

# UNITED STATES PATENT OFFICE.

JAMES WOOD, SR., JOHN WOOD, AND W. W. WOOD, OF WILMINGTON, DEL.

IMPROVEMENT IN THE PROCESS OF MANUFACTURING SHEET-IRON, WHICH IRON IS DENOMINATED  
"AMERICAN GLAZED SHEET-IRON."

Specification forming part of Letters Patent No. 2,813, dated October 12, 1842.

*To all whom it may concern:*

Be it known that we, JAMES WOOD, Sr., JOHN WOOD, and WILLIAM W. WOOD, of Delaware Iron Works, near the city of Wilmington, in the county of New Castle and State of Delaware, have invented a new and useful Improvement in the Manufacture of Sheet-Iron, which, when made by our process, is similar to the Russian sheet-iron in the glaze upon its surface, and is denominated by us "American Glazed Sheet-Iron;" and we do hereby declare that the following is a full and exact account of our process for manufacturing the same.

We roll our iron in the usual manner of performing that process, and when it is intended to receive a glazed surface we leave it thicker than it is designed to be in its finished state, the glazing being effected during a second rolling. We put these plates into an acidulated bath for the purpose of removing the oxide from the surface, using for this purpose a dilute solution of sulphuric, muriatic, or any other acid which will effect this object, the procedure being the same as when plates of iron are prepared to be tinned. When these plates have been cleaned and dried we coat them over on each side with oil or with fatty or resinous matter, preferring to use linseed-oil, which we have found to give good results. We then take two or more plates thus prepared and place them between other rolled plates, either prepared in the same manner or simply rolled, which we place on the outsides of the prepared plates and make

the whole into a pack. This pack we heat in a suitable furnace to a cherry red, or somewhat beyond this, being governed by the nature of the materials used and as experience may dictate. We then roll the pack in its heated state between the rollers ordinarily employed for that purpose. This process of preparing or oiling, of heating and rolling, is to be repeated as often as may be necessary to communicate the required glaze to the sheets and to reduce them to the intended thickness. By this procedure the surface of the iron will be made to assume a black color and a smooth and brilliant surface resembling that possessed by the sheet-iron manufactured in Russia.

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

The giving to rolled sheet-iron such a glazed surface by the process or in the manner above set forth—that is to say, by covering the surfaces of the plates after they have been freed from oxide with a coating of linseed-oil, or with other oil or fatty matter, or with resinous solutions, making the sheets so prepared into a pack, heating them to redness, and then rolling them in this state, for the purpose and substantially in the manner above set forth.

JAMES WOOD, SR.  
JOHN WOOD.  
WM. W. WOOD.

Witnesses:

FREDK. LEONARD,  
GEO. W. CHAYTOR.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF McKEESPORT, PENNSYLVANIA.

## IMPROVEMENT IN MANUFACTURING SHEET-IRON.

Specification forming part of Letters Patent No. 137,585, dated April 8, 1873; application filed March 17, 1873.

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Mode of Finishing Sheet-Iron; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention consists in the mode of finishing sheet-iron by, first, securing a non-oxidizable surface, in the manner hereinafter set forth; second, rolling and annealing; and, third, hammering in packs while cold.

To enable others skilled in the art to make and use my invention I will proceed to describe the same.

The iron, after being broken down into sheets by rolling, is cleaned of its scale by acid and alkaline baths, and washed with hot water in the manner usually practiced in the art; or the scale may be removed by other suitable process. The sheets are then immediately placed in a hot-air oven and thoroughly dried, and, while still warm and free from rust, they are plunged into a bath of graphite and oil, or an equivalent mixture of suitable consistency for coating the sheets therewith. The sheets are then rolled in packs of three or more at a

good rolling-heat. After they are trimmed and annealed I arrange them in packs of, say, from ten to one hundred, more or less, and, while cold, subject such packs to the operation of hammering over their entire surface. With a system of hammers operating at the rate of, say, twenty to forty blows per minute, a medium-sized pack can be ordinarily hammered sufficiently in about ten minutes, more or less, so as to impart to the sheets a polished surface superior to that of the best Russia sheet-iron.

The graphite and oil may be applied separately, if so desired.

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

In the process of finishing sheet-iron, the combination of the following steps: First, coating the sheets separately with a graphite-and-oil coating; second, rolling and annealing; and, third, hammering in packs while cold, substantially as set forth.

In testimony whereof I, the said W. DEWEES WOOD, have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

A. S. NICHOLSON,

G. H. CHRISTY.

W. D. WOOD.

Hammers for Planishing Sheet-Iron.

No. 142,754.

Patented September 9, 1873.

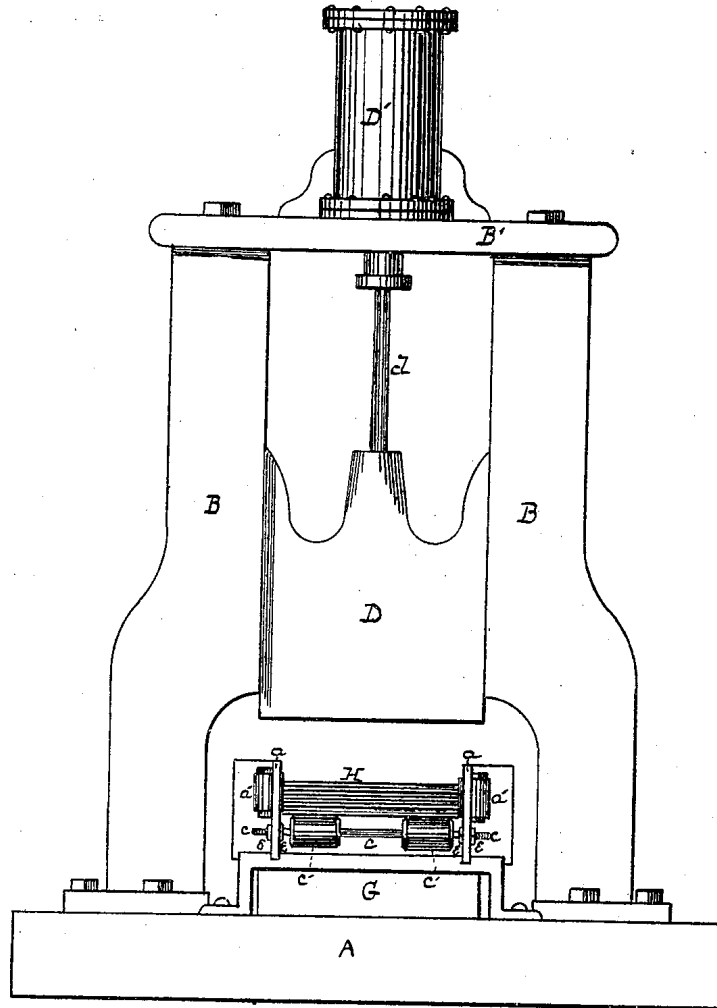


Fig. 1.

