UNITED STATES PATENT OFFICE.

LEWIS POWE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO PARK, McCURDY & CO., OF SAME PLACE.

IMPROVEMENT IN THE MANUFACTURE OF SHEET-COPPER.

Specification forming part of Letters Patent No. **36,822,** dated October 28, 1862.

To all whom it may concern:

Be it known that I, LEWIS POWE, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Mode of Manufacturing Sheet-Copper; and I do hereby declare the following to be a full, clear, and exact description thereof.

My improvement is designed to communicate to sheets of copper, when rolled hot, a superior smoothness of finish, which has not heretofore been attained in the manufacture of sheet-copper, excepting by the tedious processes of cold-rolling or hammer-dressing.

The mode of manufacturing sheet-copper heretofore in use is as follows: The copper, having been cast into blocks of considerable thickness, is heated in a furnace to a bright cherry-red, and is then passed between reducing-rollers, by which the metal is drawn out and diminished in thickness, while the length of the sheet is increased. The heated piece of copper is passed repeatedly between these rollers, the surfaces of which are brought close together after each passage of the copper, so that the sheet is gradually reduced to any desired thickness before being passed between the finishing-rollers. When the block of copper which is to be rolled out into sheets is cast the surface oxidizes in cooling, the depth to which this oxidation extends being very unequal in the same casting. This block is heated up in the furnace preparatory to the process of reducing, as before stated, and during the rolling a further oxidation takes place, and scale or oxide extends over the whole surface of the copper sheet, so that when cold it looks like a piece of rolled iron, both in color and the oxidized appearance of the surface. The oxide or scale on the surface of the sheets of copper after they have passed through the reducing-rollers is very uneven in depth, which is caused in part by the fact that during the rolling portions of the scale adhere to the rolls and separate from the copper, leaving bare spots here and there, on the surface of which a fresh scale is immediately formed. These irregularities of depth or thickness of the scale cause indentations or spots on the surface of the copper underneath the exterior or oxidized surface, and as the oxide will not roll out evenly, but is harder than the heated copper beneath it, the repeated rolling only serves to press the thicker particles of scale into the surface of the copper, so that, notwithstanding the apparently smooth exterior which the sheet presents after having passed through the reducing-rolls, the surface of the copper beneath the scale is really very rough. The sheets are then passed while still hot through highly-polished rolls for the purpose of finishing them by still further reducing their thickness and making the exterior of the sheet more even and smooth. For this purpose the sheets are piled together and passed several times through the finishing-rolls, the number of sheets in the pile being increased as their thickness is reduced. Thus by repeated rolling the sheets are highly polished on their surface; but the scale still remains on them, although rendered somewhat thinner and less unequal in depth. The sheets, when passed sufficiently often through the finishing-rolls, are allowed to get cold, and are then sprinkled with a solution of lye or ammonia and placed in an annealing-oven until they are heated to a cherry-red, when they are drawn out and plunged immediately into cold water. This last process removes the thin scale and leaves the copper tolerably smooth, but still more or less spotted and rough, owing to the varying thickness of the scales which have been removed.

If a higher degree of smoothness of surface is required, it has heretofore been necessary to roll the sheets cold and one at a time or in packs between highly-polished rollers, which by repeated passages gradually impart a very smooth surface to the copper; or the coppersmith, when manufacturing any article from the sheets finished by hot-rolling, as before described, gives it the necessary finish by hammering. These processes of finishing the sheets cold are tedious and expensive, and my invention is designed to accomplish the same result by the hot-rolling process.

I have ascertained that it is only the first scale or oxide which the block of copper receives when cast, and the further scale or oxidation which it suffers while passing through the reducing-rollers, that is sufficiently unequal in thickness or depth to affect the surface of the copper and leave it rough and uneven, and that by removing the scale before the finishing process the copper may be rolled per-

fectly smooth while hot, the scale given to its surface during its passage through the finishing-rollers being so equal and regular in its depth as not to impair the effect of the finishing-rolls on the surface of the copper, so that when the scale is again removed after the finishing process the sheets are found to have a degree of polish and smoothness not heretofore attained by any process of rolling the sheets while hot.

To enable others skilled in the art to make use of my improved process in the manufacture of sheet-copper, I will proceed to describe it more particularly.

The block of copper previously cast for that purpose is passed through the reducing-rollers until it is brought down very nearly to the required thickness. These sheets thus formed are then allowed to cool before being subjected to the finishing process. When cold they are immersed in a bath of dilute sulphuric acid, which removes the oxide or scale from the surface, leaving it very rough and uneven, owing, as before stated, to the irregular depth of the scale which had formed upon it by oxidation. The sheets are then placed in a furnace and again heated to a cherry-red, after which they are passed at a red heat through highly-polished finishing-rolls, which communicate a very smooth exterior surface to the copper. It is true that during this finishing process another scale is formed on the surface of the copper by oxidation, consequent upon the reheating after the removal of the first scale; but this second coating of oxide is not of uneven depth like the first, but is very thin, and so uniform in thickness that the copper is perfectly smooth beneath it. These sheets, after being thus finished, are sprinkled with dilute solution of ammonia, made by dissolving guano in water, and are while wet placed in the annealing-oven, where they are allowed to remain from fifteen to twenty minutes, reheated to a cherry-red color. They are then drawn out and immediately plunged in cold water, which removes the slight scale contracted by oxidation during the finishing process and leaves the surface of the copper as smooth and highly polished as cold-rolled sheets of copper.

This process is a great improvement in the manufacture of sheet-copper, as it really avoids the necessity of the tedious and expensive process of polishing the sheets of copper when cold, either by cold-rolling or hammering.

I am aware that the use of an acid bath to remove the oxide or scale from metallic surfaces is well known. I therefore do not claim its use, broadly, my invention consisting in the process of removing the uneven scale or oxide from the surface of the sheets after they have been passed through the reducing-rollers and prior to the final rolling through the finishing-rollers.

Having thus described my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

The mode of treating the sheets of copper after they have passed through the reducing-rollers, substantially as and for the purpose hereinbefore set forth.

In testimony whereof the said LEWIS POWE has hereunto set his hand in presence of us.

LEWIS POWE.

Witnesses:

A. S. NICHOLSON,

W. BAKEWELL.