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METHOD OF MALLEABLEIZING CAST METAL.

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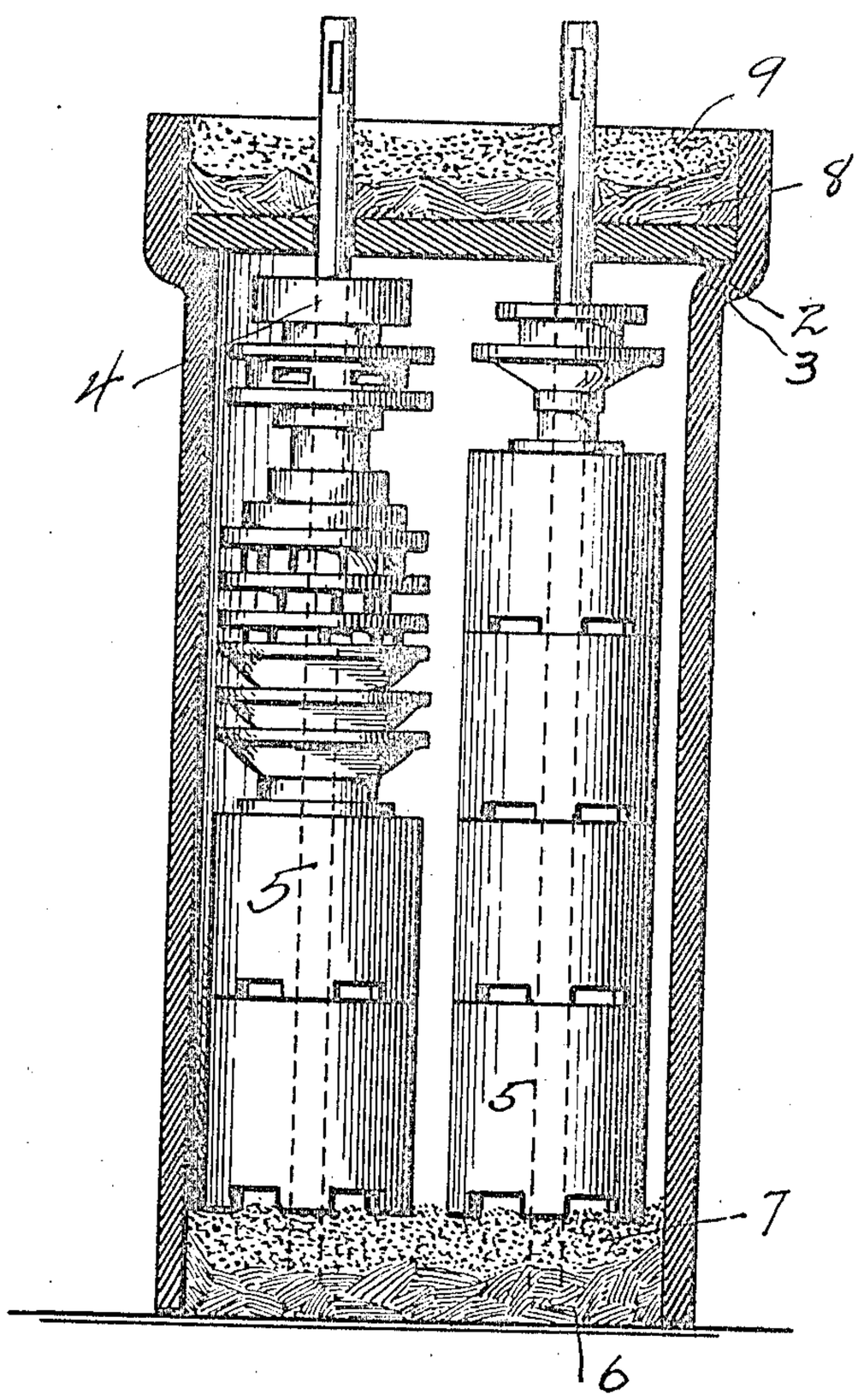
1,298,607. Patented Mar. 25, 1919.



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METHOD OF MALLEABLEIZING CAST METAL.

