F. J. TONE.

METHOD OF PRODUCING SILICON CARBID.

APPLICATION FILED JULY 11, 1908.

908,357. Patented Dec. 29, 1908.

Fig. 1.

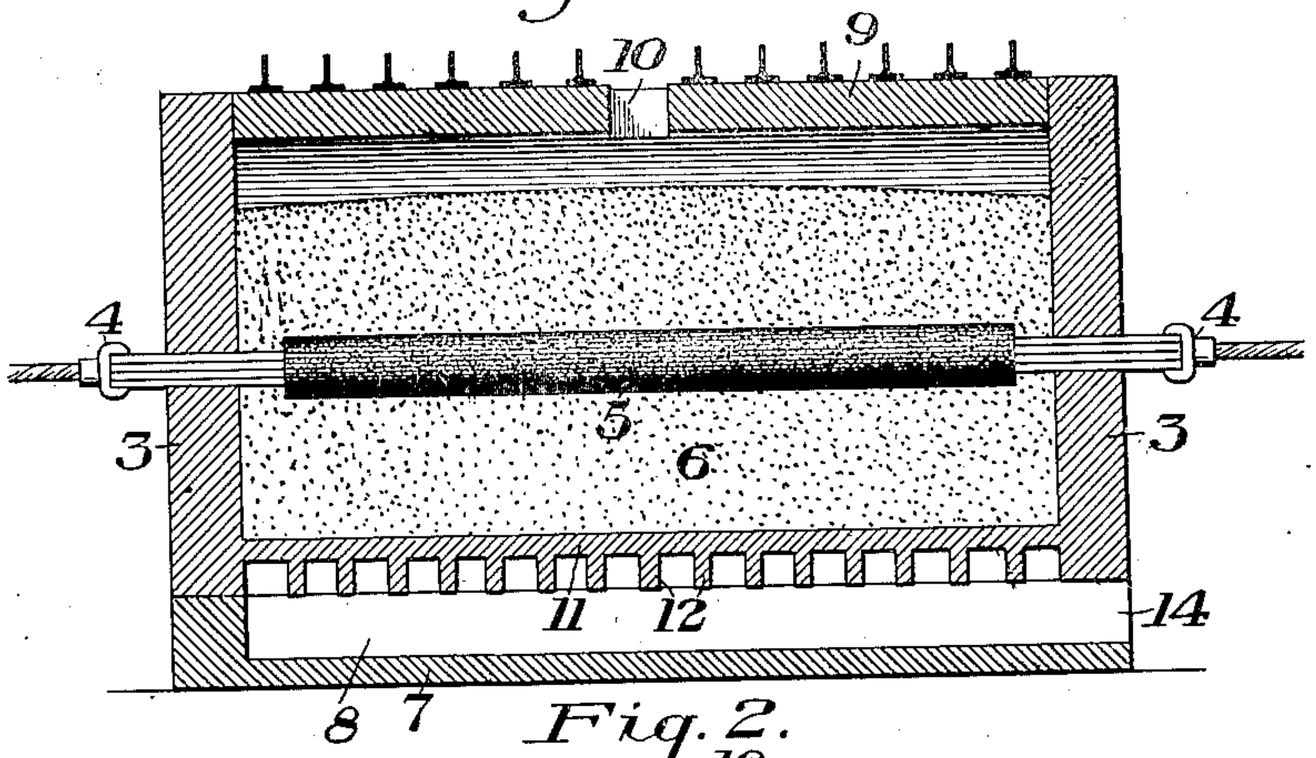


Fig. 2.