WITNESSES

R. O. Henderson.  
James L. Kay

INVENTOR

W. Dewees Wood,  
by Bakewell, Christy & Kerr,  
his Attys.

W. D. WOOD.

Hammers for Planishing Sheet-Iron.

No. 142,754.

Patented September 9, 1873.

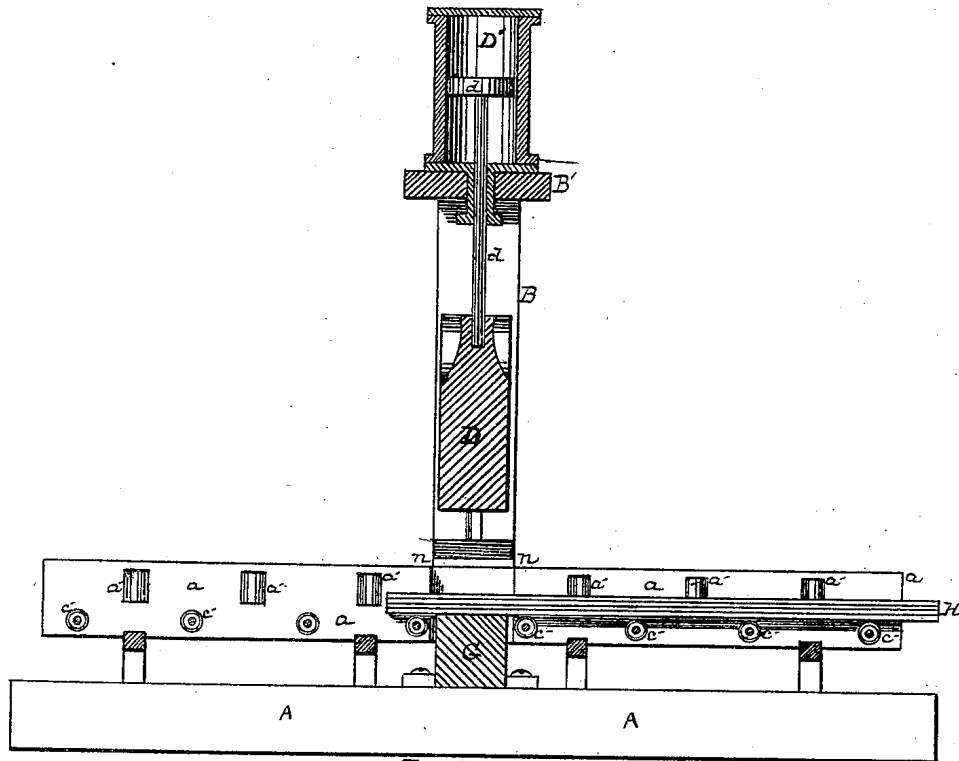


Fig. 3.

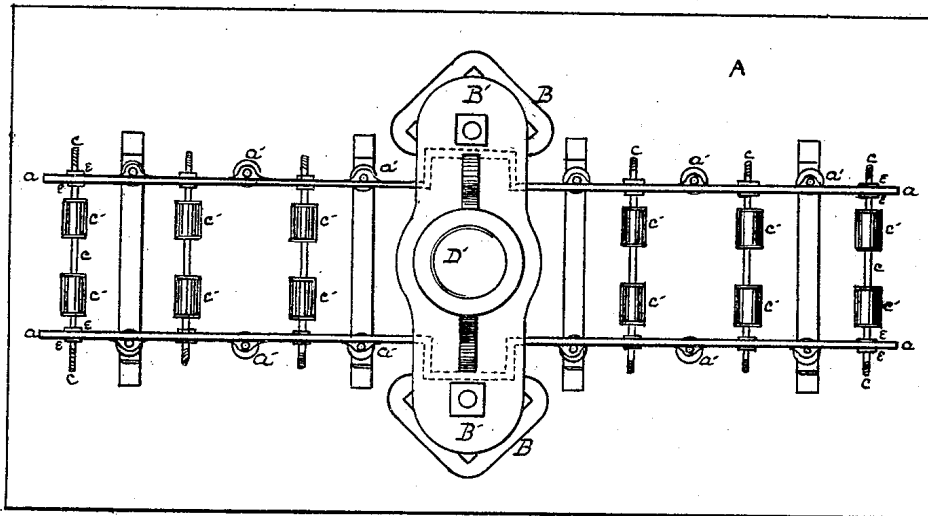


Fig. 2.

WITNESSES  
 R. C. Henderson  
 James L. Kay

INVENTOR  
 W. Dewees Wood,  
 by Bakewell, Christy & Kerr,  
 his Attys.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF McKEESPORT, PENNSYLVANIA.

## IMPROVEMENT IN HAMMERS FOR PLANISHING SHEET-IRON.

Specification forming part of Letters Patent No. **142,754**, dated September 9, 1873; application filed June 23, 1873.

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machine for Planishing Sheet Metal; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, in two sheets, making a part of this specification, in which—

Figure 1, Sheet 1, is an end elevation of my improved machine. Fig. 2, Sheet 2, is a plan view of the machine; and Fig. 3 is a sectional elevation of the machine.

Like letters of reference indicate like parts in each.

My improvement relates to the construction of a machine to be used in planishing sheet-iron in packs while cold by means of a steam-hammer. Heretofore, in this operation, this ordinary steam-hammer and anvil have been employed, and the sheet-iron pack has been moved back and forth under the hammer, and from side to side, by the workman with his tongs, so as to bring all parts of the pack successively under the hammer, and subject the same to the planishing operation. In my improved machine, I provide a feeding-table with friction-rollers in the bottom thereof, the upper faces of which rollers are even, or about even, with the face of the anvil. The feed-table also has vertical sides, which, in connection with the planishing of sheets of uniform width, may be fixed; or, in a mill where sheets are to be planished of varying width, the sides of the table are made adjustable, and, in either case, they are, preferably, furnished with vertical friction-rollers, against which the edges of the pack operate, for greater facility in feeding. In a mill where but a single width of sheets is to be made, the face of the steam-hammer is made as long, at least, as the sheets are wide; but where the machine is to be made for planishing sheets of different widths, the face of the steam-hammer is made of a length equal to the greatest width of the sheets, and the sides of the table, either by being set out opposite the ends of the hammer, or by terminating at each opposite face of the hammer, are so made that they

can be set up past the opposite sides of the hammer, and the hammer and table thereby be adapted for planishing packs of lesser widths.

