F. J. TONE.

PROCESS OF PRODUCING SILICON CARBID.

APPLICATION FILED JUNE 14, 1907.

941,339. Patented Nov. 23, 1909.

Fig. 1.

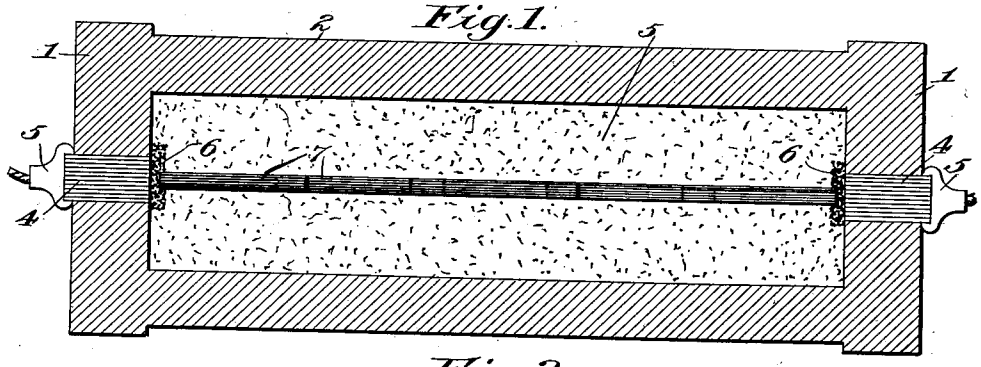


Fig. 2.

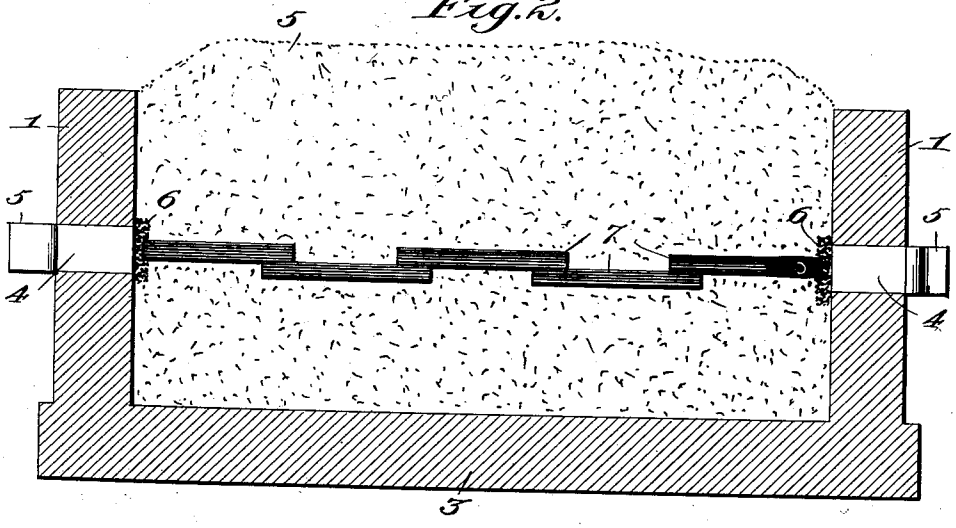
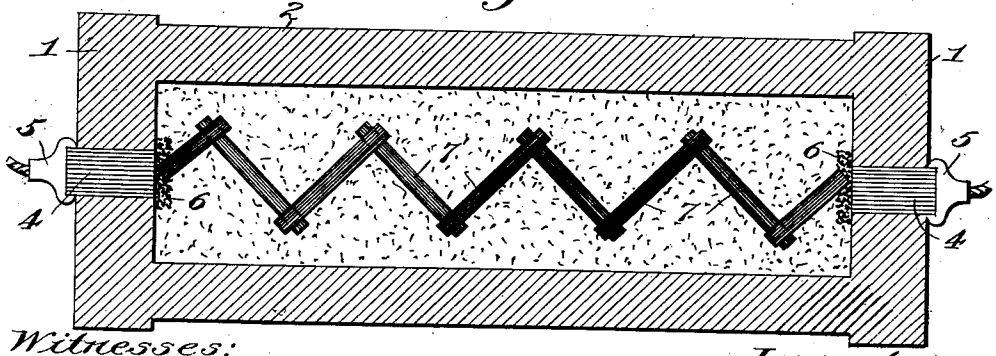


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING SILICON CARBID.

941,339. Specification of Letters Patent. Patented Nov. 23, 1909.

Application filed June 14, 1907. Serial No. 379,034.

