(No Model.)

T. DOHERTY.

PROCESS OF PRODUCING MALLEABLE CAST IRON.

No. 575,518. Patented Jan. 19, 1897.

Fig. 1.

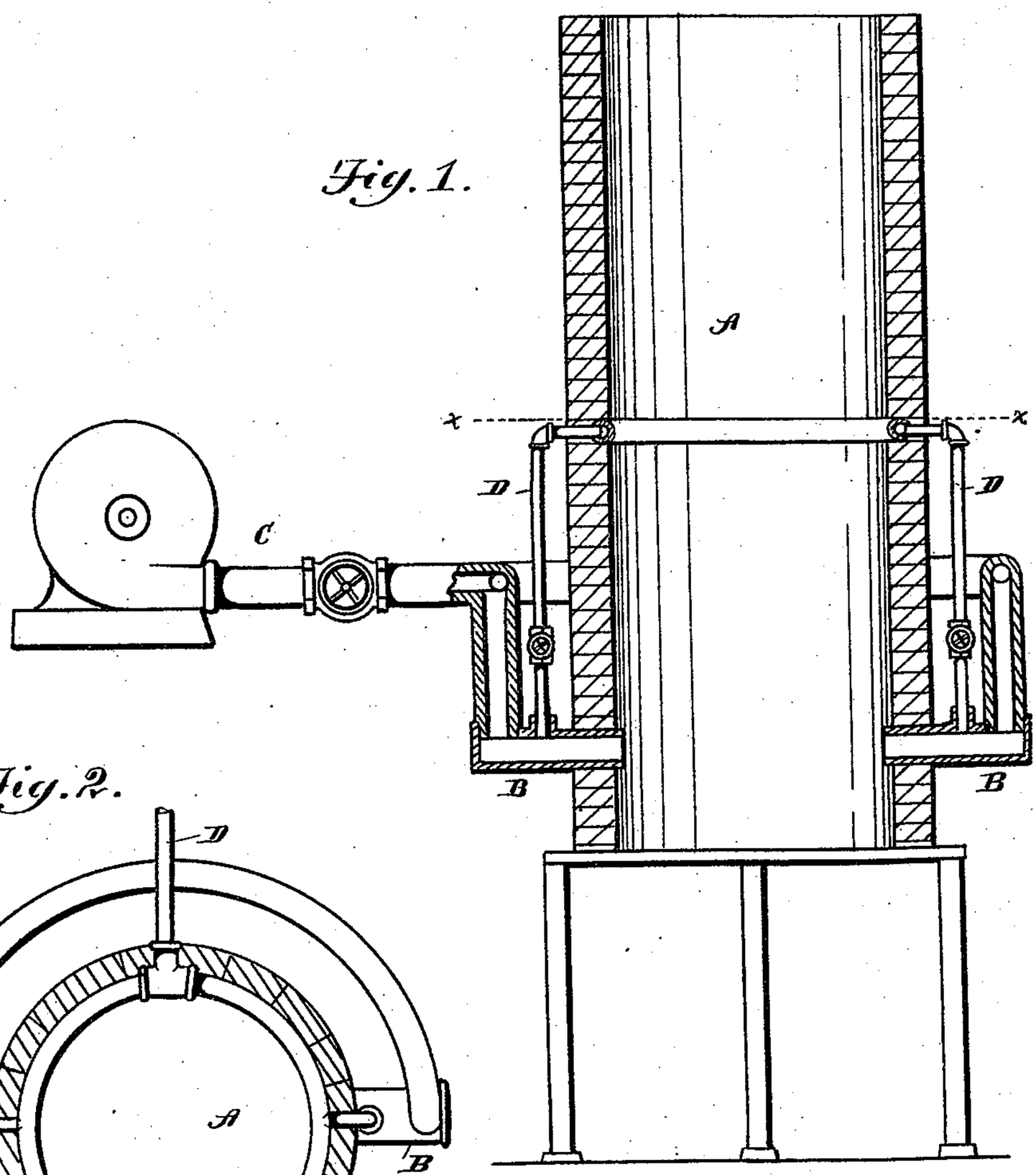

Fig. 2.

WITNESSES

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THOMAS DOHERTY, OF SARNIA, CANADA.

PROCESS OF PRODUCING MALLEABLE CAST-IRON.

