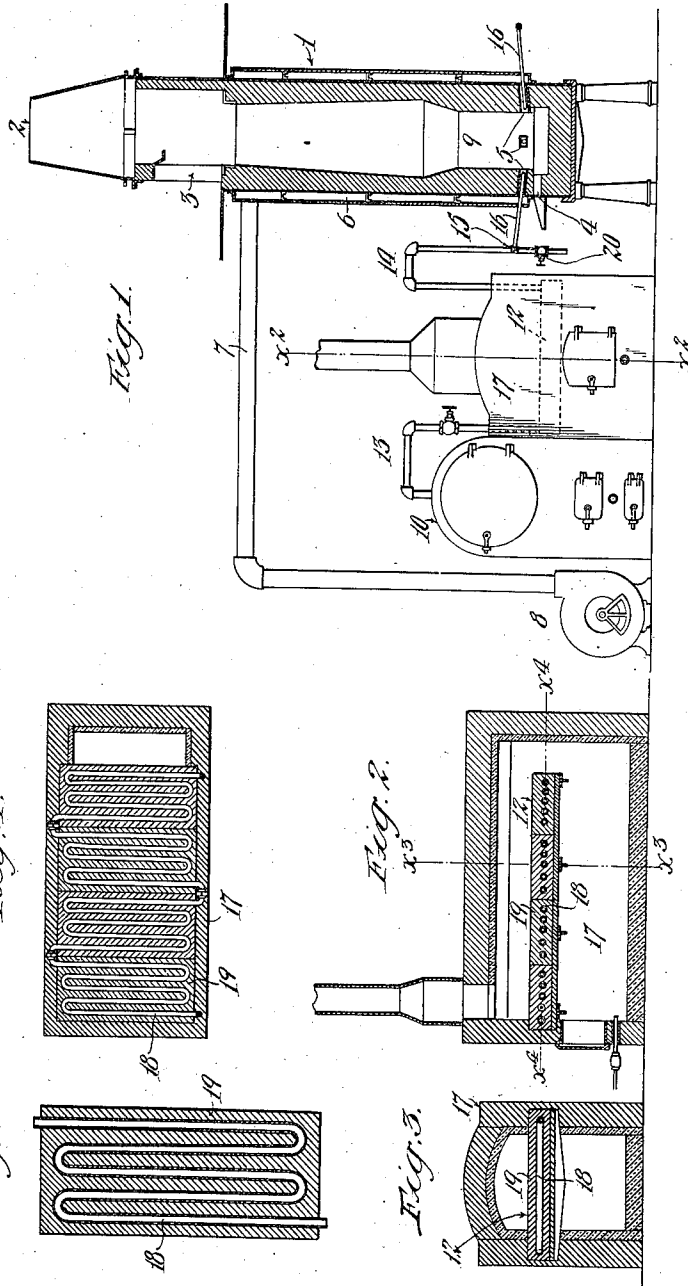


W. H. KELLY.
PROCESS FOR PURIFICATION OF METALS.
APPLICATION FILED FEB. 8, 1909.

1,041,801.

Patented Oct. 22, 1912.



Witnesses:
Louis W. Gray.
Frank L. Johnson.

Inventor
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Patented by Louis W. Gray.

UNITED STATES PATENT OFFICE.

WILLIAM H. KELLY, OF LOS ANGELES, CALIFORNIA.

PROCESS FOR PURIFICATION OF METALS.

1,041,801.

Specification of Letters Patent.

Patented Oct. 22, 1912.

Application filed February 8, 1909. Serial No. 476,864.

To all whom it may concern:

Be it known that I, WILLIAM H. KELLY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Process for Purification of Metals, of which the following is a specification.

This invention relates to the purification of metals and particularly to means whereby iron or other metals may be purified in the process of melting and casting the same.

The main object of the present invention is to provide for the elimination of impurities from iron or other metals and the improvement of the quality thereof.

In my application Serial No. 448,971, filed August 17, 1908, I have disclosed a process for reducing ores and metals by the use of superheated steam. The present invention is distinguished from that disclosed in said application in that an air blast is used in conjunction with the superheated and partly dissociated steam, the air blast and the superheated steam each supplementing the action of the other.

The accompanying drawings illustrate an apparatus suitable for carrying out the invention in connection with a cupola for melting iron.

