excessive oxidation, and it has heretofore been a common practice to put the castings in iron rings or pots, packing them in mill-scale, white sand, or other substances which would operate to exclude air, so that oxygen could not readily reach and attack the steel or iron to be annealed. An important objection to methods involving the use of pots to contain the castings resides in the expense incurred, since the pots being exposed to the oxidizing atmosphere are destroyed very rapidly by oxidation when raised to the high temperature required in the annealing-oven. It has also been attempted to prevent oxidation of the castings by placing them in a muffled or retort furnace made as nearly air-tight as possible, the castings being embedded in sand. This process, however, is objectionable because of the great expense for fuel, it being necessary to heat up the sand as well as the castings, and this objection also holds good regarding the process first above referred to. It has also been attempted to avoid the objections incident to the annealing process above described by reducing the time required for annealing, the theory being that by greatly hastening

the process of annealing there would be less danger of oxidation; but this theory does not work out in practice. I have found by experiment that by the last-named process, which involves the use in the annealing-chamber of chemical substances designed to produce gases which expedite the annealing, the chemicals employed oxidize the castings to so great an extent as in many instances to render them unfit for the market. With all the above processes it is desirable, if not essential, to use small annealing-furnaces. This constitutes another objection, since small furnaces are more expensive than large ones, as explained in my application for patent, Serial No. 89,595.

By my invention I avoid the objections above pointed out and secure an effectual annealing of the castings with a minimum of oxidation. I further provide a much more economical method of operation, so that not only is the loss from imperfect annealing reduced to the minimum, but also the cost is greatly reduced.

My invention consists in subjecting a quantity of the castings disposed in mass in a suitable annealing-furnace to an annealing temperature in an atmosphere which protects them from injury by oxidation, such as an atmosphere devoid or substantially devoid of free oxygen, so that even when the castings are subjected to the greatest heat they cannot be injured by oxidation. In lieu of rendering inert the oxygen contained in the air present in the annealing-chamber at the commencement of the operation of annealing I may employ carbonic-acid gas or some substance to generate said gas, introducing it directly into the annealing-chamber for the purpose of forcing out the air contained therein and rendering the atmosphere of the annealing-chamber inert, so far as the castings are concerned; or I may employ some other suitable gas. Furthermore, some materials must be held up to an annealing temperature for several hours in order to thoroughly anneal—that is, to toughen and soften; and my invention further consists in heating the castings to be annealed in mass, a sufficient quantity of small castings being treated to maintain a proper annealing temperature in the furnace

after such temperature shall have first been attained until all or substantially all of the castings shall have been annealed without further firing or the use of additional fuel
5 for heating. I thus not only economize in the use of fuel, but also avoid the danger of excessive heating and insure proper annealing of all or substantially all of the castings in the mass.

10 In carrying out my process by preference I place the castings to be annealed in a suitable retort or annealing-chamber, which is filled with the castings piled in a mass therein. Coke-dust, sawdust, coal, or charcoal are
15 also placed in the annealing-chamber, a few inches of the coke-dust or other suitable substance being placed on the floor of the furnace before charging the same with the castings. The annealing-chamber is then sealed
20 up substantially air-tight and heated up to an annealing temperature. The furnace is then allowed to stand without further firing until the castings have cooled. When the furnace is heated up to a suitable annealing
25 temperature, the coke-dust or other carbonaceous substance oxidizes more readily and more freely than the iron or steel, so that a carbonaceous substance at this high annealing temperature produces an atmosphere that
30 greatly protects the iron from injury by oxidation.

In lieu of the substances above referred to I may employ any substance or gas which will take up to a considerable extent the oxygen of the air in the furnace and produce a
35 reducing or carborizing atmosphere therein, or, as previously stated, an inert or reducing atmosphere may be produced in the furnace in substitution for an oxidizing atmosphere.

40 In carrying out my improved process I prefer to employ an apparatus such as that illus-

trated and described in my application filed January 13, 1902, Serial No. 89,595; but I do not wish to be limited to the use of such apparatus, as any suitable apparatus arranged
45 to carry out my improved process may be employed.

That which I claim as my invention, and desire to secure by Letters Patent is—

1. The process of annealing castings which
50 consists in depositing a quantity of castings to be annealed in mass in an annealing-furnace the quantity of castings being sufficient to maintain a proper annealing temperature in the furnace after such temperature shall
55 have been first attained until all, or substantially all, of the castings shall have been annealed, heating up the contents of the furnace to an annealing temperature, and permitting the mass of castings to stand with-
60 out further firing or otherwise applying extraneous heat after they have been heated to an annealing temperature, substantially as described.

2. The process of annealing castings which
65 consists in depositing a quantity of castings to be annealed in mass in an annealing-furnace, the quantity of castings being sufficient to maintain a proper annealing temperature in the furnace after such temperature shall
70 have been first attained until all, or substantially all, of the castings, shall have been annealed, and then heating up the contents of the furnace to an annealing temperature in an atmosphere that protects the castings
75 from injury by oxidation, substantially as described.

ALFRED M. HEWLETT.

Witnesses:

CHARLES F. CULLOM,
A. G. O'NEILL.