

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN THE MANUFACTURE OF STEEL.

Specification forming part of Letters Patent No. **139,751**, dated June 10, 1873; application filed May 31, 1873.

To all whom it may concern:

Be it known that I, JOHN ABSTERDAM, of the city, county, and State of New York, have invented a new and useful Improvement in the Manufacture of Semi-Steel of Cementation, and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same.

This invention consists in a bar, plate, sheet, or slab, of semi-steel of cementation, produced by subjecting unrefined wrought-iron bars, puddled bars, scrap-bars, muck-bars or rough flats of old rails to a process of cementation, and then refining the metal by welding the same together into a merchantable article, in such a manner that a product is obtained which can be manufactured cheap, and combines certain properties of steel with other properties of iron, whereby the same is rendered fit for a great many manufacturing purposes. Also, in a railway bar made of wrought-iron and semi-steel of cementation, produced by subjecting the crude unrefined iron to a process of cementation, and finishing the metal after cementation into a head-bar by welding under the hammer or by the action of rolls, then welding the said head-bar to a rail-pile in finishing the whole into a merchantable railway bar.

In carrying out my invention I commence by submitting to the process of cementation puddled bars, muck-bars, unrefined scrap-bars, or rough flats of old rails cut in suitable lengths, according to the pile or fagot to be made. By this process I obtain crude converted bars or crude blistered steel. From these crude converted bars I form piles or fagots corresponding to the bars or plates to be produced, and by introducing these piles or fagots into a suitable furnace, I heat the same so that they can be welded and rolled into merchantable bars, plates, sheets, or slabs. By subjecting the piles or fagots to the welding and rolling process the metal is refined after conversion, and the product obtained is a semi-steel of cementation which combines certain properties of steel with other properties of iron. The piling or fagoting, heating, and rolling, is done in the iron-rolling

mills by the same rolls and in the same manner usually employed in rolling iron bars, plates, sheets, or slabs, with the exception that a small quantity of flux may be used between the bars in the pile to insure a more uniform structure of metal.

The bars or slabs of semi-steel of cementation obtained as above described can be used with particular advantage for making semi-steel headed railway bars. In manufacturing such railway bars I pile cemented bars of crude iron, sprinkling a small quantity of flux between such bars. I then heat and roll the pile into a head-bar of the requisite thickness, sawing the same in pieces of the required length while the metal is yet hot, the length being measured according to the weight of the rails to be produced. The piling, heating, and rolling, is done as now practiced in iron-rail mills in making iron head-bars for iron rails. Having thus produced a head-bar of semi-steel of cementation, I place the same on the pile-carriage, the side to be united to the iron upward, and place the iron bars thereon, finishing the rail-pile as now practiced in piling iron for making iron rails, with the exception that I sprinkle the surface of the head bar to be welded with a small quantity of flux. My pile is passed through the same rolls which are generally used in rolling iron rails. But in order to thoroughly cleanse out the scale or oxide from between the head-bar of converted metal and the iron bars of the rail-pile, I introduce between the same some suitable flux.

The advantages of my invention will be apparent from the following observations: In the manufacture of ordinary steel of cementation refined bar-iron is always used for conversion into blistered steel, and the very best iron is selected for this purpose. I use crude or unrefined iron bars, and by converting them a crude semi-blistered steel is produced. By piling or fagoting the crude converted bars, and by heating and welding them either under the hammer or by means of rolls, the metal undergoes the operation of refining, after it has been cemented, and the product obtained is only a semi-steel of cementation, since the metal retains the properties of iron with some

qualities of steel, which is owing to the conversion of the iron before it is refined, and the refining of the metal after it is converted.

This metal being, strictly speaking, neither wrought-iron nor steel, but of a nature possessing the qualities of both, is well adapted to the construction of steam-boilers, steamships, or vessels of war, bridges, buildings, and agricultural implements; also, for making railway bars; and I intend that in the manufacture of railway bars my semi-steel of cementation shall be a substitute for Bessemer steel. The demand for the so-called Bessemer-steel rails is so great that all the orders cannot be filled on account of the scarcity of the pig-iron which is required to possess the necessary qualities for making Bessemer steel. My semi-steel of cementation has many decided advantages over the Bessemer steel: First, any puddling-mill can puddle the iron for my semi-steel of cementation, it being not necessary to take into consideration its degree of purity which is indispensable in the manufacture of pig-iron for Bessemer steel; second, old iron rails may be flattened down as now for re-rolling, and these flats may be converted sufficiently good for my purpose; third, my rails, when they are worn out, can be re-rolled into new rails just the same as is now done in re-rolling old iron rails; fourth, the saw ends of these rails, as well as other scrap from the same, can be fagoted and re-rolled the same as wrought-iron; fifth, any ordinary iron-rail mill can manufacture my rail without change in the furnaces or in the machinery, by the simple addition of converting-furnaces to their works; and since it is not strictly necessary to make my rail entirely of semi-steel of cementation, but only with a head of such semi-steel and the rest of wrought-iron, the amount of metal to be converted would only be from one-third to one-fifth the weight of

the rail, and consequently only comparatively little outlay would be required for the construction of the necessary furnaces of conversion, and a rail thus made will answer all the purposes required; sixth, the expense of converting the iron for my purpose is very small, and since the metal is in an unrefined state after cementation, nothing is added to the process of refining bar-iron, so that the cost of producing bars from my metal is only little in excess of the cost of wrought-iron of the same grade. And in applying my metal to the manufacture of semi-steel headed railway bars, the cost is but little more than that of producing wrought-iron rails, since only one-third or one-fifth of the metal composing the rail is required to be converted, the manufacture of the rail being otherwise the same as that of making wrought-iron rails, with the exception of a little flux, which may be used between the head-bar and the iron. This flux, however, is not absolutely necessary, since my semi-steel of cementation possesses about the same welding qualities as wrought-iron.

What I claim as new, and desire to secure by Letters Patent, is—

1. A bar, plate, sheet, or slab of semi-steel of cementation, produced by subjecting the crude unrefined iron to a process of cementation, and then refining the converted crude iron by heating and welding the same under the hammer or by the action of rolls, substantially as herein described.

2. A railway bar, made of wrought-iron and semi-steel of cementation, produced by subjecting the crude unrefined iron to a process of cementation, and finishing the metal after cementation, substantially as set forth.

JOHN ABSTERDAM.

Witnesses:

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