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To all whom it may concern:

Be it known that I, WALTER G. WEBSTER, a citizen of the United States, residing at Highland Park, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Methods of Malleableizing Cast Metal, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The principal object of this invention is a method of malleableizing cast metal in a materially less period of time than is possible by present known processes whereby a greatly increased output may result, and the cost of malleableizing metal reduced to a minimum. In the method of malleableizing cast iron articles at present in general use, the articles are placed in a box and packed with substances containing oxygen as iron filings, with charcoal, etc., and a number of packed boxes are placed in an annealing furnace and the articles therein brought up to the necessary temperature—namely, about 1650 degrees F., and thereupon the furnace is allowed to gradually cool. The period of time consumed in producing malleableized castings under such well known system is from about seven to twelve days. I have found by experiment that a considerable period of time is required to heat the packed articles to the required degree due to the fact of their being insulated by the packing, and that the time required to cool the articles to the necessary degree before removal from the furnace is likewise increased by reason of the insulation of the castings by the packing. It is further known that a packing is often utilized that does not contain an appreciable quantity of oxygen, in which case the principal purpose of the packing appears to be the exclusion of air and thus preventing formation of a scale or skin-hardening of the castings.

With the method which is the subject matter of this application, the castings are gas packed, excluding oxygen, but not to any great extent insulating the articles from the heat of the furnace whereby the articles may be brought to the desired temperature within a short period of time and may be cooled more rapidly than with the older method of packing mentioned and, by reason of the fact that the oxygen is practically wholly excluded from the articles being treated, the product is to some extent superior to the product of the older known processes in which oxygen may attack the iron.

It is further an object of the invention to provide a process that not only is a great saving in the time required to malleableize the metal but in which the labor cost is reduced to a minimum in that the method of excluding oxygen is automatic in its operation, and that castings do not require to be packed manually as in the older processes above mentioned. These and the several other objects and novel features of the process are hereinafter more fully described and claimed.

The drawing is a vertical section illustrative of a type of box or case in which the cast iron articles are placed for treatment, showing one manner of supporting the articles in the case, but it is to be understood that cases or pots of various shapes and sizes may be utilized. An essential characteristic, however, in any type of case or box used is that it be possible to seal the same in a manner to prevent an inflow of air containing oxygen. The box shown in the drawing is in the form of a tube open at both ends. The upper end is provided with a cap plate 2 which seats against a shoulder 3 of the case. The articles may be strung on a rod as indicated at 4, or small articles may be carried in baskets on such rod as indicated at 5. The baskets are to be understood as being open in the top and bottom faces thereof to an extent to allow the gases within the case to circulate through the boxes. Several rods or bars may be used or a single rod carrying a large open basket for the articles depending on the size and character of the articles to be treated. The plate 2 is apertured to allow the rods to extend therethrough as shown in the drawing, and the articles may be removed by pulling the rod or rods.

The case (after being sealed at the bottom with clay and sand as shown at 6 and 7), is

filled with the articles or with baskets containing the articles as may be necessary and a small quantity of sawdust or wood scrap, coal tar, or oil, or most anything volatile in character or adapted to give off a gas when heated to the proper degree is placed in the casing with the articles. The case may be formed with a bottom integral with the side walls if desired, in which event the clay and sand for sealing may be dispensed with at the bottom. In the event that the case is sealed at the bottom with clay and sand as mentioned, the volatile material as sawdust or the like, is thrown into a case, there being some placed in each of the baskets (if baskets be used), or if oil or tar be used, the articles may be each covered with some of the material and sufficient volatile material should be placed in the case that, upon combustion taking place, the oxygen within the sealed case will be entirely utilized in supporting the combustion. After the articles have been placed in the box with the sealed or integrally formed bottom and volatile material placed therein, the cap plate 2 is positioned and covered with a clay composition 8 on which is a covering of sand 9 thus hermetically sealing the box.

When sawdust, for instance, is used in the case or pot, it ignites at about 600 degrees F. At this temperature the castings have not become heated to such degree that the oxygen may attack or combine therewith and, by reason of the combustion of the volatile material, the oxygen is entirely used up previous to the metal becoming heated to such degree that the oxygen may combine therewith, and during the subsequent continued heating up to the desired temperature, the metals are really gas-packed to the exclusion of oxygen. In the older method in which a packing as iron filings was used, a considerable period of time elapsed before the articles acquired the desired temperature. With the method of heating herein described, oxygen being excluded, the articles are not insulated as in the old method and thus more quickly attain the desired temperatnre and are more rapidly cooled resulting in a considerable saving in time.