Figure 1 is a vertical section of the cupola showing in elevation the apparatus for applying the invention thereto. Fig. 2 is a vertical section on the line x^2-x^2 in Fig. 1 through the super-heater. Fig. 3 is a longitudinal section of the super-heater on line x^3-x^3 in Fig. 2. Fig. 4 is a horizontal section on the line x^4-x^4 in Fig. 2 through the super-heater. Fig. 5 is a horizontal section of one element of the super-heater.

1 designates a cupola which may be of any usual construction, being provided with a stack or gas outlet 2, charging opening 3 and tap-hole 4. Into the lower portion of the cupola open a plurality of air inlets 5 which communicate with a space around the cupola formed by a jacket 6 which surrounds the cupola, said space being supplied with air under pressure forced through a pipe 7 by a blower 8 so that a forced draft of air passes into the lower part of the cupola chamber 9 through the air inlets 5. Means are provided for supplying super-heated steam at these air inlets, said means consisting of a boiler or steam generator 10 and a super-heater 12 connected by a pipe 13 with said

boiler and by a pipe 14 with a manifold 15 provided with nozzles or pipes 16 extending into respective air inlets 5 to deliver to each air inlet a blast or jet of super-heated steam. The super-heater comprises one or more coils or heating members 12 inclosed in a suitable heating chamber or furnace 17, the construction of said coil being preferably as shown in Figs. 2 and 3. Each heating member or element 12 consists of a pipe 18 of iron or other suitable material, bent backward and forward to form a coil, which is embedded in cast iron 19 cast thereonto to form a block or slab through which extends a tortuous passage formed by the pipe. The above-described superheater is adapted to heat the steam to a sufficiently high temperature to cause more or less dissociation of the steam into oxygen and hydrogen.

The process is carried out as follows in the above-described apparatus: A metal, for example, scrap iron or pig iron, or ores with coke, etc., is charged into the cupola chamber 9, and the blower 8 and the steam generator 10 and superheater 12, 17 are set in operation, it being understood that the stack or chamber of the cupola is first brought to a proper temperature by starting a fire therein in any well known manner. The air passing from 8 through conduit 7 is conducted by the casing or jacket 6 around the cupola so as to absorb heat therefrom and to pass to the air inlets 5 in a more or less heated condition. By reason of its pressure the air enters through these inlets as a blast or forced draft producing in conjunction with the carbon of the charge a sufficiently high temperature to melt the metal in the charge. At the same time the steam generated at 10 passing through the superheater is more or less dissociated into oxygen and hydrogen and the resultant gases are delivered through pipes 14, 15 and 16 to the several air inlets 5, so that dissociated oxygen and hydrogen are delivered to the melting chamber together with and in contact with the air blast.

I have found that with the above-described process cast iron of inferior quality is transformed into a condition resembling steel, being fine grained, tough and susceptible of being hardened. The oxygen and hydrogen in a dissociated condition combine with and take up the impurities of the metal, for example, phosphorus and sulfur, and carry the same away with the blast.

In order to prevent any liability of explosions from water or unvaporized water in the fire chamber, I provide a conduit or pipe from a valve 20 adjacent to the superheater which is wholly free from any valves or traps wherein or whereby a back pressure or stoppage of steam might occur, thereby causing a condensation in the pipe which would be thereafter carried into the fire chamber. The pipe being unobstructed throughout its entire length through the superheater to the delivery ends thereof causes the superheated vapors to be discharged into the fire chamber at the same pressure as that of the superheater, the pressure in the superheater being regulated by the valve 19 between the boiler and superheater.

The apparatus herein shown and described for carrying out my invention is applied to what is commonly known as a cupola furnace and is ordinarily used for the purpose of remelting metals for casting purposes, but I desire it to be understood that my process and the means for carrying the same into practice are applicable to any and all kinds of furnaces whether for remelting metals or for roasting or reducing metals, and I do not confine myself to any

particular style or construction of the furnace.

What I claim is:

1. The process of purifying metals which consists in melting the metals and directing on the body of metal as it melts a current of air together with steam which has been heated to a sufficient temperature to cause dissociation of a part thereof.

2. The process of purifying metals which consists in melting the metals in a chamber and directing into said chamber air together with steam which has been superheated to a sufficient temperature to cause dissociation of a part thereof.

3. The process of purifying metals which consists in charging the metal into a chamber, melting the metal by the action of a fire in conjunction with an air blast, and passing into the chamber together with the air blast nascent oxygen and hydrogen.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 4th day of January 1909.

WILLIAM H. KELLY.

In presence of—

ARTHUR P. KNIGHT,
FRANK L. A. GRAHAM.