

# UNITED STATES PATENT OFFICE.

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IMPROVED PROCESS FOR UNITING CAST-STEEL OR CAST-IRON WITH WROUGHT OR CAST IRON SURFACES.

Specification forming part of Letters Patent No. 50,976, dated November 14, 1865.

## *To all whom it may concern:*

Be it known that we, JAMES D. WHELPLEY and JACOB J. STORER, both of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Process for Uniting Cast-Steel and Cast-Iron with Wrought or Cast Iron, for use in the wearing parts of pulverizing-mills and quartz-crushers and other machines requiring hard friction or battering surfaces toughly united; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same.

The nature of our invention is as follows: In casting iron or steel about wrought or cast iron cores or skeletons of plate, bars, or wire a difficulty occurs which, with certain kinds of metal, is almost insurmountable. The surface of the core, plate, bar, or wire being always slightly corroded by the action of the atmosphere, the carbon of the cast-iron, coming in contact with it at a white-heat, reduces the rust and forms carbonic oxide, which honeycombs the cast-iron in cooling and makes it frail and unserviceable. Our invention has succeeded in obviating this difficulty, first, by coating the core with a non-oxidizable metal; secondly, by the use of a special combination of metals for the most perfect casting.

To enable others skilled in the art to make and use our said invention, we will now proceed to describe the nature and operation of the same.

We in the first place thoroughly cleanse the perforated plate, bar, wire, or core of wrought or cast iron, and then cover it with a deposited film of tin, silver, copper, gold, or other ductile metal not easily oxidizable in the open air or in the presence of moisture.

If we use tin for a cover, the wrought-iron core or the casting is first cleaned in the usual manner and then immersed in a bath of molten tin, which effectually protects it from rust by becoming incorporated with the surface of the iron.

A thin coating of silver we consider preferable to tin, were the expense equal, for the reason that silver is less liable to atmospheric rust. A covering of copper or silver may be used upon perfectly-cleaned wire or plate of iron, which may be applied by rubbing with a sponge dipped in a solution of chloride or cya-

nide of silver or copper rendered alkaline by the addition of an alkaline chloride or cyanide and diluted with glycerine, or the core may be dipped in a bath of this solution.

Unless non-oxidizable metals are used, the prepared core should be cast upon immediately after covering with the protecting metal, to forestall the formation of atmospheric oxide on its surface. The cores thus prepared are placed in the sand or cast-iron mold and molten cast-iron poured about them in the usual manner for the formation of chills.

The molten cast-iron itself should be a mixture of several kinds of metal, such as manganese, zinc, and iron, to which may be added, as occasion serves, a small percentage of tungsten, molybdenum, titanium, or other suitable metal, to give toughness and hardness. We consider the best combination attainable at present to be as follows: from ten to twenty per cent. (10 to 20 per cent.) of franklinite pig-iron, which contains a portion of manganese and zinc, and from eighty to ninety per cent. (80 to 90 per cent.) of ordinary gray cast-iron. It will be found that the alloy of the three metals—manganese, iron, and zinc—thus obtained by the mixture of the franklinite or manganese pig-iron with the ordinary pig metal adheres more closely to the wrought or cast iron core and produces a harder and more serviceable chill than any other at present known; but we are confident that further research with pig metal containing titanium or tungsten will give as good or better results than that developed with franklinite. Cast steel, semi-steel, and "Bessemer steel," so called, can also be attached to wrought or cast iron in a similar way.

What we claim as our invention, and desire to secure by Letters Patent of the United States, is—

1. Covering with some metal not easily oxidized iron cores, either wrought or cast, perforated plates, wire, or bars, when it is desirable to coat such cores with or firmly attach them to cast iron or steel previous to pouring upon them the molten metal, and for the purpose of permanently and solidly connecting wrought or cast iron cores with cast-iron or cast-steel, substantially as and for the purpose described.

2. The use of glycerine solutions of cyanide

or chloride of copper or silver, rendered alkaline by alkaline cyanides and chlorides, and of chemically-analogous solutions of tin and other metals, for the purpose of depositing the thin not easily oxidizable metallic film required in this process.

3. The alloy of franklinite metal (itself an alloy of zinc, manganese, and iron) with common cast-iron, in the proportions of from ten to twenty per cent. (10 to 20 per cent.) of the former to eighty or ninety per cent. (80 to 90 per cent.) of the latter, also similar alloys of iron with zinc and molybdenum, tungsten, titanium, manganese, and other metals, when the proportions of manganese indicated in the

above alloy are replaced by equivalent proportions of metals of like properties in their alloys with iron.

4. The construction of the wearing parts of pulverizing-mills and quartz-crushers of cast metal attached to wrought-iron by the above process.

5. The connecting of cast-steel, semi-steel, and "Bessemer steel," so called, to wrought-iron surfaces by use of the process described.

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Witnesses:

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