W. J. DIEDERICHS.

PROCESS FOR TREATING IRON.

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1,325,626.

Patented Dec. 23, 1919.

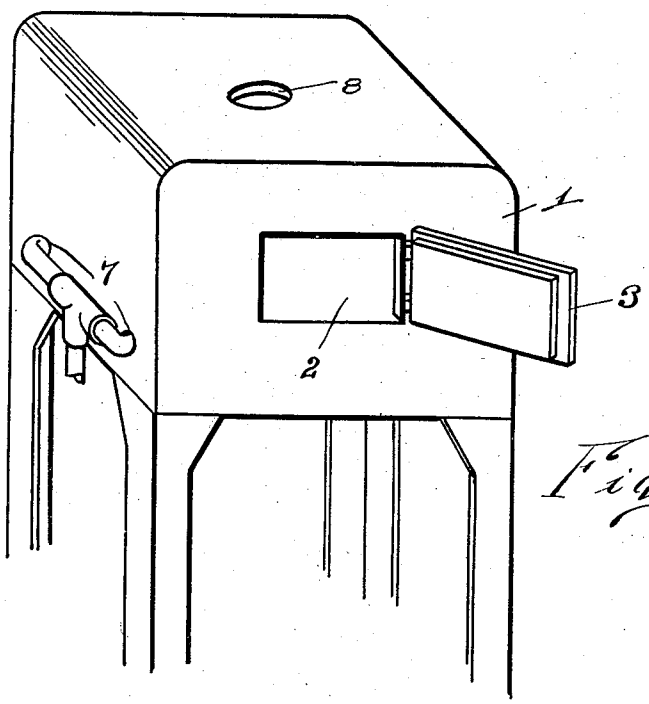


Fig. 1.

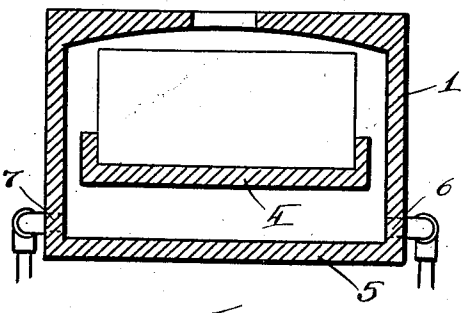


Fig. 2.

Witness

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To all whom it may concern:

Be it known that I, WILLIAM J. DIEDERICHS, a citizen of the United States, residing at Ithaca, in the county of Tomkins and State of New York, have invented certain new and useful Improvements in Processes for Treating Iron, of which the following is a specification.

The object of this invention is to provide a new and improved process for treating white cast iron by which an iron is produced having usually somewhat greater strength than white cast iron and much greater strength than gray cast iron.

This and other objects of the invention will be described in the specification and pointed out in the claim at the end thereof. Drawings have been added for the purpose of showing more fully how the process may be worked.

In the drawings Figure 1 is a perspective view of a furnace by which my process may be conveniently worked.

Fig. 2 is a vertical transverse section through the furnace illustrated in Fig. 1.

In the drawings like reference numerals indicate like parts.

In the drawings reference numeral 1 indicates the body of the furnace having an opening 2 in the front thereof to close which the hinged door 3 is provided.

Inside of the furnace a charging floor 4 is provided elevated above the main floor 5 of the furnace. Through the sides of the furnace are openings indicated at 6 and 7 through which the combustible mixture is projected into the furnace under the charging floor by the burning of which combustible mixture the furnace is heated. The products of combustion circulate through the furnace and above the charging floor on which the iron which is being treated is held after which the products of combustion escape through the opening 8 at the top of the furnace.

The furnace illustrated and described herewith is merely an elementary furnace and is shown for convenience and completeness only, it being understood that any type of furnace or heating apparatus by which the proper degree of temperature can be secured and maintained, so that iron can be exposed to that temperature, may be used, and in extensive operation it will be desirable to use a furnace that can be charged at one end with the iron and in which the iron will move progressively toward the other end of the furnace at a rate that will secure its exposure to the desired temperature for the proper length of time by the time it emerges at the other end of the furnace, and for this purpose any of the many well known types of furnaces may be used.

