

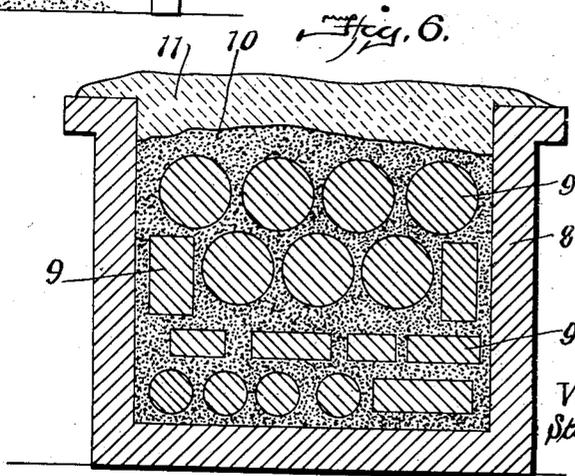
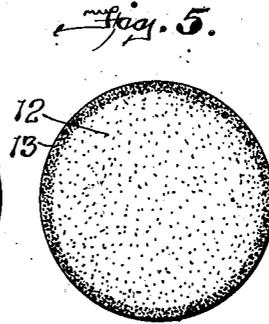
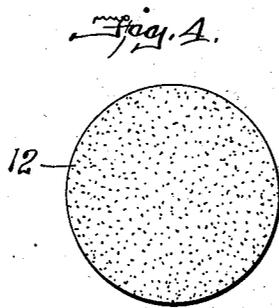
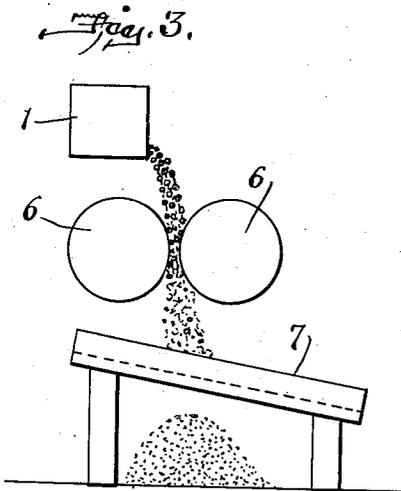
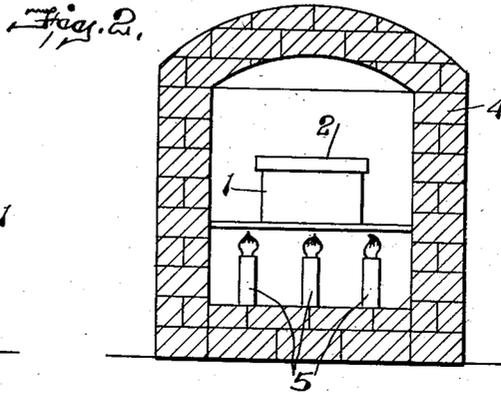
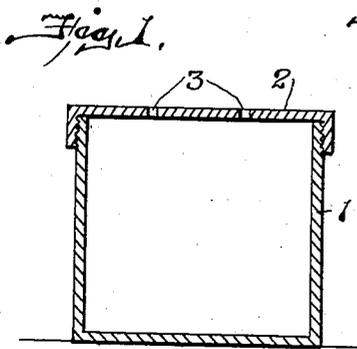
Sept. 9, 1924.

1,507,845

S. B. MATHEWSON ET AL

CARBONIZING COMPOUND AND PROCESS OF MAKING AND USING IT

Original Filed April 3, 1922



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By

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UNITED STATES PATENT OFFICE.

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CARBONIZING COMPOUND AND PROCESS OF MAKING AND USING IT.

Original application filed April 3, 1922, Serial No. 549,274. Divided and this application filed August 7, 1922. Serial No. 580,225.

To all whom it may concern:

Be it known that we, STANLEY B. MATHEWSON and WALTER K. JAMISON, citizens of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Carbonizing Compounds and Processes of Making and Using Them, of which the following is a specification, reference being had therein to the accompanying drawing.

Our invention relates to a carbonizing compound and the process of making it and using it for carbonizing metal, and in particular case hardened steel. The object of our invention is to utilize scrap leather by the treatment of our invention hereinafter described and claimed.

An additional object of our invention is to provide a new product by this treatment which may be utilized as a carbonizing material.

It is a further object of our invention to provide a method of utilizing our new product in case hardening metals such as steel in order to provide a very deep case in the minimum of time and economically.

This is a division of application No. 549,274 now Patent 1,471,563, of October 23, 1923.

Referring to the drawings:

Fig. 1 is a carbonizing can;

Fig. 2 is a diagrammatic view of the furnace in which the carbonizing can is placed with the scrap leather in order to reduce it to the form of the product now in question;

Fig. 3 is a diagrammatic view of the rolls and screen for determining the size and grade of the resulting carbonized product;

Fig. 4 is a cross section of a piece of steel before treatment with this carbonizing material;

Fig. 5 is a similar view after carbonization showing the case.

Fig. 6 is a section of a carbonizing box packed with the carbonizing material involved herein showing the articles being carbonized and the arrangement of their packing.

It will be understood that the foregoing

drawings are diagrammatic merely and are only for the purpose of illustration.

