

UNITED STATES PATENT OFFICE.

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COMBUSTION-CRUCIBLE.

SPECIFICATION forming part of Letters Patent No. 653,823, dated July 17, 1900.

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To all whom it may concern:

Be it known that I, PORTER W. SHIMER, a citizen of the United States, residing at Easton, county of Northampton, and State of Pennsylvania, have invented certain new and useful Improvements in Combustion-Crucibles, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements in crucibles for fusing or highly heating metal and other substances in an atmosphere of any gas desired.

The improvements constituting the present invention have been designed with particular reference to crucibles for use in making carbon combustions in iron and steel analysis, and they will for convenience be described in that connection, it being understood, however, that the invention is not to be thus limited, but that it is applicable to and includes crucibles used in other ways and for other purposes than the combustion of carbon.

The method heretofore practiced for the determination of carbon is exceedingly expensive and otherwise open to objection in that it necessitates the employment of a costly and bulky combustion-furnace, a platinum or porcelain tube, and a supply of pure oxygen. Such apparatus also, aside from its first cost, is further expensive in that in its use great waste of gas and heat results, the gas consumed and heat generated being altogether out of proportion to the small amount of carbon burned, or, in other words, many times in excess of the gas and heat which would be required in a proper apparatus for the combustion of a given amount of carbon. Such apparatus is further objectionable because with it it is sometimes impossible in places where the gas-pressure is low to obtain a heat of the required temperature for the complete combustion, for example, of graphite in pig-iron.

It is the object of the present invention to overcome these objections and to provide means whereby an ordinary crucible of platinum or other suitable material may be adapted for carbon combustion and other purposes and which will render the employment of the costly and bulky combustion-furnace and consequent waste of gas and heat, as in prior apparatus, unnecessary. The means pro-

vided by the present invention for these purposes, briefly stated, consists in a stopper adapted to tightly close the mouth of the crucible and provided with means for the circulation through it of a cooling medium, as water, by which the stopper is kept cool and a tight joint maintained between it and the crucible, and with means for the circulation of air or the like through the crucible during combustion, and, further, in the combination therewith of means whereby the crucible itself is also cooled exteriorly.

The invention also consists in other features, which will be hereinafter referred to and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is an irregular sectional elevation of a crucible provided with the present invention, and Fig. 2 is a plan view of the same.

Referring to said drawings, 1 represents the crucible, which is preferably of platinum and is circular in cross-section, with its walls flaring upwardly, so as to provide a bell-shaped mouth for the reception of a stopper 2, while 3 represents a supporting-table of asbestos-board for the crucible, which passes through an opening in said table a distance equal to about one-third the depth of the crucible, and 4 represents a portion of a blast-lamp and Bunsen burner for heating the crucible. The crucible is provided with a thin strengthening-band 5 at its extreme upper portion for strengthening the crucible at this point and preventing stretching thereof. This band consists, preferably, of a strip of sheet copper, brass, or other suitable metal, with its ends brazed, which while preventing stretching of the crucible at the upper portion will not at the same time make it too rigid and unadaptable.

The stopper 2 corresponds in shape and taper to the bell-shaped mouth of the crucible 1, so that when introduced therein it will conform thereto. It is important that there should be no variation in the shape or taper of the stopper and the mouth of the crucible for the reason that if such variation exists, and particularly if the taper of the stopper is greater than that of the mouth of the crucible, the stopper is liable to be forced out of the mouth of the crucible by the pressure within the crucible when the latter is heated.

It is also important, in order to secure a perfect fit and tight joint, that no irregularities by way of projections, indentations, rough joints, or otherwise should exist in the adjacent portions of the faces of the stopper and the mouth of the crucible.

The stopper 2 is provided at its lower end with a gasket 6, stretched tightly thereon, of elastic yielding material, preferably rubber—such, for example, as the black rubber bands of commerce—which when the stopper is introduced into the crucible is tightly compressed between the faces of the stopper and mouth of the crucible, and thereby forms a perfectly-tight joint.