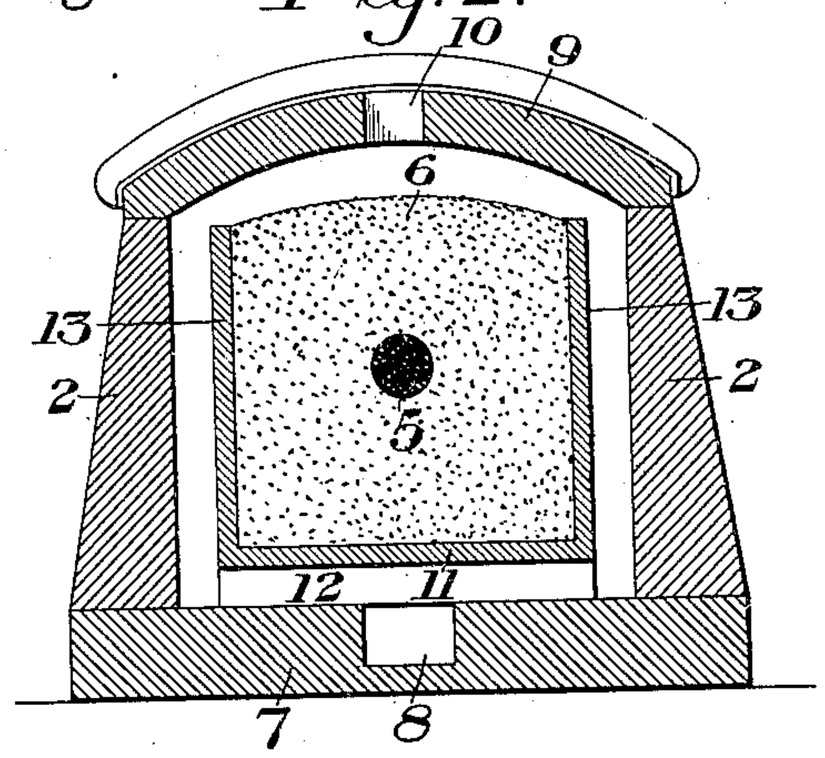
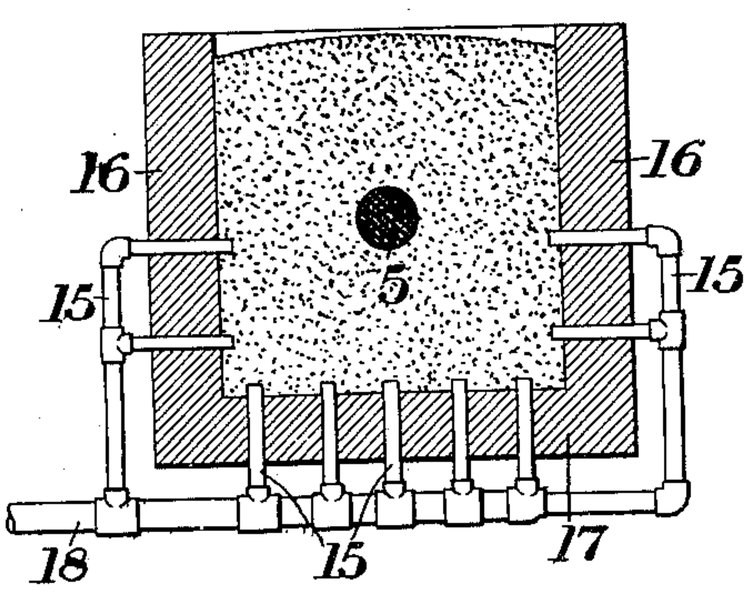


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK J. TONE, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO THE CARBORUNDUM COMPANY, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF PENNSYLVANIA.

METHOD OF PRODUCING SILICON CARBID.

No. 908,357. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed July 11, 1908. Serial No. 443,076.

To all whom it may concern:

Be it known that I, FRANK J. TONE, of Niagara Falls, Niagara county, New York, have invented a new and useful Method of Producing Silicon Carbid or Electric-Furnace Products, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical longitudinal section showing a furnace arranged for carrying out my invention; Fig. 2 is a cross-section of the same; and Fig. 3 is a view similar to Fig. 2 showing another form of furnace.

My invention relates to the manufacture of products by electric heat, and more particularly to the manufacture of silicon carbid.

The object of the invention is to increase the efficiency of the process, and the output of the furnace; and to reduce the cost.

In the ordinary manufacture of silicon carbid, a mixture of silica and carbon is subjected to heat in an electric furnace of the resistance type, the heat being generated by a passage of current through a resistance conductor. At the beginning of the heat the temperature of the resistance conductor and the charge mixture is substantially that of the surrounding air and the whole mass must be raised to a high temperature before the reaction begins. In heating the charge up to this critical temperature, a large amount of electric heat is generated at high expense.

