Patented Oct. 28, 1924. 1,513,435

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.

MOLD.

No Drawing. Application filed May 26, 1923. Serial No. 641,766.

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 a new and useful Improvement in Molds, of which the following is a full, clear, and exact description.

This invention relates to molds, and particularly to permanent molds such as are used for casting metals. Generally speaking, two general classes of molds for use in casting metals are in common use. The use of silica sand, moistened with water or mixed with various organic binding agents is well known. The use of dies made of steel or plaster of Paris is also quite extensively practiced, particularly for casting the lower melting alloys. Steel molds or parts of molds have also been used for the production of cast iron articles, such as sewer pipe, but these are generally unsatisfactory because the surface is chilled and is so hard that cutting or shaping is almost impossible.

I have discovered that silicon carbide grains made into proper shapes by bonding with suitable binders and vitrified to a solid body may be advantageously used in many cases to replace either the sand, metallic or other molds now in common use, especially in the making of permanent molds, that is, molds which are used for more than one casting operation without being broken up in a manner similar to sand molds. The particular property of silicon carbide which makes it highly suitable in the making of permanent molds for casting is its high thermal conductivity, which is about eight times that of molding sand when formed into the molds commonly used in casting. The thermal conductivity of silicon carbide is, however, only about one-third that of iron.

For rapid work and satisfactory production, a material for making a permanent mold should be able to carry away heat from the fluid metal fast enough to bring the metal of the casting to a solid condition in a much shorter time than is the case in sand molds, so that the mold can be opened, the casting dropped out, and the mold then closed up again ready to pour the next casting. However, it should not have such a high thermal conductivity that the casting is chilled and converted into chilled iron on its surface or throughout the casting. I have discovered that silicon carbide has a thermal conductivity of the exact range necessary to produce this result, and is unique in this respect of standing midway between the metals and other mineral substances in the scale of thermal conductivity.

When properly bonded into permanent form, as for example, by my process disclosed in United States Patent No. 1,204,211, November 7, 1916, silicon carbide refractory blocks have great strength, not only at ordinary temperatures, but even at the highest temperatures attained in the casting of the common metals and alloys. The molds thus made have great resistance to temperature changes and do not crack, spall, warp or distort in shape.

As distinguished from sand molds, which may be used for a single casting only, bonded silicon carbide molds under suitable condtions may be used repeatedly in the form of permanent molds, thus saving the labor of molding. Iron or other metals cast in silicon carbide molds do not stick to it, thus saving the labor of cleaning the casting. Since the molds are already vitrified they do not give off gas as does a sand mold, and one of the principal causes of unsound castings is therefore removed. While steel and metal molds may be used over and over, their cost, especially for intricate designs, is much greater than for similar molds made from silicon carbide and a bonding agent, as above described.

As a preferred method of making this form of mold, I take a mixture of ten parts of highly refractory clay and ninety parts of silicon carbide grain of mixed sizes from 14 mesh to the finest powders. This mixture is moistened with water and worked into the desired shape. It is then dried and burned at high temperature to form a thoroughly vitrified article, and is then ready for use in casting metal shapes. The mold may be designed in parts to facilitate its being opened and drawn away from the solidified casting in any of the well known methods used in the art, and these parts may be mounted in suitable frames or flasks so that they may be assembled and disassembled in a convenient manner. The thermal conductivity may be varied by varying the amount of silicon carbide in the mixture, and I may accordingly reduce the rate of cooling the casting by re-

ducing the amount of silicon carbide and increasing the amount of ceramic binder.

While I have described my invention as a mold for casting, it will be understood that I use this term in a general sense, it being intended that it shall include, for example, the use of my material in cores. In such case, the core may be left unvitrified or the composition may be varied when it is desired to break up the core.

I claim:

1. A permanent mold for casting comprising a vitrified mixture of silicon carbide and ceramic binder.

2. A permanent mold for casting comprising a vitrified mixture of silicon carbide and clay.

3. A permanent mold for casting comprising a vitrified mixture of approximately 90 parts of silicon carbide and 10 parts of a ceramic binder.

4. A permanent mold for casting comprising a vitrified mixture of silicon carbide and a ceramic binder, the silicon carbide being in sufficient proportion to give it a thermal conductivity greater than a sand mold.

5. A permanent mold for casting comprising a vitrified mixture of silicon carbide and a binder, the silicon carbide being in grains of varying sizes.

6. A permanent mold for casting comprising a vitrified mixture of silicon carbide and a binder, the silicon carbide being in grains of varying sizes but none larger than 14 mesh.

In testimony whereof I have hereunto set my hand.

FRANK J. TONE.