To enable others skilled in the art to make and use my improved machine, I will proceed to describe its construction and mode of operation.

On any suitable foundation, A, I erect the guide-posts B, with a cross-head, B', and in such a position that they shall carry or support the steam-hammer D, which, by the piston and stem *d* and cylinder D', is operated in the usual way. The length of the face of this hammer, as also of the anvil-block G immediately under it, is at least as wide as the greatest width of sheet or pack to be operated on thereby. The feeding-table may be made of any desired form; but the form shown embodies all essential features of construction. As shown, it contains vertical side rails *a*, in which are set the friction-rollers *a'*, with their inner faces projecting slightly beyond the inner faces of the rails. These rails are connected together a little below the feeding level by tie-rods *c*, on which are mounted the friction-rollers *c'*, the upper faces of which are level, or nearly so, with the upper face of the anvil-block G. By means of nuts *e* the side rails *a* are adjustable to and from each other. These side rails may terminate at or a little short of each lateral face of the hammer D, as at *n*, or they may, at those points, be outwardly bent, as shown in the drawings, so as to make room for the desired adjustment. When the machine is to be used in a mill where but a single width of packs is to be planished, the hammer D may have a face equal in length to such width, and the side rails *a* be fixed in position to exactly or about the same width. But where, as is generally the case, different widths of packs are to be planished, the hammer is made with an operative face at least as long as the greatest width of pack, and the said rails *a* are then made, one or both of them, adjustable, so as to be adapted for feeding along under the hammer packs of such width as may be desired. The feeding operation with such a machine will be simple and easy, as each blow

of the hammer will be operative across the entire face of the pack, and no assistance will be required from the workmen, except to move the pack forward. In Figs. 1 and 3 the packs are shown at H.

One great feature of utility connected with the use of the side rails results from the fact that when the sheets are fed under the steam-hammer in packs, in the ordinary way, and are held by the workman's tongs without any lateral support, the sheets are, as one result of the blows, displaced laterally, so that they do not, as the blows are continued, each receive the full impact evenly across its entire surface. But, by my machine, the sheets are held against lateral displacement by the side rails, and against longitudinal displacement by the workman's tongs. One side rail may, in some cases, be sufficient, as the workman

can, by a little extra labor, guide the pack along such side rail.

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

1. In a machine for planishing metal, the combination of an anvil and hammer, a feeding-table, and side rails, substantially as described.

2. The combination of hammer and anvil, the operative faces of which are as wide as the pack, a series of friction-rollers, constituting the face of the feeding-table, and one or more adjustable side rails, substantially as described.

In testimony whereof I, the said W. DEWEES WOOD, have hereunto set my hand.

Witnesses: W. DEWEES WOOD.

T. B. KERR,

G. H. CHRISTY.

W. D. WOOD.  
Manufacture of Sheet-Iron.

No. 155,691.

Patented Oct. 6, 1874.

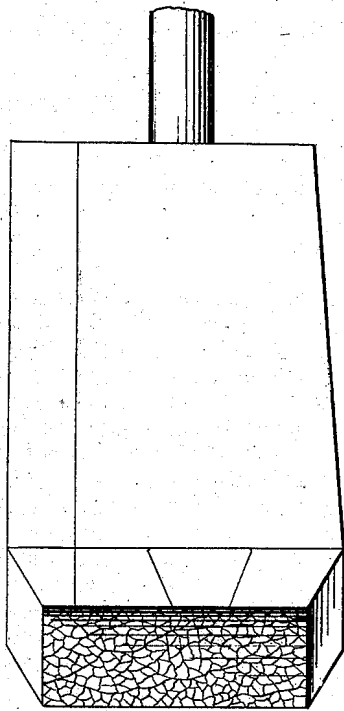


FIG. 1.

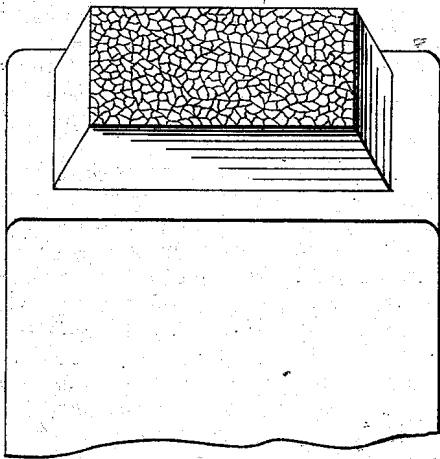
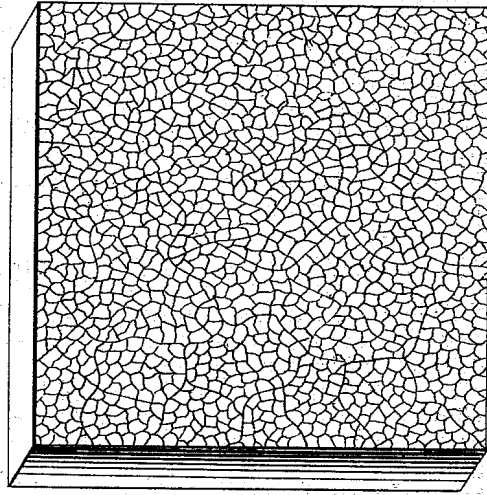


FIG. II.



WITNESSES

*A. J. C. C. C.*  
*D. P. Cowl*

INVENTOR:

*W. Devereux Wood*  
*by Bakewell & Kerr*  
*Attys*

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF MCKEESPORT, PENNSYLVANIA.

## IMPROVEMENT IN THE MANUFACTURE OF SHEET-IRON.

Specification forming part of Letters Patent No. **155,691**, dated October 6, 1874; application filed March 2, 1874.

*To all whom it may concern:*

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

My invention relates to the mode of finishing sheet-iron for the purpose of imparting to its surface a highly-polished and mottled appearance.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same.

The iron, after being previously broken down into sheets by rolling, may be treated in the following manner: Being first cleaned of its scale in any usual way, and after being thoroughly dried, it is immersed in a bath of graphite or plumbago and oil, or equivalent mixture, after which it is piled in packs of three or more sheets each, and, after being heated to a proper rolling temperature, is subjected to the rolling process. The sheets are then trimmed and annealed, and, when cold, arranged in packs of three or more sheets, preparatory to the final operation of hammering. The process, so far as already referred to, is the same as that described in Letters Patent of the United States granted to me on April 8, 1873, No. 137,585, and reissued the first day of July, 1873, and need not therefore be more fully detailed. In the patent just referred to it is stated that the packs of sheets thus prepared are subjected to rapid hammering when cold, for the purpose of imparting the desired polished surface.

