

# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN THE MANUFACTURE OF SHEET-IRON.

Specification forming part of Letters Patent No. 46,384, dated February 14, 1865.

*To all whom it may concern:*

Be it known that I, DANIEL L. PRATT, of Bridgeport, county of Belmont, and State of Ohio, have invented new and useful Improvements in the Manufacture of Sheet-Iron; and I do hereby declare the following to be a full and exact description of the same.

My object is to produce a perfectly pure article of iron, similar in its characteristics and appearance to the Russian sheet-iron, and which shall be homogeneous, so far as integral quality is concerned, irrespective of an increased density of the surface. I do not seek to effect this by giving a chemically different character to the surface, as has been sought to be accomplished by the addition of carbon in its various forms, such as changing the scale from a ferrate to a protocarbide and incorporating it with the iron, or other analogous plans which might be cited. I make no application of an enamel or add anything which chemically combined with the iron arrests oxidization. I claim to produce a pure article which holds inclosed in its pores a material calculated to preserve the iron from the effect of oxygen. I take sheet-iron, and after removing the scale I saturate the iron with oil, then roll it, polish, and "blue" it at a heat which does not expel the oil.

I will now proceed to describe my process with such minuteness that any person skilled in the art to which it appertains will be able to use my invention.

I speak of the sheets in the singular number for convenience, as some of the operations require consecutive handling.

I take common sheet-iron and immerse it in an acidulated bath composed of a solution of organic acid and a mineral acid. I prefer oil of vitriol. By "organic acid" I mean such as results from the acetous fermentation of grain or fruit, or such as pyroligneous acid. I have used vinegar or still-slop which has reached this stage of fermentation. To twenty gallons of the described organic-acid solution of the strength of ordinary household vinegar I add one gallon of the oil of vitriol of commerce. The solution is heated to say 150° Fahrenheit, and the sheet metal may remain in the bath from three to twelve hours. The warming of the solution is done in any suitable manner, such

as a furnace below the copper floor of the tank or a coil of steam-pipe, &c. These are mechanical appliances well understood and not requiring explicit description. The strength and heat of the solution and the time during which the plates shall remain exposed to it are not particularly defined, nor would an intelligent workman require it. Should the solution be a little weaker, more time would be required, and increase of heat will expedite the process. The object to be attained by this acidulous bath is to loosen or remove the scale. I have not operated on any iron in which the loss by scaling has exceeded five per cent. When it is taken from the vat it is washed and scrubbed. It is then immersed in an alkaline solution consisting of water and carbonate of potash or equivalent alkali. This bath is also at a temperature of 150° Fahrenheit. Its object is to follow the acid into the pores of the iron and neutralize it. One hour may suffice for this. It is then passed between two wheel-brushes, one running above and the other below the plate, and revolving at a high speed—say five hundred revolutions per minute. Jets of water are thrown upon each brush during the process of scrubbing, and the sheets are passed through between the brushes in any suitable manner. The object of this portion of the process is to thoroughly cleanse the surface. It is then placed edgewise in an oven heated to, say, 150° to 200° Fahrenheit, so as to become perfectly dry. It is then placed in a bath of oil at a temperature of 100° to 150° Fahrenheit. This oil I prefer should be neat's-foot, fish, or other animal oil, and free from salt or acid. The sheets are placed in this bath edgewise and out of contact with each other, and may remain—say ten or fifteen minutes—until the pores of the iron are filled with oil. It is then taken out and dripped. The sheet is then passed between a pair of well-polished chilled-iron rolls until the grain of the sheet is thoroughly rolled down. This has the effect of condensing the surface and closing up the oil in the pores in the interior of the sheet. To roll the sheet at a heat that would evaporate oil would be fatal to this part of my process. The sheet may be passed through between the rolls several times to complete the operation. The sheet is then passed between two rollers

made of wood or other suitable material and covered with leather. I use sole-leather. These rollers have a very high velocity—say from a thousand to fifteen hundred revolutions per minute—the sheet being dusted with a fine powder of chalk or brick-dust properly pulverized and bolted through a superfine cloth. The plate is passed between the rollers by any suitable mechanical contrivances, and the object of this part of the process is to polish the sheet. It is then colored as required by being placed over a bed of burning charcoal until it acquires the requisite tinge.

Many attempts have been made to produce the mottled appearance, which is nothing more than an irregular color in the sheet, and arises from the fact that the parts were unequally heated.

It is well known that in tempering steel the first color that it receives is a light yellow, and so passes to a darker, and to a red, and eventually to a blue. Now, if the particles of charcoal are some of them nearer to the iron than others, those nearest parts will become the most heated, and the others, being a little "behind," as it may be called, will bear the color next in suit. Thus it may be mottled blue and a shade of purple derived from the red stage through which it has imperfectly passed. Any mechanical contrivance, such as making a hammer-surface to the rollers, so as to give a different reflection to the rays that strike upon the surface of the sheet, is equivalent to making an irregular surface. A heated metallic surface of some irregularity may produce the desired effect. I prefer the bed of charcoal.

By a preconcerted arrangement of parts a conformation may be given to the colors of the sheet-waves, patterns, or figures, instead of indiscriminate mottling.

I am not aware that mottled appearance is any evidence of value; but it is often seen on the Russian iron, and some desire it. I am not making a mere imitation of anything; but fancies and tastes govern these matters at times, and I am making a merchantable article for sale.

The sheet, after coloring, is cleaned with a hand-brush and oiled, so as to preserve it against corroding agents during the transportation or the accidents of storage.

Having thus described my invention, the following is what I claim as new and desire to secure by Letters Patent:

1. The herein-described series of processes, substantially as described.
2. Subjecting the sheet of iron, after it has been cleansed of its scale and of the operating chemicals and water, to a bath or coating of oil, which is rolled in cold or at a temperature that will not dissipate the oil.
2. Subjecting the sheet, after it has been removed from the bath of alkaline solution, to the action of revolving brushes, upon each of which a jet or stream of water is thrown.
4. The combination of an organic and mineral acid in the acidulous bath, substantially as described.

DANIEL L. PRATT.

Witnesses:

ALEX. A. C. KLAUCKE,  
EDWARD H. KNIGHT.