It will be also understood that the furnace may be heated by any of the well known fuels such as gas, oil, or powdered coal burnt in connection with air and they may be used in such proportions as to secure either an oxidizing, a neutral, or a reducing atmosphere in the furnace, or the heat may be secured electrically instead or by a combination of combustion and electricity, or in any other manner that may be desired so long as the proper temperature is secured.

The iron used in this process is known as white cast iron such as is used in making malleable castings. This white cast iron differs principally from ordinary gray cast iron in that while both contain carbon the white cast iron contains the carbon wholly or principally in the form of carbid of iron represented by the formula Fe_3C, while gray cast iron contains the carbon to a great degree in the form of graphite or graphitic carbon.

The process consists in raising the temperature of white cast iron with convenient rapidity to about 1,000 degrees centigrade and holding it at that temperature from about a half hour to several hours or more and then letting it cool normally without exposing it to drafts. This can be done best by covering the iron with sand, cement, or lime, or other neutral material. As a result of this treatment I have found that the tensile strength of the iron is usually more than the tensile strength of the white cast iron from which it is made so that it requires a much higher stress to break it. I have also found that the resulting iron possesses other properties that white cast iron does not possess as will presently be explained.

I have also found that the temperature may be varied with satisfactory results between 950 and 1050 degrees centigrade, and that the length of exposure to the heat may be varied within considerable limits, it being desirable sometimes to vary the temperature or time or both, according to the composition of the metal, the size and shape of the castings and the properties desired.

A temperature lower than 950 degrees centigrade can probably be used with a much

longer exposure and a temperature higher than 1050 degrees centigrade may be used with shorter exposure, but with danger of warping or melting.

I believe that by this process the carbid of iron of the white cast iron is partially decomposed into iron and carbon, but probably not to the same extent that takes place in making commercial malleable castings.

It is well known that ordinarily in making malleable castings the iron is packed with some oxidizing material in sealed cast iron boxes which are loaded into the furnace while the furnace is cold and the furnace is then gradually raised to a temperature of between 800 and 850 degrees centigrade and the furnace is maintained at that temperature for at least sixty hours after which the furance is gradually cooled, the whole process requiring a week or more of continuous operation. In the making of malleable castings the iron carbid is changed mainly to iron and graphite. The resulting iron has a lower tensile strength than the white cast iron from which it was made, but it will bend or stretch to an appreciable degree which is not true of the white cast iron.

In working my process I use white cast iron just as is used in making malleable castings, but I use a very different and shorter process and obtain a product that is radically different from malleable castings.

The product of my process differs from malleable cast iron in that it has a much higher strength and gives a much better machined or ground surface, but cannot be bent or stretched appreciably before breaking, and because of its increased tensile strength it is much superior to ordinary gray cast iron which it resembles in practically all other respects, such as stiffness, hardness, etc. In some respects it can be machined easier than ordinary gray cast iron because it does not have the hard scale that is ordinarily found on the surface of gray iron castings, and it machines more like soft steel or machinery steel than it does like cast iron. The cuttings from the stock show a tendency to form short ribbons rather than the granular cuttings of cast iron or the long ribbon cuttings from steel. The metal takes a finished surface like steel and in this respect it is in marked contrast with white cast iron which is very difficult to cut with machine tools because it dulls the cutting tools very rapidly. Cast iron made by this process is believed to be especially valuable wherever metal having the properties of gray cast iron, but of higher strength is desired, it having been shown that while gray cast iron has ordinarily a tensile strength of from 20,000 to 30,000 pounds per square inch and white cast iron has ordinarily a strength of from 45,000 to 50,000 pounds to the square inch, metal produced by this process has been found to have a strength of from 70,000 to 80,000 pounds to the square inch or even higher.

I claim:

The process for the heat treatment of castings from white cast iron which consists in (1) the subjecting of the casting to a heating in the neighborhood of 1000° C. for a period ranging from about thirty minutes to five hours, (2) the removing of the casting from the furnace after having been subjected to the above heat and (3) the cooling of the casting gradually and uniformly.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM J. DIEDERICHS.

Witnesses:
ERIC ISCHINGER,
EUGENE RAINES.