Referring to the drawings in detail, 1 is a carbonizing can or metal container having a lid 2 with apertures 3 in the lid thereof. The scrap leather is placed in this can and the can is placed in an oven 4. This oven is heated by any desired means as for instance by burners such as at 5. It will be understood that this illustration of the burners is typical only and that any kind of heating apparatus may be employed. The cans are covered and the lids are tight fitting. The openings 3 are provided in the cans to permit of the adjustment of the internal pressure and to permit of the escape of gases within the container.

The cans are preferably packed in an oil furnace, the temperature of which has been brought up to 1200 degrees F. at which time the burners are shut off and the furnace sealed with the exception of the regular ventilation therefor. It is customary to allow the furnace to remain closed for about six hours, after which time the containers can be removed and the finished product may be removed from each one of the individual containers. It is then crushed between the rollers 6—6 and screened by the screen 7 which is preferably about of a $\frac{3}{8}$ " mesh. The purpose of this is to reduce it to a suitable size for carbonizing purposes.

Process of hardening steel.

The finished product thus secured is used as follows. The parts to be carbonized are thoroughly cleansed in an alkali solution in order to remove all dirt and oil. Any cleansing solution of similar character may be employed. They are then packed in the boxes 8 so that the parts 9 will be arranged in layers in the carbonizing material 10. The top of the box is sealed with fire clay as at 11. It is the preferred practice to place a layer of the carbonizing material, then a layer of parts separated from one another by the carbonizing material, a layer of carbonizing material and another layer of parts, and so on. The whole packing is covered with a layer of the carbonizing material.

If desired the lid may be of metal and sealed with fire clay. Any common practice of this sort may be followed. The boxes are then placed in a carbonizing furnace and the temperature brought up to 1700 degrees F. and held at this temperature for about three hours but this time and temperature varies upon the depth of case desired, the size of the parts to be carbonized and the size of the carbonizing boxes.

In the event the furnace is cold when the boxes are placed therein a proportionately greater time will be necessary to effect the desired result.

The boxes employed are usually about eight and one-half inches in diameter, eleven inches deep and walls about $\frac{3}{8}$ " thick. It takes about three hours to bring a hot furnace up to the temperature of 1700 degrees, the temperature used for carbonizing.

For instance, in the case of carbonizing, S. A. E. 10-20 steel, it has been found good practice with this carbonizing material to hold the carbonizing heat at 1700 degrees F. for five hours when packed in a box of the above mentioned dimensions in order to obtain a $\frac{1}{2}$ " depth of case.

The preferred method after this temperature has been maintained this desired length of time is to allow the case hardened steel parts to cool in the carbonizing boxes before they are exposed to the air.

We do not desire to confine our invention to any particular type of furnace for the heat treatment. An open type furnace may be employed in which the temperature has been brought up to 1450 degrees F. before the parts are placed in the furnace. It will then customarily require about fifteen to twenty minutes to bring a $\frac{3}{4}$ " part, speaking in terms of diameters, up to 1450 degrees. The parts are then removed and quenched in brine or oil. It will be understood that these parts are always removed from the furnace and quenched on the rising heat.

In the second method a salt bath may be used and the parts are immersed in this solution. After the solution has been brought up to 1450 degrees F. the parts are removed and quenched in brine or oil. This type of furnace is usually designated a cyanide furnace. It will be understood that the fire does not come in direct contact with the work as a cast iron tank is placed in the furnace and the salt solution is placed in the tank and melted by the heat coming in contact with the outside of the tank.

It will be further understood that it is preferred by us that all quenching solutions be retained at as low a temperature as possible, which is accomplished by any well known means such as circulating the solution through cooling coils.

Referring to Figs. 4 and 5, 12 is a specimen of steel and 13 is the case.

When the carbonizing material so produced by the above mentioned process is examined with the naked eye it appears to be a porous cellular structure with a highly vitrified appearance. The apertures therein and therethrough are irregular in shape and size.

The carbonaceous material referred to herein as the carbonizing compound is generally composed of approximately 30% to 31% volatile matter, about 3% moisture, about 58% fixed carbon and about 8% ash. It will be understood that these amounts are approximate.

Upon analysis the ash will usually develop a ferric oxide color. The volatile matter consists of various gases. In these gases a varying amount of ammonia will be found and the usual reaction to litmus will be alkaline.

While we have shown and described certain features as constituting our invention, it will be understood that parts have been shown for purposes of illustration only, and that we do not desire to be limited to such details, as obvious modifications will occur to persons skilled in the art.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent, is:—

1. The process of case hardening metals consisting in heating the metal in the presence of carbonizing material consisting of ash moisture and fixed carbon containing material volatilizable by the heat to carry the carbon into the surface of the metal to be case hardened.

2. The process of case hardening metals consisting in heating the metals in an air tight vessel in the presence of carbonizing material consisting of ash moisture and fixed carbon containing material volatilizable by the heat to carry the carbon into the surface of the metal to be case hardened.

3. The process of case hardening metals consisting in heating the metal in an air-tight vessel to approximately 1700° F. in the presence of carbonizing material consisting of ash moisture and fixed carbon, the last containing material volatilizable by the heat to carry the carbon into the surface of the metal to be case hardened.

4. The process of case hardening metals consisting in heating the metal in an air-tight vessel in the presence of carbonizing material to a temperature approximately 1700° F., the carbonizing material containing ammoniacal volatilizable gases to carry the carbon into the surface of the metal to be case hardened.

In testimony whereof, we affix our signatures.

STANLEY B. MATHEWSON,
WALTER K. JAMISON.