

UNITED STATES PATENT OFFICE.

BENJAMIN F. WATKINS, OF JOHNSTOWN, PENNSYLVANIA.

MODE OF MAKING MOLDS FOR STEEL CASTINGS.

SPECIFICATION forming part of Letters Patent No. 281,212, dated July 10, 1883.

Application filed September 23, 1882. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. WATKINS, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented a new and Improved Mode of Making Molds for Steel Castings; and I do hereby declare that the following is a full and exact description thereof.

To make plain my mode of making molds for steel castings, to enable those skilled in the art to make a mold, I will first describe the difficulties in making molds for a metal which is of so high a temperature as molten steel.

A dry-sand mold made of material ordinarily used for iron will not answer. It develops too much gas from the organic matter in the sand, which blows the casting, and the sand, not being sufficiently refractory, partially fuses and hardens upon the surface of the steel casting. If purely silicious sand of ordinary fineness is used instead of molding-sand, although it is sufficiently porous to admit of the exit of the gas, and being pure, it will neither give off much gas nor fuse when it comes in contact with the metal, yet it will be found impossible to get a clean casting of steel from such a mold, for the melted metal at its high temperature will permeate the interstices of the sand and will make a hard crust of mixed sand and metal on the surface of the casting, which has to be cut away before reaching solid and clean metal, entailing a great amount of labor and expense in its removal, and the result is a scabby and dirty-looking surface. Another disadvantage of this permeation of the sand by the steel is that the molds thus permeated become too hard and unyielding, and as the shrinkage of steel at the high temperature at which it is melted is so much greater than the shrinkage of iron, (being about double,) the crust thus formed is liable to crack or break the casting or tear off any projections on the casting before it is stripped of the sand forming the mold, which it is impracticable to do before the casting has become cool and is done shrinking. I am aware of the use of pure silica only for the purpose of making molds for steel castings; but I have found in my repeated experiments as a practical molder that the methods heretofore employed in using it cannot be made successful. I also found, after a great deal of experiment, that the so-called "flux" or "scoria" that formed on

the outside of the castings was not due to the fluxing of the material used in making the molds, but was actually a mass of steel and sand combined, caused by the penetration of the molten steel through and into the interstices of the sand of which the mold was composed. It matters not how pure in silicious matter the material used in forming the mold may be, good castings in steel cannot be made—especially castings with projections upon them—unless the material used is pulverized to that degree of fineness that it will present on the surface of the mold a body so compact and smooth that it is impossible for the molten steel to penetrate, which I accomplish in my practice as follows:

My method is to combine silicious sand with sufficient flour or other proper glutinous material to give it the required tenacity for ordinary molding purposes, and then to use for large or heavy castings a wash of silica ground to a very fine or impalpable powder and mixed with a sufficient quantity of flour or other proper binding material and water to make it adhere to the mold, thus forming a close and compact refractory surface on the mold without leaving any interstices through which the molten metal may permeate. For small or light castings I use finely-powdered silica mixed with flour or other proper binding material as a facing for the mold, and do not use the wash. After the molds are finished they are to be thoroughly dried before casting.

I am aware that it is not new to use silicious sand reduced by pulverization to the ordinary degree of fineness as a material for mold and core making; but such use of such material in that condition does not, for the reasons already stated, attain the objects I have in view, and hence does not come within the scope of my present invention, and is accordingly disclaimed. In the working of my invention it is essential that the silicious sand, after being brought to the ordinary degree of fineness by pulverization, should be still further reduced, by grinding or other suitable means, to an impalpable powder or dust, and then that the coarser grains or particles should be removed by sifting or bolting through bolting-cloth of fine mesh. The product thus obtained, when mixed and used or applied as above described,

gives a dense, firm, hard mold or mold-facing, so far free from porosity that the molten steel fails to permeate the same or to unite therewith, as it does in the use of molds of un-
5 ground and unbolted silicious material, or material reduced only to the ordinary degree of fineness.

My method of obtaining silica sufficiently pure for my purpose is to take sandstone,
10 quartz, or any ordinary clean sharp sand such as is in use in foundries, and grind and bolt it, reducing it thus to a very fine powder. This powder I then combine with water and sufficient flour or other proper glutinous
15 matter to fit it for molding purposes, and this composition I use as a facing, in making my molds, for all those parts which come in contact with the metal. In addition to this, I use
20 of the above-described composition mixed with

water to about the consistency of cream and applied with a fine brush to the surfaces of the mold which come in contact with the metal.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, 25 is—

1. The improved method of preparing molds for steel castings, which consists in facing or washing them with a preparation of pure finely-pulverized silica, substantially as and for the
30 purpose herein specified.

2. A mold for casting steel composed of silicious sand or other suitable material faced or washed with an adhesive preparation of pure finely-pulverized silica, substantially as and
35 for the purpose herein specified.

BENJAMIN F. WATKINS.

Witnesses:

CYRUS ELDER,

JAMES M. SWANK, Jr.