The surface given to sheet-iron thus prepared, rolled, and hammered, as described in my said patent, is perfectly smooth and highly polished, whereas the surface given by my present improved process is more highly polished, but not perfectly smooth. Heretofore, generally, in the manufacture of sheet-iron, the sheet has been submitted to the hammer before being thoroughly scaled, the scale being in part worked into the face of the sheet by the blows of the hammer, and in part broken off, giving, as a consequence, irregularity in the finish of the sheet. One of the first essen-

tials of my improved process is that all scales shall be removed from the sheet. This improvement has reference to the hammer finishing process, irrespective of the previous treatment of the sheets of iron, provided, as above specified, all scale has been removed from the iron; and it consists in a method of finishing sheet-iron by hammering the sheets by rapid strokes between a hammer and anvil, the operative faces of which, or of either of which, are planished or mottled by slight indentations, the general contour of the surface being otherwise plane. For this purpose a steam-hammer is preferable, as great rapidity of stroke can be thereby attained. The dies or operative faces of the hammer and anvil are made of common cast-iron, or of chilled cast-iron planed smooth and true, and are then indented or mottled by repeated strokes with a small-sized planishing-hammer, as illustrated in the drawing, Figure 1 being the operative faces of the hammer and anvil, and Fig. 2 a detached view.

I prefer, as before stated, to have the face of both the hammer and anvil thus indented; but, if desired, one of them may be smooth and the other mottled.

In the manufacture of sheet-iron it is not absolutely necessary, in order to give the desired mottled and polished surface, that the sheets should be first treated with the plumbago bath, in the manner described in my former patent, before referred to; but I prefer that mode. Indeed, the hammering operation may be employed with good effect on sheets from which the scale has been thoroughly removed, only in the latter case the high finish is not obtained; but the best results are obtained where the sheets have been previously submitted to the carbon bath, for the reason that the plumbago or similar material employed acts as a lubricant, and preserves the uniform finish of the sheet, preventing any weld or adhesion between the face of the hammer and the sheet, and the consequent stripping off or breaking of the polished film formed upon the face of the sheet.

In the finishing of sheet-iron by means of the mottled hammer and anvil, I pile the sheets previously annealed in packs, usually



of three or more, then heat the pack to a very dull red heat, and then pass them rapidly under the mottled hammer. The result of this operation is an increased polish of the surface of the iron, as compared with sheets finished by means of rolls, or by plane-surface hammering, and a peculiar character of gloss, different from and far superior to that which is produced by any other known means. After being thus hammered such sheets need not, ordinarily, be reannealed, although this may be done, if preferred, or found in any case to be desirable.

I have described the sheets as being heated previously to hammering; but this is not absolutely necessary, a similar result as to surface polish resulting from the hammering of the sheets when cold with the mottled hammer.

Having thus described my improvement,

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

As an improvement in the process of manufacturing sheet metal patented to me April 8, 1873, No. 137,585, reissued July 1, 1873, in virtue of which I am enabled to produce sheet metal very closely resembling what is known as Russia sheet-iron, the operation of hammering with a hammer and upon an anvil whose operative faces are true planes otherwise than that they are mottled over with slight indentations, as described, instead of with the ordinary plane-faced hammer heretofore used.

In testimony whereof I, the said W. DEWEES WOOD, have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

FREDERICK STANDISH,

T. B. KERR.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN THE MANUFACTURE OF PLANISHED SHEET-IRON.

Specification forming part of Letters Patent No. **172,235**, dated January 11, 1876; application filed December 14, 1875.

*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 Manufacture of Planished Sheet-Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof.

My present invention relates to an improvement in the manufacture of what is known in the trade as planished sheet-iron.

In a patent granted to me May 14, 1861, the use in a manner therein described of carbonaceous matter ground in oil is set forth as then a new improvement in the art; and this also constitutes a step in the process described and claimed in the patent granted to me July 1, 1873, reissue No. 5,474. In both of these patents the coating or wash of such compound is represented as being applied independently of a baking process before finishing in rolls, or by hammers. I have ascertained by experiment that if such coating or wash be applied to the faces of the sheets, and thoroughly baked thereon before finishing in rolls or hammers, a sheet is produced much superior in its finish to any heretofore put on the market, and, on account of the perfectness of its glaze, much less liable to injury by oxidation, and, consequently, so much the more durable.

In carrying out my improvement the bar or billet is subjected to the operation of "breaking down," by the use of rolls of any suitable construction, till it comes to about Nos. 20 to 22 wire-gage. I then, after removing the surface oxides as completely as may be desirable or practicable, by "scaling," or in other suitable way known in the art, coat or wash the sheets (preferably on both sides)

with a mixture of graphite, plumbago, or other carbonaceous matter ground in oil or other hydrocarbons, or immerse them in a bath of such mixture, pack the sheets in a tight box or case, and subject them to a high red heat, which will require several hours—say, from twelve to twenty-four hours, more or less—and then allow them to cool gradually, taking care to prevent reoxidation during the cooling process. In this manner the mixture specified will, by the action of the heat thereon, be baked into or onto the surfaces of the sheets, so as, by some chemical or mechanical action not fully understood, except by its results, the sheets will have the capacity, when again brought up to the proper temperature—say, a low red heat—for being finished by rolling, or hammering, or both, of receiving a better finish, a more perfect glaze, with less liability to rust than has yet been attained by known processes. While the baking operation is going on other suitable means or material may be employed to protect the sheets against injurious oxidation.

I claim herein as my invention—

As a step in the manufacture of planished sheet-iron, baking a mixture of carbonaceous matter and oil or other hydrocarbon into or onto a previously-deoxidized or scaled surface of the sheet while inclosed or protected against injurious reoxidation, and preparatory to finishing in rolls, or hammers, or both, substantially as set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