I have discovered that I can increase the efficiency and output of the furnace as well as reduce the cost, by utilizing the heat of combustion in initially heating the furnace, and that I can thereby bring the mixture up to nearly the reacting temperature. My invention, therefore, consists in initially heating the charge by the products of combustion, and thereafter continuing the operation by electrically developed heat.

Figs. 1 and 2 show one type of furnace for carrying out my invention. In these figures I show a rectangular furnace chamber having side walls 2, 2, and end walls 3, 3, through which extend the terminal electrodes 4, 4. A core of resistance material 5 connects the electrodes, and is surrounded by the charge of sand and coke 6. The bottom of the furnace is shown at 7, having a channel 8 for receiving products of combustion. The top of the furnace is closed by a refractory cover 9 having an outlet 10 for the products of combustion. The charge is held within a receptacle having a bottom 11 supported above the main bottom by ribs or flanges 12, and side walls 13 inclose the charge, these being spaced apart from the outer furnace walls. The heated gases of combustion may be led from any suitable furnace and enter the base at the port 14. They traverse the longitudinal channel within the bottom, and then spread out under the bottom of the charge and ascend around the sides, and thence flow from the top of the charge to the top central outlet port. In their passage through the furnace they heat the inner receptacle and its inclosed charge. When the maximum degree of temperature has been obtained by the action of the heated gases, the electric current is supplied, and by its passage through the resistance core the charge is further heated to a temperature of conversion, and the operation goes on in the ordinary manner. The combustion gases may be continued through the electric heating or not, as desired.

In Fig. 3 I show another form of furnace in which the gases of combustion are brought into intimate contact with the charge. In this case the charge of silicious and carbonaceous material is provided with an excess of carbon. The furnace is of the well known type for producing silicon carbid except that supply pipes 15 project into the charge through the side walls 16 and the bottom 17 of the furnace, these leading from a main pipe 18. The heated gases of combustion are passed into the main, and thence into the silicon carbid furnace, and when the charge in the vicinity of the inlet ports from the pipes is heated to redness, or to an ignition temperature, air or oxygen-bearing gases are introduced through the pipes. The oxygen combines with the excess carbon of the charge to heat the contents of the furnace. After this initial heating by combustion of the excess carbon, the electric current is turned on in the same manner as in the previous form and the operation thereupon continued, as in the ordinary method.

The advantages of my invention result from the use of the heat of combustion for the initial heating of the charge, this being followed with electrically developed heat. In this manner I increase the efficiency in output of the furnace and decrease the cost

of manufacture, since the electric heat is concentrated upon the reaction period.

Many changes may be made in the form and arrangement of the apparatus, and in the method of initial heating, without departing from my invention. The process may also be applied to the production of any material in electric resistance furnaces.

I claim:—

1. The process of producing silicon carbid, which consists in embedding a resistance conductor in a charge of silicious and carbonaceous material, initially heating the charge by combustion and then passing current through the resistance conductor sufficient to produce silicon carbid.

2. A process of producing silicon carbid which consists in embedding a resistance conductor in a porous charge of silicious and carbonaceous material, initially heating the charge by passing heated gases therethrough, and then passing current through the resistance conductor sufficient to produce silicon carbid.

3. A process of producing silicon carbid which consists in embedding a resistance conductor in a porous charge of silicious and carbonaceous material, said charge containing an amount of carbon in excess of that required for the formation of silicon carbid, initially heating the charge by combustion, said combustion being accomplished by the combustion of the excess carbon of the charge mixture and oxygen-bearing gases introduced into said charge, and then passing current through the resistance conductor sufficient to produce silicon carbid.

4. A process of producing silicon carbid which consists in embedding a resistance conductor in a charge of silicious and carbonaceous material, initially heating the charge by combustion and then in addition to combustion heating, passing current through the resistance conductor sufficient to produce silicon carbid.

In testimony whereof, I have hereunto set my hand.

FRANK J. TONE.

Witnesses:

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FRED I. PIERCE.