UNITED STATES PATENT OFFICE.

GEORGE WEBB, OF JOHNSTOWN, PENNSYLVANIA.

LINING FOR MOLDS FOR METALS.

SPECIFICATION forming part of Letters Patent No. 223,565, dated January 13, 1880.

Application filed October 8, 1879.

To all whom it may concern:

Be it known that I, GEORGE WEBB, of Johnstown, Cambria county, in the State of Pennsylvania, have invented certain new and useful Improvements relating to Linings for Molds for Metal, of which the following is a specification.

My invention is intended particularly for the cast-iron molds in which to mold the rectangular ingots in which cast-steel is brought from the melted condition to a solid form for subsequent working; but it may be applied in various other positions and to molds generally.

I employ the mineral known as "dolomite," a magnesian limestone. In one mode of working the invention I simply apply the calcined dolomite mixed with sufficient water to form a wash. This is applied in a coating over the whole inner surfaces of the molds, which may be effected by dipping the molds therein when the latter are, as I prefer, made in sections. Under other circumstances the wash may be applied by a brush, or in any manner which will cover the surface with the wash.

Another mode of applying the dolomite is to evaporate the water from the wash until the mass becomes a paste about as thick as putty, and then subject slices of it to a pressure—say ten thousand (10,000) pounds per square inch; then let these slabs air-dry completely. The material thus formed may be held in a desired position in any suitable manner to form the interior surface of the whole or a portion of the molds. I esteem it especially important to thus line the bottoms of large ingot-molds where the melted steel is allowed to fall with great violence from a high point. If allowed to strike on the iron of the mold it is liable to cut into it; but if guarded with my dolomite lining it will remain for an indefinite period.

In any mode of using it the dolomite possesses the property, which is particularly important in steel-molding, of neutralizing the tendency to form gas, which is incident to the molding of steel within metallic inclosures or molds.

For some reason, not yet fully ascertained, there is a strong tendency in melted steel to form bubbles or pipings near the surfaces. It seems that the gas which causes these pipings is the result of a reaction of the carbon in the melted steel when it contacts with the silicon in the metal of the mold. My dolomite wash tends greatly to prevent this. The presence of dolomite in thin sheets has a similar effect.

The thin dolomite wash, which is, in short, a whitewash made from magnesian lime, may be formed of magnesian lime and sufficient water to form a liquid thin enough to be spread with a brush. The calcined dolomite should, of course, be in the condition of quicklime not previously air-slaked.

To produce the slabs, I can simply evaporate the water and press and dry the wash, as above indicated, or, as I prefer, dry it before pressure, and grind and thoroughly knead it with crude petroleum. This being made of the proper consistency is then subjected to strong pressure and reduced to the shapes desired, and subsequently air-dried. One of these slabs should be laid in the bottom of an ingot-mold before pouring, and a similar one may be put on the top of the fluid metal so soon as the pouring is completed. When, as I prefer, the ingot is to be compressed in the fluid state the set or top piece is applied upon the dolomite slab thus rested upon the top of the metal.

In casting shapes, as railroad-car wheels, or other articles of steel, the metal mold may be coated with the wash, or wholly or partly lined with the thin slabs, or both these steps may be taken. It is especially important to give the increased thickness due to the slabs in cases where, like the base of an ingot-mold, the material of the mold is subject to the impact of a stream of melted steel.

My dolomite lining in either form may be applied in molding any metals, though I do not esteem the use for other metals as important as for steel.

Modifications may be made in some of the details. I can use naphtha, or various petroleum products, light and heavy, even paraffine under proper conditions, to mingle with the fine dolomite in the slabs. I also believe those oils may be used with proper precautions in forming the wash to be stuck directly upon the inner face of the mold.

The theory of the action is not essential so

long as the improvement is realized in the manner above stated; but I will state my belief. The carbon of the dolomite (and petroleum where the latter is used) preserves the carbon of the steel from attack by the one-half ($\frac{1}{2}$) to three and a half ($3\frac{1}{2}$) per cent. of silicon in the cast-iron of the mold.

In producing steel by cementing, it is found that as the carbon travels into the mass of wrought-iron whenever it arrives where silicates are located a reaction occurs, which will rend apart the solid iron, and the steel produced is blistered in exact proportion to the amount of such silicates located in spots in that iron.

There is very little piping in casting iron if careful treatment is observed; but in steel no amount of care will wholly prevent piping. Casting steel in sand molds, unless a large amount of silicon beyond the carbon units is left in the steel, is sure to result in a porous mass. The only cheap and practicable matrix yet found to cast steel in is cast-iron. With this pipings will exist near the surface.

Comparing the difference between melted steel and melted iron, two ingredients in the iron are almost absent in the steel. The silicon is about all gone, and, say, about nine-tenths ($\frac{9}{10}$) of the carbon is gone. The iron casts sound; the steel casts porous.

It seems that the gas forming pipings is generated by the combination and reaction of silicon from the iron mold with the carbon in the steel, and that when the silicon is all absent from the steel the pipings are in inverse ratio to the carbon in the steel—the more carbon the less pipings. I therefore conclude we ought to have a surplus of carbon placed between the fluid steel and the silicon in the iron mold.

The carbon in my dolomite wash or plate will intercede and arrest the combination and reaction with the elements of the mold, and the molten mass will be free from the gases resulting from reactions; also, the carbon will be a uniform per cent. throughout the entire mass. I know of nothing so well adapted for that purpose as the carbonate procured by burning dolomitic limestone and applying in the manner shown.

I use the term "dolomite" to mean a magnesian limestone, such as commonly occurs in nature—a mixture or combination of the carbonates of lime and magnesia, having the crystalline form of calx-spar. I prefer the most common proportions, those in which the carbonates unite in the proportions of single equivalents.

I claim as my invention—

1. A metallic mold faced on its inner surface with dolomite, so as to serve as herein specified.

2. A mold coated on its interior with a mixture of dolomite and water, of the consistency set forth.

In testimony whereof I have hereunto set my hand this 3d day of October, 1879, in the presence of two subscribing witnesses.

GEO. WEBB.

Witnesses:

A. MONTGOMERY,

DAVID MCABEE.