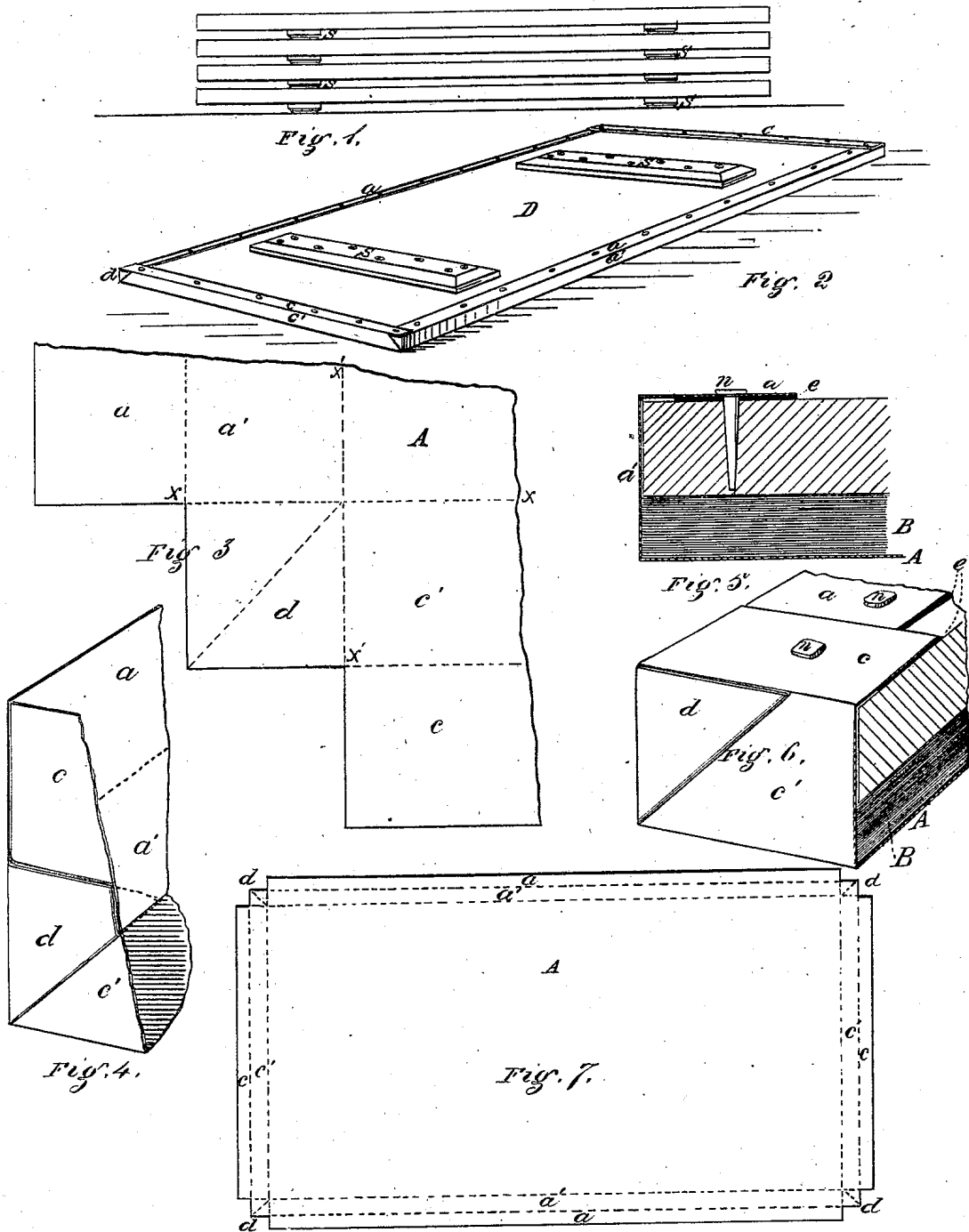
JAMES M. CHRISTY,  
GEORGE H. CHRISTY.

W. D. WOOD.

CASES FOR PACKING METAL SHEETS

No. 183,356.

Patented Oct. 17, 1876.



Witnesses *Thomas L. Clark*  
*Henry A. Weaver*

Inventor: *W. DeWees Wood,*  
By *George H. Christy,*  
his Att'y

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN CASES FOR PACKING METAL SHEETS.

Specification forming part of Letters Patent No. **183,356**, dated October 17, 1876; application filed October 2, 1876.

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 Cases for Sheet-Metal Packages; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1 shows a pile of my improved packages, illustrating their positions with reference to each other, and the floor on which they rest when stored or *in transitu*. Fig. 2 is a perspective view of a single package complete. Fig. 3 is a diagram of one corner of the sheet-metal part of the case unfolded, and nearly or about its full ordinary size. Fig. 4 shows in perspective the sheet of Fig. 3 bent and folded to receive the pack or bundle. Fig. 5 is a sectional view of one edge of the complete package. Fig. 6 is a perspective sectional view of one corner of the complete package; and Fig. 7 is a reduced diagram of the sheet-iron part of the case, showing the lines of cut and bend.

In the handling and transportation of sheet metal, and more especially the finer qualities, such as Russia sheet-iron, planished sheet-iron, &c., great loss results not only from the bending and bruising of the sheets, but more especially from tarnishing and oxidation, caused by handling or by water, or by moisture in the air. This is a serious evil in shipments by sea, lake, or river, and also on railway-cars, since the roofs of cars on which this class of freight is commonly carried are frequently leaky, and railway companies now take such sheet metal only at owner's risk. To guard against this loss various means have been resorted to, such as bundling with straps and outer sheets of an inferior quality, sewing up the bundle in a canvas covering, and also inclosing the bundle in a tight metallic case. None of these methods have proved satisfactory.

In making my improved case—say, for a bundle of twenty-four sheets twenty-eight by fifty-six inches each—I take a sheet, A, of the same or an inferior quality, about five inches longer and wider than the bundle. Each

corner of this sheet I cut as indicated more particularly in Fig. 3. The side edge *a a'* is then bent up by a crease along the line *x x*, and the end edge by a crease along the line *x' x'*, and the corner-piece *d* is folded along its diagonal, bent around against the end or side and soldered or riveted, the corner of the sheet then being as represented in Fig. 4. This is done at each corner. The sheets B, which constitute the bundle, are then put in the box thus made, as represented in Figs. 5 and 6, and a wooden or board cover, D, of the same length and width as the bundle, is then placed on top. This cover should be thick enough to stiffen the pack, and also to nail to, say, three-fourths of an inch, more or less. The projecting edges *a c* are then folded down onto the cover D, and secured thereto by nails or screws *n*, with or without an interposed packing, *e*, of india-rubber, fibrous, or other suitable material, with or without luting, such as will make a water-tight joint. If the cover is made of two or more boards, their joint or joints are preferably luted, and necessarily so if a perfectly water-tight case is desired. Across or along the outer face of the cover D I fasten two or more wooden or metallic cleats, *s*, the upper faces of which are somewhat above the level of that face of the package. These cleats not only hold, stiffen, and strengthen the cover, but also (the package then being inverted for storage or transportation) afford a slightly elevated support for the package to rest on. The packages are then piled one on top of another, as represented in Fig. 1.