To preserve the rubber band or gasket against injury by heat from the crucible, the stopper is made hollow, so as to provide a chamber or receptacle closed by the top of the stopper for the reception and circulation of a cooling medium, as water, which is introduced therein through a tube 7, provided with a flexible connection 8, leading to a source of supply, and is discharged therefrom through a tube 9, which, for a purpose hereinafter described, empties into a circular trough 10, resting upon the table 3 and inclosing the crucible 1, this trough in turn being provided with a waste pipe or tube 11. The circulation of the cooling medium through the stopper 2 maintains the latter in a cool condition, and thereby preserves the gasket 6 against injury by heat from the crucible when the latter is heated to the temperature required for the combustion of carbon. The tubes 7 and 9 may be secured to the stopper in any suitable way and tight joints secured by brazing, soldering, or otherwise.

To further preserve the gasket 6 against injury by heat from the crucible, the latter is enveloped by a wick 12, of any suitable fibrous material, coiled about the crucible at a point below the gasket 6, and the ends of which rest in the trough 10, the coiled portions of the wick being thus kept moist by the water discharged into said trough by the discharge-pipe 9, leading from the water-chamber of the stopper, and thus keeping the upper portion of the walls of the crucible in a cool condition.

To avoid possible melting of the lower exposed edge of the gasket by the heat radiating from the bottom of the crucible, the latter may be supplied, to a depth equal to about one-third to one-half its height, with asbestos laid over the substance to be treated.

The stopper 2 also bears inlet and outlet tubes 13 15, preferably of brass, brazed or soldered in, for the circulation of air or the like through the crucible during combustion of the carbon, the upper end of tube 13 being bent outwardly at substantially a right angle and provided with a flexible connection 14, leading to a source of supply, and the tube 15 similarly bent and provided with a flexible connection 16, leading to a point of delivery. The inlet-tube 13 extends down-

wardly into the crucible about two-thirds the depth of the crucible and is bent inwardly toward the center thereof, while the lower end of the tube 15 is substantially flush with the bottom of the stopper.

The stopper may consist of brass, copper, or any other suitable material and may be made in any suitable way, as by casting or by stamping the parts thereof out of sheet metal and afterward uniting them by solder or brazing or by spinning the body portion of the stopper in a single piece out of sheet metal and securing the top thereto by soldering or brazing.

Although the invention has been described as applied to a crucible for the combustion of carbon and to such crucible supplied with air, it is to be understood that the invention is not to be so limited, as it is manifest that the invention is equally applicable to crucibles used for other purposes and into which there may be introduced instead of air, through the supply-tube 13, oxygen, hydrogen, nitrogen, steam, or whatever gas may be required in the tests or uses to which the crucible is applied. It is also to be understood that the invention is independent of any particular form of heater or furnace, although the present invention makes it possible to dispense with the costly furnaces heretofore used and adapts the crucible to heating without loss of gas or heat by heaters of the most simple and inexpensive kind.

What is claimed is—

1. A crucible-stopper provided with means for the circulation through it of a cooling medium and with means for circulating air or the like through the crucible, substantially as described.

2. Hollow crucible-stopper 2 provided with inlet and outlet tubes 8 9 for a cooling medium and with means, including inlet and outlet tubes 13 15 passing through the stopper, for circulating air or the like through the crucible, substantially as described.

3. The combination with a crucible, of a stopper therefor, and an elastic gasket between the two, said stopper being provided with means for the circulation through it of a cooling medium and with means communicating with the crucible for the circulation of air or the like through the latter, substantially as described.

4. The combination with a crucible, of a stopper therefor, a gasket of elastic material between the two, said stopper being provided with means for the circulation through it of a cooling medium, and a wick of fibrous material leading from a source of supply of cooling medium and passing around the crucible, substantially as described.

5. The combination with crucible 1, of stopper 2 closing the mouth of the crucible and bearing inlet and outlet tubes 8, 9, for the circulation of a cooling medium through the stopper, gasket 6 between the stopper and crucible, trough 10 for containing a cooling

medium, and wick 12 leading therefrom and passing around the crucible, substantially as described.

5 6. The combination with crucible 1, of stopper 2 closing the mouth of the crucible and bearing inlet and outlet tubes 8, 9, for the circulation of a cooling medium through the stopper, and inlet and outlet tubes 13, 15, for the circulation of air or the like through the

crucible, and gasket 10 between the stopper 10 and crucible, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PORTER W. SHIMER.

Witnesses:

REUBEN KOLB,
ALICE FENICLE.