C. B. JACOBS.

RESISTANT SURFACE AND METHOD OF MAKING THE SAME.

APPLICATION FILED APR. 21, 1906. RENEWED MAR. 12, 1910.

954,965. **Patented Apr. 12, 1910.**

Fig. 1

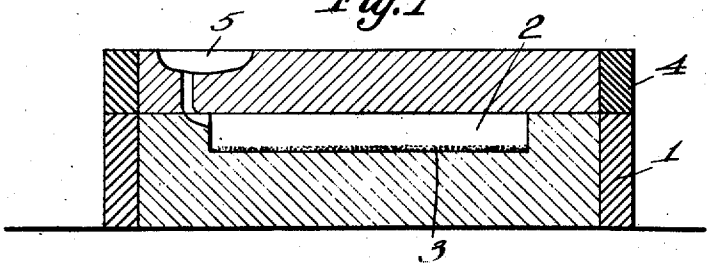


Fig. 3,

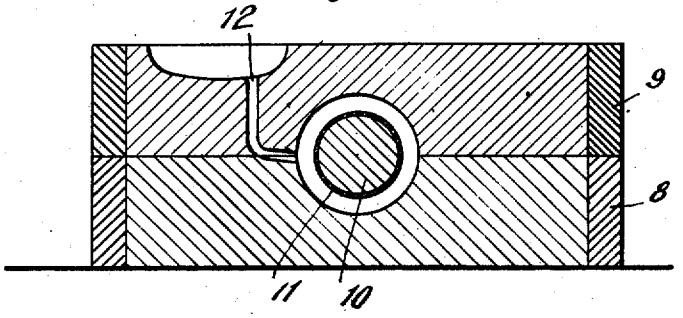


Fig. 2,

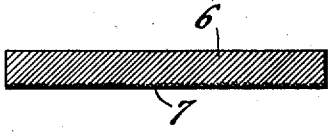
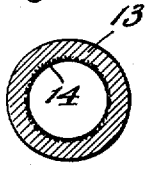


Fig. 4,



WITNESSES:

Wm. J. Dolan.

John Conahey

INVENTOR

Charles B. Jacobs

BY

J. H. Freeman

ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES B. JACOBS, OF PORT CHESTER, NEW YORK, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO MURRAY AND JACOBS MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

RESISTANT SURFACE AND METHOD OF MAKING THE SAME.

954,965. Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed April 21, 1906, Serial No. 312,967. Renewed March 12, 1910. Serial No. 548,801.

To all whom it may concern:

Be it known that I, CHARLES B. JACOBS, a citizen of the United States, and a resident of Port Chester, Westchester county, State of New York, have invented certain new and useful Improvements in Resistant Surfaces and Methods of Making the Same, of which the following is a specification.

My invention relates to the manufacture of surfaces adapted to resist abrasion, and it has for its object to provide a surface which, while adapted for a wide variety of uses where abrasion is to be avoided, is particularly adapted to resist abrasion by the impact of abrasive material, as in dredging pumps and pipes, disintegrating mills, and the like.

My invention also has for an object to provide a method whereby such surfaces may be given the desired shape and dimensions and may be produced easily and cheaply.

These and other objects of the invention will in part be obvious and in part be more fully explained in the following description.

The invention consists in the novel improvements, constructions, and methods of construction herein set forth.

I have discovered that a practically indestructible surface may be produced by forming it of elements harder than the abradant to which the surface is subjected, providing that when subjected to impacts the said elements are at least in substantially as fine a state of division as the abradant to the impacts of which the surfaces are subjected, and so closely arranged as to protect the binding material from the action of the abradant. The binding material should be of such a character and so disposed as to hold the surface elements against the impact of the abradant. I have also discovered that a surface of the character specified may be produced by forming a mold for the article, covering or coating a mold surface which is to give shape to a resistant surface of the article with a layer of the harder elements which are to give the surface its resistant quality, and then introducing into the mold a liquid which will penetrate the said layer without destroying the elements thereof and which will thereafter become sufficiently rigid to effectively resist displacement of said harder elements by the abradant. For example, to produce a surface well adapted to resist the abrading action of gritty substances, as sand or rock fragments, I form a sand mold, such as those employed for making iron castings, then cover such of the mold surfaces as are to give shape to the resistant surface of the article with a layer of corundum, carborundum, alundum, or similar natural or artificial material which is harder than the gritty substances, said harder material being comminuted, preferably somewhat finer than the fragments of the gritty substance when the latter act by impact. This layer should cover the surface of the mold so that the interstices between the particles or elements will be so small that the binding material which fills the same shall be protected by the hard elements from abrasion. The layer may be, and preferably is, given a substantial thickness, as say from a thirty-second to an eighth or even a quarter of an inch, where the coarser grades are employed. Where the surface of the mold which is to receive the layer of hard mineral elements does not occupy such a position that the material will rest thereon by gravity, the material may be mixed with and temporarily held by any suitable material. Preferably, a binding material is employed which will be displaced by the liquid which is introduced into the mold. In the example given, a paste, such as that employed by coremakers, may be used and a coating consisting of the hard material and the paste may be applied either directly to a mold surface or to a sand core and then afterward introduced with the core into the mold.