With packages thus incased it will not be necessary, for warehouse storage or for railway shipment, to pack or lute the joints. The package, when thus inverted, has a close sheet-metal top, sides, ends, and corners, so that no water can get in from a leaky roof. The packages are so far apart, and the lower one is so far from the floor that no water can get into any package from below, and also far enough apart for the workmen readily to get hold of them in loading and unloading.

In giving the numbers, measurements, and proportions above specified, I do not mean to limit myself thereto, since they may be varied at pleasure to a considerable extent without any substantial departure from the invention.

For some purposes it will answer to omit the folds *a c*, and nail the edge folds *a' c'* directly to the edges of the cover D.

I claim herein as my invention—

1. A case for metallic sheets, consisting of sheet A, closed at the corners, and secured to a wooden cover, D, the latter being provided with raised cleats *s*, substantially as and for the purposes set forth.

2. A water-tight case for metallic sheets,

composed of a metallic sheet, A, folded as described, in combination with wooden cover D, with luted or packed joints, and cleats *s*, substantially as set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

J. J. McCoRMICK,

GEORGE H. CHRISTY.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN PROCESSES AND COMPOSITIONS FOR FINISHING SHEET-IRON.

Specification forming part of Letters Patent No. **186,969**, dated February 6, 1877; application filed December 18, 1876.

*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 Process and Composition for Finishing Sheet-Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof.

My present invention relates to that part of the process of finishing sheet-iron in which heretofore the sheets, after being scaled, have been coated with carbonaceous and oleaginous matter, preparatory to the final heating and rolling or hammering.

I have found that the finish and glazing upon the surface of the iron may be greatly improved by the use, in this part of the process, of an admixture of sal-ammoniac, or any suitable salt or solution of ammonia.

The use of carbon and oil in finishing sheet-iron is described in patents granted to me May 14, 1861, July 1, 1873, and January 11, 1876; and in my present invention the sal-ammoniac may be used in connection with the carbon and oil, as the use of the same is described in any of these patents, as also in connection with a substantially-similar use of the same ingredients, or their equivalents, by mixing with the carbonaceous and oleaginous mixture about ten per centum, by weight, of sal-ammoniac, either pulverized and mixed in by stirring or grinding, or dissolved in the oil, and mixed in like manner, the mixture being of about the consistency of the carbon-and-oil mixture, as heretofore employed, and the application to the iron being made in like manner; but instead of using oil for dissolving and mixing, the sal-ammoniac may be dissolved in the proper amount of water, spirits, or other suitable fluid, for giving to

the carbonaceous matter the proper consistency, and then be mixed with the carbon, or the fluid may consist partly of oil and partly of water, grinding being preferred as a means of mixing.

While I consider sal-ammoniac as the best for the purpose, I include in my invention other compounds and solutions of ammonia adapted for the purpose.

The carbon employed along with the ammonia need not necessarily be a solid, since, by coating the sheets with a mixture of oil and ammonia, and reheating the sheets carefully, so as not to go beyond, say, a cherry-red, or thereabout, the carbon of the oil baked or burnt onto or into the sheets, will, in connection with ammonia, give an improved finish and quality of surface to the iron.

If solid carbon be used, the finer qualities are preferred, such as plumbago, ivory black, &c., though others may be employed with advantageous results.

I claim herein as my invention—

1. The mode of finishing sheet-iron by coating the sheets in the process of rolling with a mixture of carbonaceous matter, ammoniacal salt or solution, and suitable fluid, for the purpose of giving the surface a finely-glazed appearance, substantially as described.

2. As a coating for sheet-iron in the process of finishing, a plastic mixture of carbonaceous matter, and a solution or compound of ammonia, substantially as set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

J. J. MCCORMICK,  
CLAUDIUS L. PARKER.

# 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.



W. D. WOOD.

MANUFACTURE OF SHEET IRON.

No. 252,166.

Patented Jan. 10, 1882.

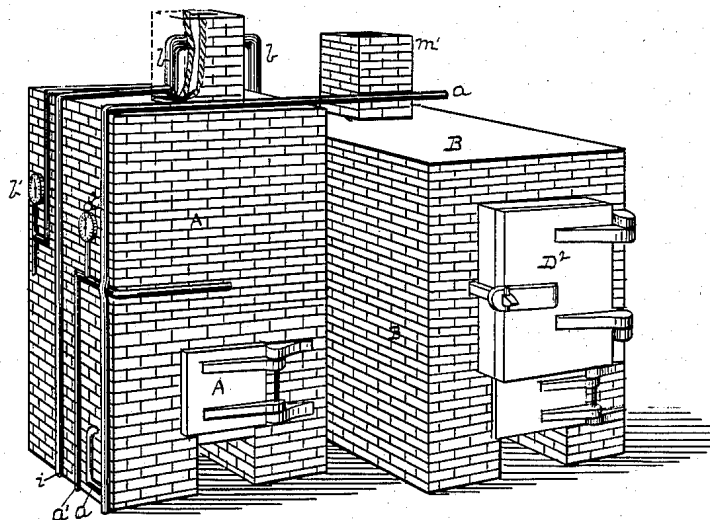


Fig. 1.

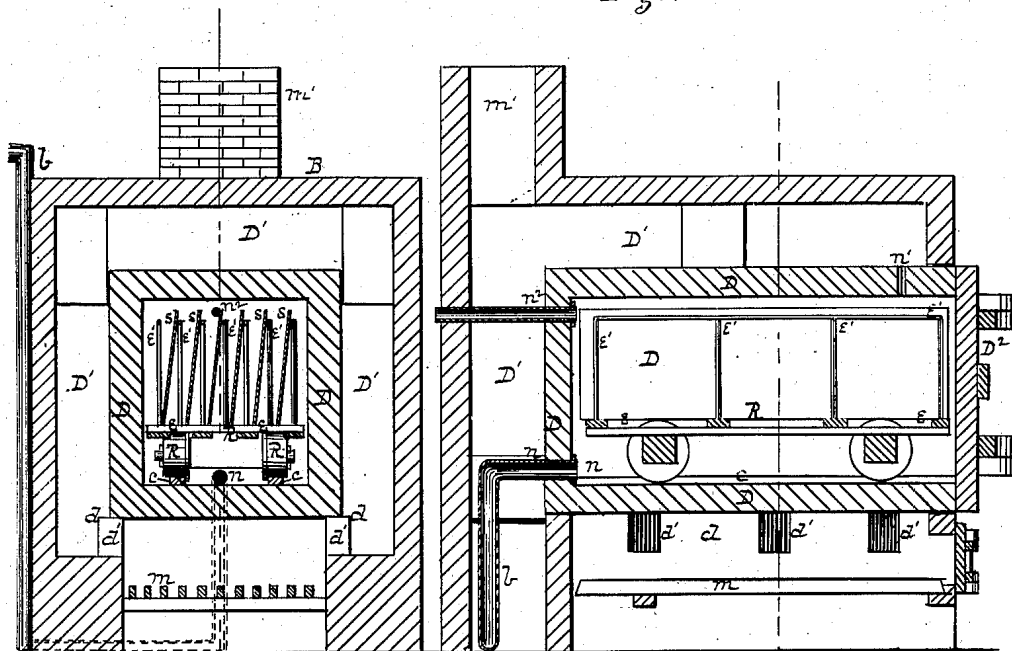


Fig. 2.