SPECIFICATION forming part of Letters Patent No. 575,518, dated January 19, 1897.

Application filed February 21, 1896. Serial No. 580,145. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS DOHERTY, a citizen of Canada, residing at Sarnia, county of Lambton, Province of Ontario, Canada, have invented a certain new and useful Improvement in Processes of Producing Malleable Cast-Iron; and I declare the following to be a full, clear, and exact description of the invention, 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.

This invention relates to metal-founding, and has for its object an improved process employing a cupola or melting-furnace in which the iron is melted and a large portion of the impurities are burned out and expelled from the metal and the metal is rendered softer and stronger and almost malleable, approaching to the nature of mild steel, so that samples can be upset, drawn under a hammer to a limited degree, and castings made by it can be easily drilled, punched, or filed. Not only do I produce a superior quality of casting by this process, but I produce a much larger amount from a given quantity of iron charged into the cupola than can be produced by ordinary processes. For example, I have found experimentally that a charge of seven thousand seven hundred and forty-five pounds of common stove-plate scrap and two thousand two hundred and sixty-one pounds No. 2 pig-iron weighed into the cupola has produced nine thousand five hundred and eighty-two pounds of merchantable iron, showing a loss of only 4.23 per cent., whereas under ordinary practice the loss on this same mixture would have been from twenty to twenty-five per cent. I attribute this to the fact that by my process that portion of the scrap which has become oxidized is to a large extent deoxidized and resmelted into metallic iron instead of being carried off in the slag and lost, as is the case in ordinary practice.

In my process I place in the cupola the charges in the usual manner, but my cupola is so arranged that at the proper time I can turn into each twyer a steam-jet which combines with the carbon of the fuel the oxygen and nitrogen of the air-blast and produces a much stronger combustion and of a great reducing character, which acts chemically on the fusing metal, removes the oxygen from the oxid, and produces a much purer form of metallic iron.

Especially have I found that it is not necessary to be particular with the coal or coke that is used, as is the case in the ordinary process, where great care must be used to procure a coke or coal that is free from sulfur, whereas with my process a moderate amount of sulfur in the fuel is immaterial.

After placing the charge of coal or coke in the cupola the fire is started and allowed to burn until the gases burn through. The iron is then charged in and the cupola filled with alternate layers of fuel and iron, when the draft is controlled till the time the air-blast is turned on, and then in a few minutes the steam is turned on, moderately at first, and the color of the evolved gases watched until they assume the peculiar hydrogen color of this element. This is evidence that the combustible impurities in the iron have been burned out and the chemical reaction has taken place in the cupola. The molten metal then begins to run out at the tap-hole in a very heated condition.

I have found that the amount of steam required depends very much on the atmospheric conditions, more steam being required on a dry day than on a wet or foggy day, and it also depends somewhat on the character of the fuel, for if the fuel is high in sulfur more steam is required than otherwise; but the test in all cases is watching the color of the flame as it passes up past the charge-hole in the cupola, as hereinbefore specified.

In the drawings, Figure 1 shows a cupola with mechanism for producing the combined air-blast and steam-blast. Fig. 2 shows a cross-section at the line $x\ x$ of Fig. 1.

A indicates the cupola.

B B indicate the twyers.

C indicates the air-blast, and D the steam-pipe. Both the air-blast and steam-pipe are provided with suitable valves, the air-blast is produced by any suitable means, and the steam is heated in any suitable heating apparatus near at hand, or it may be superheated, if desired, above the twyers inside the linings by running a pipe around, which

is heated by evolved gases in combustion, and thereby save the extra trouble and cost of an extra or separate heating apparatus. Such an apparatus is shown and described in my Patent No. 565,262, granted August 4, 1896.

What I claim is—

The process of producing a cast-iron approaching in quality to malleable cast-iron or mild steel, but retaining some of the characteristics of cast-iron, consisting in charging a cupola with fuel and metal, raising the heat of the contents of the cupola to a high heat and liquefying the metal with the aid of an air-blast, injecting steam in connection with the air-blast through the metal, and regulating the steam-jet until the flames above the molten iron show a distinct hydrogen color, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

THOMAS DOHERTY.

Witnesses:
CHARLES F. BURTON,
FRANCES CLOUGH.