To all whom it may concern:

Be it known that I, FRANK J. TONE, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Processes of Producing Silicon Carbid, of which the following is a specification.

In the commercial manufacture of silicon carbid, it is customary to heat the charge of silicious and carbonaceous materials in an electric furnace, by means of a resistance-core of granular or pulverized carbon embedded within and extending longitudinally through the charge-body. The specific conductivity of granular carbon is low and it is necessary to employ a core of considerable diameter to carry the requisite current. The charge is a poor conductor of heat, the temperature-gradient from the core outward is steep and the zone within which silicon carbid is produced is radially narrow. Much heat is lost by radiation and conduction from the outer surface of the productive zone and the thermal efficiency of the furnace varies inversely as the area of this outer surface. It also varies inversely as the diameter and mass of the resistance-core, which must be raised to a high temperature throughout. In removing the silicon carbid from the furnace portions adjacent to the core are more or less mixed with granular carbon therefrom.

According to the present process, the resistance-core of granular carbon is replaced by a relatively narrow core consisting of separate shaped resistance-pieces arranged longitudinally in direct electrical contact and preferably disposed in a zigzag line between the furnace-terminals, the pieces being loosely connected at the angles of the zigzag. The resistance-pieces are preferably supported by the charge, in such a manner as to remain in contact notwithstanding settling of the charge, since separate supports resting on the base or floor of the furnace afford direct paths for the escape of heat.

Two constructions which have been found effective are shown in the accompanying drawings, in which:

Figures 1 and 2 are longitudinal horizontal and vertical sections, respectively, of a charged electric furnace having a straight core; and, Fig. 3 is a longitudinal horizontal section of a charged furnace having a zigzag core.

These furnaces have the usual end walls 1, side walls 2 and floor 3, of firebrick. Terminals 4 coupled to electric mains 5 pass through the end walls, contact with the ends of the core being made by interposed layers 6 of powdered coke. The charge-mixture, consisting essentially of silica and carbon, surrounds the core and fills the furnace.

The core shown in Figs. 1, 2 consists of separate carbon bars or blocks 7, arranged in a substantially straight line between the terminals 4 and supported by the charge, in which they are embedded. Alternate bars are superposed at their ends upon the intermediate bars, the adjacent surfaces being in direct electrical contact.

The core shown in Fig. 3 differs from that of Figs. 1, 2 only in that the bars 7′ are arranged in a zigzag line, the ends of the bars crossing at the angles. The resistance of the core per unit of furnace length is thereby increased, correspondingly increasing the energy-capacity and output of the furnace without decreasing its thermal efficiency.

The described arrangement of the carbon bars enables them to maintain contact with each other and with the terminals notwithstanding the settling of the charge which occurs as reduction proceeds. All of the heat from the core is transmitted to the charge, and the mass of the core and radiating surface of the product are greatly decreased. The silicon carbid is of better quality, is free from adherent carbon and is more abundantly and cheaply produced than by the use of a granular core.

I claim:

1. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a linear series of separate shaped resistance-pieces of predetermined cross-section and resistance arranged in direct electrical contact, and passing an electric current through said conductor.

2. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces of predetermined cross-section and resistance arranged longitudinally in direct electrical

contact and supported by the charge, and passing an electric current through said conductor.

3. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces of predetermined cross-section and resistance loosely and directly connected and so arranged as to maintain contact notwithstanding lateral movement of the conductor, and passing an electric current through said conductor.

4. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces of predetermined cross-section and resistance loosely and directly connected, supported by the charge, and arranged to maintain contact notwithstanding movement of the charge, and passing an electric current through said conductor.

5. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces arranged longitudinally in direct electrical contact and disposed in a circuitous line between the terminals of the furnace, and passing an electric current through said conductor.

6. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces arranged longitudinally in direct electrical contact and disposed in a zigzag line between the terminals of the furnace, and passing an electric current through said conductor.

7. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces arranged longitudinally in direct electrical contact and disposed in a zigzag line between the terminals of the furnace, the resistance-pieces being loosely connected at the angles of the zigzag, and passing an electric current through said conductor.

8. The process of producing silicon carbid, which consists in embedding in a charge of silicious and carbonaceous materials a resistance-conductor consisting of a series of separate shaped resistance-pieces arranged longitudinally in direct electrical contact and disposed in a zigzag line between the terminals of the furnace, the resistance pieces being loosely connected at the angles of the zigzag and being supported by the charge, and passing an electric current through said conductor.

In testimony whereof, I affix my signature in presence of two witnesses.

FRANK J. TONE.

Witnesses:
FRED I. PIERCE,
CHARLES CHORMANN.