UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF CLEANED AND PLANISHED IRON.

Specification forming part of Letters Patent No. **210,735**, dated December 10, 1878; application filed October 14, 1878.

To all whom it may concern:

Be it known that I, W. DEWEES WOOD, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in the Manufacture of Cleaned and Planished Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof.

My present invention relates chiefly to the manufacture of what is commonly known as "planished sheet-iron;" and it consists in the features of operation hereinafter set forth and claimed, whereby the quality of the product is improved and the cost of making it is materially lessened.

It also relates in part to the production of a cleaned or scaled iron, preliminary to finishing by the other steps, hereinafter described, or by cold-rolling, or in other manner known to the art.

The working of the invention in making planished sheet-iron will be first described.

In order to get the best results, the pig-iron to be employed should be selected with care, with particular reference to its freedom from sulphur, phosphorus, and silicon, the purer the better. Following the known methods of working such material, when the finer qualities of sheet-iron are desired, I bring the iron through the successive forms of refined plate metal, blooms, bars, and into sheets of, say, about No. 20 to 22 (more or less) wire gage; but, in order to get and preserve through successive steps a good surface on which to operate, I occasionally subject the material, after it reaches the bloom stage, and while hot, to the action of cold water, the result of which is that so much of the oxide surface as is free, or as becomes so under the action of the water, is "raised," as it is called, and scales off, leaving a surface slightly oxidized, but so far uniform in quality or condition that a perfect and uniform working in all parts at subsequent stages of the operation is greatly facilitated.

The plates or sheets thus produced, having been previously trimmed or cut to size, are then (when cold, or practically so) immersed in water or otherwise wet, and while still wet are packed in an annealing-box (preferably of cast-iron) sheet by sheet, with interposed films or layers of finely-powdered charcoal or other suitable carbonaceous matter dusted or otherwise applied between the sheets, to the thickness of, say, one-thirty-second of an inch, more or less. After the box is properly filled its cover is put on, the joints made air-tight, or practically so, and the whole is charged into an ordinary annealing or other suitable furnace, and heated slowly, say, from ten to fifteen hours, more or less, or until the box shows a bright red color. The furnace is then plastered up as tight as practicable, with reference to excluding the air, and allowed to cool down, which operation will require about thirty hours, more or less. When the box and contents become cool enough to be handled, the sheets are taken out, superfluous coal-dust shaken off or otherwise removed, and they are then subjected, by preference, separately to what is known as the "cold-rolling" operation, through cold-chilled highly-polished rolls, and under heavy pressure, say four, six, or eight times, more or less.

I have found that the moistened charcoal has apparently the effect, in the annealing operation, of deoxidizing the slight oxide surface of the sheets, or perhaps slightly carburizing it, and giving it a white, silvery appearance, nearly or exactly that of pure metallic iron; but, whatever its chemical action may be, the result is a surface capable of taking a high finish, such in kind as is commonly seen in planished sheet-iron, but of a finer quality. The first succeeding step in securing this finish is that of cold-rolling, above referred to, which thoroughly closes up the pores of the iron, fills up all the minute cavities from which small particles of scale may have fallen, and leaves the surface smooth and bright.

The process may from this point be completed by matching the sheets up in packages, reheating them to a low red heat, and rolling and hammering in the usual way, care being taken that they do not become so hot as to be again oxidized; but in order to get a still better article I prefer, after the cold-rolling, to wash and dry the sheets, so as to get a thoroughly-clean surface, and then subject them to the coating, baking, and annealing operations described in Letters Patent granted to me January 11, 1876, No. 172,235. After this they are again heated to a low red heat,

as above stated, rolled in packs to the desired gage, and hammered in the usual way.

In the annealing operations described, either or both, I do not limit myself to any particular form of carbon, except that the material employed on or between the sheets must contain both carbon and hydrogen; and for this purpose solid pulverized carbons may be mixed with water or oil, or the heavier hydrocarbon oils may be used alone.

I have found in practical operation that by the process described I am able to produce a superior article of planished sheet-iron, and such superiority I believe to be due chiefly, if not wholly, to the cold-rolling, combined with the previous annealing of the sheets while in contact with charcoal and water, or their described equivalents; and it is an element of considerable saving that I am enabled to dispense with the previously-used operation of cleaning or scaling the sheets by "pickling," as it is called, which heretofore has required the use of acids and alkalies, the cost of which largely increases the cost of making such iron.

While I have described the entire process with some particularity, many of the details or separate parts may be varied somewhat without any substantial departure from the scope of my invention. For example, while I deem it unnecessary to clean the sheets by pickling before the first annealing, such operation may be performed, and the cold-rolling may then follow the annealing; or some other and additional step or operation may be interposed between any two of the steps or operations described; or the order of the operations of reheating to a low red heat, rolling, and hammering may be varied or repeated at pleasure.

The preliminary annealing of the unscaled or uncleaned iron in contact with charcoal and water, or their described equivalents, and while inclosed in a close box, may be employed as a cleaning or scaling process in its application to wrought-iron and wrought-iron articles generally. Such process, if carefully conducted, removes all, or practically all, oxide from the surface of the iron, and leaves it with a clean, white, silvery appearance, such as appertains to pure metallic iron, and such as is required preparatory to tinning, galvanizing, or other like coating. The iron or iron articles after being so cleaned may be finished in the manner already described, or by the well-known cold-rolling process, by galvanizing, tinning, or in other way known to the art.

I am aware that it is not new to subject a number of loose sheets with intermediate layers of dry charcoal, in an ordinary reheating-furnace, to the action of a smoky flame at a comparatively low temperature for, say, ten or fifteen minutes, followed by the further reduction of such sheets between rolls at a low red heat; also, that such sheets with intermediate layers of charcoal have been placed in such a furnace with an edgewise packing of wood saturated with water, and then subjected to the action of the heat, smoke, and gases of the furnace fire, followed by hammering, for the purpose of working in the oxide on the surface of the sheets; also, that sheets which have been previously reduced to the gage required in the finished product have been subjected to an annealing operation with interposed layers of iron chips or filings in a close flask, after which they have been passed (without further reduction) under pressure between polished rolls, and then raised to a bluing heat, or, in other words, finished without further reduction; and to such prior processes I make no claim herein.

What I claim herein is—

1. In the manufacture of planished sheet-iron, the improvement in the method of operation, substantially as described, which consists in annealing the sheets in a close box while in contact with charcoal and water, or their described equivalents, followed by cold-rolling, and preliminary to reheating and finishing with an intermediate coating and baking.

2. In the manufacture of planished sheet-iron, the combination of the following steps: first, annealing the unscaled sheets in a close box while in contact with charcoal and water, or their described equivalents; second, cold-rolling the sheets; third, again annealing with a carbonaceous coating; and, fourth, finishing by reheating to a low heat, rolling, and hammering, substantially as set forth.

3. The mode of cleaning unscaled or uncleaned iron, preliminary to subsequent treatment, by subjecting the material or articles to be cleaned to the annealing process in a close box while in contact with charcoal and water, or their described equivalents, substantially as set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

WILLIAM F. ROBB,
JOHN M. ROBB.