Fig. 3.

Witnesses

Francis L. Clark  
Claudius L. Parker

Inventor W. Dewees Wood

By Attorney George H. Christy

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF MCKEESPORT, PENNSYLVANIA.

## MANUFACTURE OF SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 252,166, dated January 10, 1882.

Application filed January 25, 1878.

To all whom it may concern:

Be it known that I, W. DEWEES WOOD, of McKeesport, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in the Manufacture of Sheet-Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is an exterior view, in perspective, of a steam-superheating and oil-vaporizing furnace, as also of a sheet-metal-heating furnace in which my improved process is worked. Figs. 2 and 3 are respectively longitudinal and transverse vertical sections of the latter furnace.

In sundry patents heretofore granted to me, and more particularly Nos. 137,585 (Reissue No. 5,474) and 172,235, I have described the use of carbons, both solid and liquid, in the manufacture of sheet-iron.

In further perfecting the process referred to in said patents, I have found that carbon may be advantageously employed in finishing sheet-iron, not only as a solid or liquid, but also as a gas or vapor; and my present improvement relates, chiefly, to the use of carbon in a gaseous or vaporous condition in connection with superheated steam in the process of finishing sheet-iron.

In Fig. 1, A represents in exterior view a furnace of any suitable construction, adapted to the superheating of steam and to vaporizing the oil or to converting the oil into a fixed gas; but as I make no claim to such furnace separately considered, I deem it unnecessary to show or explain the same in detail.

One convenient or suitable construction of steam-superheating apparatus to be employed in the furnace A is that referred to in patent to Charles J. Eames, No. 186,465, of January 23, 1877, and a suitable vaporizer for converting the oil into a vapor or gas is shown and described in Patent No. 132,266, of October 15, 1872, to same party; but instead of these devices other known construction of apparatus adapted to superheat steam and convert petroleum or other hydrocarbon into a vapor or gas may be employed. I have shown, how-

ever, a steam-pipe, *a*, which leads from any suitable steam-generator, for conveying the steam to the superheater in the furnace.

The pipe *a'*, leading from a pump, tank, or other source of supply under pressure and provided with a pressure-gage, *a<sup>2</sup>*, is the oil-pipe which leads to the vaporizer inside. The commingled steam and carbonaceous vapor or gas are conducted off and carried over to the sheet-metal-finishing furnace B by a suitable pipe, *b*, to which I also apply, by a suitable pipe-connection, a pressure-gage, *b'*. For material I employ any suitable hydrocarbon capable of being readily converted by heat into a vapor or gas, using, by preference, petroleum or such of the residual products or distillates thereof as contain a considerable percentage of carbon, or the same compounded with flaxseed or other oils.

The furnace B is made in oven form with a fire-grate, *m*, in its lower part, and a stack or chimney, *m'*.

On suitable side walls, *d d*, I support a close box or chamber, D, in which the sheet-iron is to be treated. This box or chamber has side and top flues, *D'*, so that the heat evolved from the fire on the grate-bars *m*, passing through flue-holes *d'* in the side walls, *d*, may so surround or encompass the box or chamber D as to raise the same and its contents to the desired high degree of temperature. Access is had to the inside of the box or chamber through a door, *D<sup>2</sup>*, which is made so as to fit closely and prevent the escape of gas or vapor to any dangerous extent.

On rails *e* in the bottom of the chamber D, in connection with a track outside, I run in and out a car or truck, R. The platform *e* of this truck is made, by preference, as open as possible, but so as to support the sheets *s* which are to be treated. These sheets I place on the car edge-wise, and keep them in that position and at the proper distance apart by any suitable open-work—such as posts and rails *e'*. In this way I secure the action and effect desired over the entire surfaces of the sheets.

The conduit-pipe *b* enters the box or chamber D at any suitable point, as at *n*, so as to discharge the commingled superheated steam and the gas or vapor, or both, into the box or chamber.

An escape-port, to guard against undue pressure, is provided at  $n'$  or other suitable point; but to prevent all danger of explosion I prefer to connect the vent with a pipe leading outside, as at  $n^2$ . All the pipes referred to are to be provided with suitable cocks or valves for regulating the flow or supply. At  $i$ , I have shown a pipe which connects with the pipe  $m$  for carrying off the excess or waste.

By the ordinary operation of "breaking down" and rolling I bring the sheets to about Nos. 20 to 22 (more or less) wire-gage. The sheets are scaled in any of the ways known to the art, and are then placed on the car. The latter is run into the chamber D, and the door is closed and made tight. The commingled steam and gas or vapor are then turned on, and a vigorous fire kept up below. The sheets remain subject to these agencies until they are brought up to, or about to, a red heat—say from 900° to 1,100° Fahrenheit, more or less—and for a short time thereafter—say thirty minutes or so, more or less—after which the gas and steam are turned off, and the sheets are allowed to cool down to below a red heat while still in the chamber, and before being brought into contact with external air. The result of this process is that the sheets are coated with a black or dark film, glaze, or coating, such as is known in the art and generally called a "magnetic oxide of iron," with the addition thereto apparently of some carbonaceous elements, the whole glaze constituting probably a magnetic carburet of iron. They are then (if further reduction is desired) rolled or hammered in packs in the usual way.

While I have made specific description of the car and its supports, I do not limit myself absolutely thereto in so far as relates to the mechanical appliances for working the inven-

tion, since in this respect it is only necessary that each sheet be subjected on both faces to the action of the steam and gas or vapor while in a close chamber which is externally heated, and to this end the devices may be varied in structure and arrangement at pleasure.

Without limiting myself absolutely to any particular theory of chemical or mechanical action as regards the operation of the steam and the gas or vapor on the iron, I am now of opinion that such operation is substantially the same as that described in Patent No. 172,235, the carbon of the gas or vapor being baked into or onto the surface of the previously-scaled sheet by the steam and exterior heat, while the sheets are inclosed in a close chamber, and protected thereby against injurious reoxidation; and so far as regards this feature of my present invention, I now consider it as an embodiment of my previous invention, differing only to the extent of specially adapting the latter to the use of carbons brought to a gaseous or vaporous condition before being brought in contact with the iron, as distinguished from the like use of carbons gasified or vaporized after being applied to the iron.

