

UNITED STATES PATENT OFFICE.

CHARLES McKNIGHT, JR., OF SEWICKLEY, PENNSYLVANIA.

METHOD OF CASTING METAL.

1,331,816.

Specification of Letters Patent.

Patented Feb. 24, 1920.

No Drawing.

Application filed December 20, 1919. Serial No. 348,309.

To all whom it may concern:

Be it known that I, CHARLES McKNIGHT, Jr., a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Methods of Casting Metal, of which the following is a specification.

My invention relates to the art of casting iron and steel products, whether in their initial, final or intermediate state of manufacture.

The objects thereof are to reduce porosity, such as blow-holes, and remove oxid inclusions at or near the surfaces of cast ferrous articles, to improve the surfaces of such articles, and to facilitate the removal of the articles from their molds.

For the purposes of illustration merely, I will describe my invention as practised in the production of steel ingots in steel or cast-iron molds, but it is to be understood that I do not limit my invention to the production of any definite article or to the casting of any definite metal, or to the use of any type of mold, for it may be applied to the casting of any iron or steel article in any mold, whether composed of iron, steel, molding sand, or other material. It is applicable to the surfaces of cores as well as to the surfaces which form the outer walls of the cast articles.

Hitherto the surfaces of ingots where they contacted with the molds have contained holes formed by gas entrapped or confined in the ingots at or near their surfaces. After rolling the ingots, these holes, commonly called blow-holes, result in various defects, such as seams, sponginess, or cracks, which have to be chiseled or otherwise cut or removed. The removal of blow-holes or other porosity is a very expensive operation and causes much delay in the manufacture of the ultimate product. By the present invention, I prevent or, at least, lessen the formation of blow-holes, improve the surfaces of the cast articles and facilitate their removal from their molds. By this invention I also reduce metallic oxides which may be included in the metal.

I prevent or lessen the formation of blow-holes and the inclusion of metal oxides by applying to the article-forming surfaces of the mold a suitable agent which combines with the metallic oxides and the gases tending to form blow holes. This agent may be one or

more of several substances, such as aluminum, titanium, magnesium, or other equivalents. I regard the application to molds of any agent capable of combining with the gases which tend to form blow-holes as coming within my invention, no matter what materials compose the molds or the articles cast. I have found powdered aluminum to be a very satisfactory agent. It may be applied in a dry condition by blowing or dusting it on the mold surfaces. I may mix it with various dilutents, or carriers, as molasses or water or colloidal solutions, for example, and apply the resultant composition with a brush, a spraying nozzle, or other device. I find that, by employing a colloid, preferably in solution with water, as my carrier for the aluminum, the aluminum is held in suspension indefinitely which facilitates its application to the mold. As examples of such colloids I cite the following: glue, starch, sodium silicate, tannic acid, dextrose, and gelatin. I may employ in addition to the said agent, aluminum or its equivalent, a substance, such as graphite, to lubricate the mold and prevent the sticking of the article therein. Graphite serves to give more body to the composition and enables it to spread more and cover a larger surface. The graphite may be applied separately or with one or more of the other ingredients. I may apply silica wash or slaked lime to the mold either separately or mixed with one or more of the other ingredients to prevent the sticking of the article in the mold. As examples of the composition which I have found satisfactory I give the following: first, two gallons of sodium silicate, fifty pounds of powdered aluminum, twenty pounds of graphite, and water sufficient to make about fifty gallons of the mixture; second, one pint of molasses, two pounds of powdered graphite, one pound of powdered aluminum and water sufficient to make about two gallons of the mixture.

While I have given various illustrations of compositions containing one or more gas-combining and reducing agents, and of various substances which may, if desired, be used with one or more of such agents without first forming compositions therewith, I wish it to be understood that these illustrations are merely examples of the many means and methods by which my invention may be practised. In applying my coating to molding surfaces, I use substantially the

amount needed to cause the removal of included oxids and gases, and not enough to materially alter the physical characteristics of the metal. By physical characteristics I mean hardness, ductility, and tensile strength and the like. I am not attempting to form a coat of aluminum or other material on castings; I employ as much aluminum or its equivalent as is required to combine with the gases which tend to form blow-holes.

This application is a continuation in part of my application, Serial Number 323,926, filed September 15, 1919.

I claim:

1. The method of reducing porosity and lessening included metal-oxids at or near the surface of ferrous castings which consists in applying to the molding surface a coating having the property of combining with the gases and oxids in the molten metal and then running the molten metal into the mold, said coating containing substantially the amount needed to cause the removal of the occluded gases and the oxids and not enough to materially alter the physical properties of the metal.

2. The method of reducing porosity and lessening included metal-oxids at or near the surface of ferrous castings which consists in applying to the molding surface a metallic coating having the property of combining with the gases and oxids in the molten metal and then running molten metal into the mold, said coating containing substantially the amount needed to cause the removal of the occluded gases and the oxids and not enough to materially alter the physical properties of the metal.

3. The method of reducing porosity and lessening included metal-oxids at or near the surface of ferrous castings which consists in applying to the molding surface a coating having the property of chemically combining with the gases and oxids in the molten

metal and then running the molten metal into the mold, said coating containing substantially the amount needed to cause the removal of the occluded gases and the oxids and not enough to materially alter the physical properties of the metal.

4. The method of reducing porosity and lessening included metal-oxids at or near the surface of ferrous castings which consists in applying to the molding surface a metallic coating having the property of chemically combining with the gases and oxids in the molten metal and then running the molten metal into the mold, said coating containing substantially the amount needed to cause the removal of occluded gases and the oxids and not enough to materially alter the physical properties of the metal.

5. The method of reducing porosity at or near the surface of ferrous castings which consists in applying to the molding surface a coating of powdered aluminum and then running the molten metal into the mold.

6. The method of reducing porosity at or near the surface of ferrous castings which consists in applying to the molding surface a coating of powdered aluminum together with a suitable carrier and then running the molten metal into the mold.

7. The method of reducing porosity at or near the surface of ferrous castings which consists in applying to the molding surface a coating of powdered aluminum together with a suitable carrier, containing a colloidal substance, and then running the molten metal into the mold.

8. The method of reducing porosity at or near the surface of ferrous castings which consists in applying to the molding surface a coating of powdered aluminum with graphite and a suitable carrier and then running the molten metal into the mold.

Signed at Pittsburgh, Pa., this 18th day of December, 1919.

CHARLES McKNIGHT, JR.