The layer of harder material having been applied to the desired surface or surfaces of the mold, the latter is filled with molten iron which will penetrate the layer of harder material so that when it cools, it will firmly unite the elements thereof and hold them in such close relation that the iron will be protected from the action of the abradant and will effectively resist displacement of the elements of the harder material by the abradant. Where the layer of harder material includes a binding material, such as the paste referred to, the molten iron will destroy the same and take its place in the layer, thus uniting the elements of the harder material, as in the case where no binding material is employed. By reason

of the comminuted or granular form of the hard mineral elements, such as those specified, the same are capable of withstanding the high temperature of the molten iron without being disintegrated or so injured as to be ineffective or infirmly held by the iron when solidified.

In order that my invention may be more fully understood, I have in the accompanying drawing, which is referred to herein and forms a part hereof, illustrated two molds prepared in accordance with certain features of my invention together with the products produced from the molds and embodying certain other features of the invention.

Of the drawings: Figure 1 is a vertical section of a mold for casting a bar or flat plate with a resistant surface; Fig. 2 represents a section of the article cast in the mold of Fig. 1; Fig. 3 is a view similar to that of Fig. 1, illustrating another form of mold; and Fig. 4 represents a section of an article cast in the mold of Fig. 3.

Referring to the drawings in detail, the mold of Fig. 1 comprises a drag section 1 in which a mold recess 2 is formed. The lower horizontal surface of this mold recess is represented as having applied thereto a layer 3 of a suitable hard material, the elements of the layer being represented as completely covering the mold surface and as having a substantial thickness or depth. The mold is completed by the cope section 4 in which is formed the gate 5 through which the mold may be filled with molten iron.

In Fig. 2 the plate or bar 6, cast in such a mold as that illustrated in Fig. 1, is represented as having embedded in the lower part thereof and forming its lower surface a layer 7 of the hard material.

In Fig. 3 the mold recess is formed partly in the drag section 8 and partly in the cope section 9, and the recess is partly filled with a core section 10. In this case the layer of hard material is represented as a coating 11 around the core 10, the elements being held by a suitable binding material. The gate through which the mold is filled is represented at 12. The article cast in this mold, which article may be a pipe, is represented in section in Fig. 4. As there shown, the article 13 is provided on its inner surface with a layer 14 of the hard material, the molten iron having displaced the binding material and serving to so firmly unite the elements of the hard material as to effectively resist their displacement by the action of the abrading material passing through the pipe.

One of the advantages of the method herein set forth for producing the article forming one feature of the invention is that the resistant surface of the article may be accurately formed by the mold surface and the article produced at only slight expense in addition to that of an ordinary iron casting.

It is to be observed that various materials may be employed both for the surface and the body of an article produced in accordance with my invention, the materials selected being those best adapted or suitable for the particular use to which the article is to be applied.

In its broader aspects, my invention is not limited to the particular materials or to the particular steps or mode of procedure herein specified by way of example, as many variations may be resorted to without departing from the main principles of the invention and without sacrificing its chief advantages.

I claim:

1. An article adapted to resist abrasion, said article consisting of a base of cast metal and a layer of granular hard mineral elements, said elements being so closely arranged as to protect the base in which they are embedded from abrasion.

2. An article adapted to resist abrasion, said article consisting of a base of cast metal and a surface layer of granular hard mineral elements, said elements being of such material and size that they will not be injured by the heat of the molten metal when casting the same and said elements being so closely arranged as to protect the base in which they are embedded from abrasion.

3. An article adapted to resist abrasion, said article consisting of a base of cast iron and a layer of granular hard mineral elements, the particles of the said elements being so closely arranged as to protect the iron in which they are embedded from abrasion.

4. An article adapted to resist abrasion, said article consisting of a base of cast iron and a layer of granular corundum, the particles of the corundum being so closely arranged as to protect the iron in which they are embedded from abrasion.

5. The method of producing articles adapted to resist abrasion, which method consists in forming a mold having a surface which is to give shape to a resistant surface of the article coated with a layer of granular hard mineral elements and then introducing into the mold a molten metal which will penetrate the said coating without destroying the hard mineral elements and which will thereafter become sufficiently rigid to effectively resist displacement of said hard mineral elements by the abradant.

6. The method of producing articles adapted to resist abrasion, which method consists in forming a mold having a surface which is to give shape to a resistant surface of the article coated with a layer comprising granular hard mineral elements and a bind-

ing material and then introducing into the mold a molten metal which will replace the said binding material without destroying the hard mineral elements and which will thereafter become sufficiently rigid to effectively displace the said hard mineral elements by the abradant.

7. The method of producing an article adapted to resist abrasion, which method consists in forming a sand mold having a surface which is to give shape to a resistant surface of the article coated with a layer comprising granular hard mineral elements and then introducing into the mold molten iron.

8. The method of producing an article adapted to resist abrasion, which method consists in forming a mold for the article, coating a mold surface which is to give shape to a resistant surface of the article with a layer comprising granular corundum and then filling the mold with molten iron.

9. The method of producing an article adapted to resist abrasion, which method consists in forming a mold for the article, coating a mold surface which is to shape a resistant surface of the article with a layer of granular mineral elements, and then filling the mold with a molten metal which melts at a high temperature, said elements being of such material and size that they will not be injured by the heat of the molten metal and so closely arranged that when the metal is solidified it will be protected by said elements from abrasion.

10. The method of producing an article adapted to resist abrasion, which method consists in forming a mold for the article, coating a mold surface which is to give shape to a resistant surface of the article with a layer comprising granular corundum and a binding material, and then filling the mold with molten iron, said binding material being such that it will be destroyed or displaced by the molten iron.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

CHARLES B. JACOBS.

Witnesses:
WM. J. DOLAN,
JOHN CONAHEY.