With the older method of packing the castings the time required to anneal articles was from about seven to twelve days and with my improved method I have malleableized small cast articles in a period of fifty-two hours, the metal being fully equal if not superior in malleability to the articles treated for seven days period with the older method and being without the scale or skin-hardening as is desirable with a malleable casting. I desire it to be understood that all articles may not be properly annealed in fifty-two hours by my method as the time required to properly malleableize a casting depends largely upon its bulk. Articles having a comparatively small cross section of metal may be malleableized in a shorter period of time than articles materially greater in cross section as is well understood by those skilled in the art.

As heretofore stated, the pots or cases in which the articles are inclosed may be of various sizes or shapes depending upon the character of the articles to be treated, and the character or form of the case or pot forms no part of this invention, the illustration being only of a form of pot adaptable for the performance of the process. The essential characteristic of this process resides in heating the metal parts to the necessary degree of temperature while non-insulated from heat except by the case and in the absence of oxygen during that period in which oxygen would attack or combine with the carbon of the heated metal.

I have malleableized castings by the described process using all of the various substances mentioned containing volatile matter with equally beneficial results, and I am therefore led to believe that the character of the gas given off by the volatile matter is of little importance, the principal value of the combustible material being that in the combustion thereof the oxygen within the case is consumed. It is further evident that the oxygen, in a form in which it may combine with the heated metal may be removed in various ways and secure an equally beneficial result. It is therefore to be understood that a particular feature of the invention is involved in heating the cast iron articles to the necessary temperature practically in the absence of oxygen and the preferred method of exhausting the oxygen is by the use of a combustible material although this may be accomplished by other equally efficient methods.

It is evident that, in the use of a combustible material of the character stated to exhaust the oxygen, gas is produced containing carbon dioxid and carbon monoxid and the metal attains the desired temperature in the presence of a gas containing carbon. In this method the metal is not decarbonized as with the methods at present in use, but micro photographs indicate that the following result is attained: In the original castings the carbon is so thoroughly mixed with the metal that apparently each molecule of metal carries with it substantially the same proportion of carbon. After treatment by the method herein disclosed the carbon appears to have separated from the molecules of iron and gathered in small quantities comparatively uniformly distributed through the mass metal and being in the nature of flakes of carbon with comparatively pure metal surrounding and inclosing these coagulations. The malleableness of the metal is thus apparently produced by

separation of the carbon from the molecules and the segregation thereof within the mass of metal.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is—

1. The method of malleableizing metal consisting in placing the same in a hermetically sealed receptacle together with a quantity of material sufficient upon burning to exhaust the oxygen contained in the receptacle and form gas in a sufficient quantity to produce pressure preventing an inflow of gas containing oxygen, subjecting the receptacle to heat for a sufficient period prior to malleableizing metal and then allowing the same to cool while in the sealed receptacle.

2. The method of malleableizing metal consisting in placing the same in a practically hermetically sealed receptacle together with a quantity of material adapted to burn at comparatively low temperature and in quantity sufficient upon ignition to exhaust the oxygen contained in the receptacle and form a gas of sufficient volume at the pressure developed preventing an ingress of gas containing oxygen, heating the receptacle till the metal therein has attained a temperature of practically 1650 degrees F., then allowing the same to cool while in the sealed receptacle to a temperature not greater than 1000 degrees F.

3. In a method of malleableizing metal, the step consisting in heating the metal to the required temperature in a sealed receptacle in the presence of matter adapted to burn at low temperature and in sufficient quantity to exhaust the oxygen within the receptacle.

4. In a method of malleableizing metal the step consisting in heating the metal to the required temperature in a practically hermetically sealed receptacle in the presence of a quantity of matter in excess of that required to exhaust the oxygen upon burning and adapted to produce a gas containing carbon.

In testimony whereof, I sign this specification.

WALTER G. WEBSTER.