I claim herein—

As a step in the process of finishing sheet-iron, subjecting the sheets in a close exteriorly-heated chamber to the action of a hydrocarbon vapor or gas and superheated steam, substantially as set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

J. J. McCORMICK,  
CLAUDIUS L. PARKER.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## PROCESS OF MANUFACTURING PLANISHED SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 291,260, dated January 1, 1884.

Application filed June 2, 1883. (No specimens.)

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, a citizen of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in the Process of Manufacturing Planished Sheet-Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof.

My present invention relates to the manufacture of a kind of sheet-iron having a surface dark in color, but bright and glossy, and not liable to oxidation under the influence of the atmosphere or other usual surroundings or conditions of use. Sheet-iron possessing these characteristics to a greater or less degree is already known in the art under the names of "Russia," "Imitation Russia," "Planished," &c., and processes of the manufacture of the same are described in sundry patents already granted to me. In the most of these processes, and in fact, as I believe, in all in which by actual use any practical success has been attained, the broken-down iron sheets have heretofore been subjected to the acid-sealing operation preliminary to the formation of a protective coating thereon; but several years of practical experience in the business have shown that, with such degree of care as can ordinarily be secured from mill-operatives, some sheets will be passed and worked into final product, in which the acid will not be perfectly neutralized or the alkali will not be completely removed, and, as a result, a small percentage of product is liable to go out, which will not be as free as is desired from liability to deterioration in use. My present process contemplates the entire disuse of the acid and alkali treatment and provides for the formation or building up of an oxidized surface on each sheet and on each side of each sheet, over and above what is secured in the ordinary workings of the material employed, followed by the "reviving" or reconversion of such oxidized surface back into metallic iron, or so nearly to that state or condition (sometimes called a "nascent" state or condition) that such "revived" or reconverted or nascent surface will enter readily into combination with or will freely and quickly com-

bine with an oxidizing agent supplied thereto in manner substantially as presently to be described, and thereby give an oxide surface adapted to protect the sheet, which oxide surface being fixed, as presently to be described, is worked by heating and hammering or planishing till the desired product is secured.

In working my invention, I preferably use refined cast-iron, and, by known methods, get a bloom of a comparatively high degree of purity. This I work down by ordinary forging or rolling operations to sheet form, of about No. 20 wire-gage, (more or less,) taking care throughout the operation to keep the material clear of free scale; but at the same time I secure the formation on each face of each sheet of a fixed (as distinguished from a free or raised) black oxide coating, and on such coating I promote, so far as may be, the formation of a red oxide surface, and to this end I give to each sheet, while undergoing the rolling operation, a free exposure on both sides to the atmosphere, changing or opening up the sheets frequently if rolled in doubles or packs, and also use water on the rolls with considerable freedom, so that it shall run down on the sheets while passing through, or apply the water directly to the hot sheet by a brush or otherwise, but not in such amount as to cool them through or to interfere seriously with their regular and uniform reduction by rolling. If any free scale is raised, it is to be carefully brushed off or otherwise removed. This method of treatment will give a fixed black oxide coating on each surface of each sheet, and will form more or less red oxide on the top or surface of the black oxide. The sheets thus broken down, and with the black and red oxide coatings thereon, as thus described, are allowed to cool, and I then apply to each surface of each sheet a coat or wash consisting of charcoal-dust, red oxide of iron, and suitable liquid—such as water or oil—made or mixed up thin, so as readily to be applied with a broom or other suitable implement, and by the use of which the wash is to be thoroughly rubbed in, or the rubbing action is to be kept up until the red oxide formed on the sheet and the ingredients of the wash are well commingled, and are also distributed

with a good degree of uniformity over the surface of the sheet, on which they remain as a thin film or coating. This step in the process is directed especially to the building up or accumulation of a comparatively thick coating of oxide on each face of each sheet, and it differs from anything previously done to my knowledge, in this branch of the art, both in the intentional making of a red oxide on top of a black oxide by artificial means during the breaking-down operation, and also in adding thereto an additional quantity of artificially-applied red oxide, and, still further, in rubbing in the artificially-formed and applied red oxides, with reference to facilitating the operations next to be described. The pulverized charcoal is used chiefly to aid in the chemical operations subsequently taking place. In the preparation of this wash a finely pulverized or ground red oxide may be used; or, if not put in at first, the repeated washings and rubbing of successive sheets, and the redipping of the brush or broom or other implement into the liquid will soon so impregnate or charge the wash with the red oxide taken from the sheets that it will answer the purpose in view. If the work thus far is well and carefully done, enough red oxide will be formed on the sheets for the purpose of this invention. The sheets are then matched up in packs—say of from three to six sheets, more or less, according to the gage of product desired, and are then heated in an ordinary or any suitable sheet-reheating furnace, and rolled, again heated and rolled in the manner common in doing such work, until the sheets are brought down to or approximately to the desired gage. The first of these heatings should be to or about a bright red, and subsequent ones to a lower temperature—say a dull red. During the rolling operations the sheets are to be opened up from time to time, to see that they are clear of dirt and free scale and do not stick, &c., in the process of rolling. The sheets, then being cold, are again rubbed as before, separately and on both sides with a wash of red oxide and water, or with the same wash as previously used, and while they are still wet therefrom I throw or sprinkle onto each wet surface a coating of charcoal-dust, preferably somewhat coarse, till it is well covered at every point—say, thick enough to cover the surface of the sheet from sight; or it may be thicker still without danger of injurious results. The sheets, as fast as they are thus coated, are piled one on top of another, till a package is formed of from, say, twenty to one hundred sheets, more or less; but the sheets, when dry, may be thus built up into a package, with intermediate layers of charcoal, if so desired; but the work can be done with greater ease and facility when the sheets are wet. Such package is then charged into a chamber or re-ort of iron or clay or other suitable material, which is then closed up air-tight and subjected to external heat—about a white heat—for from, say, four to eight hours. (more or less,) or

till the fixed oxide on the surfaces of the sheets has, by the action of the carbon of the charcoal, become revived, or reconverted into metallic iron, or brought so near to the condition of metallic iron that it is just ready to come, or on the point of coming, to that condition, and it may then be termed "nascent" iron. The package is then removed with the sheets still at a high temperature. Immediately thereon, and before any injurious effects are produced by atmospheric exposure, I quickly remove the refuse material—such as ashes, unconsumed charcoal, &c.—from the face of each sheet, and simultaneously or immediately after supply an oxidizing agent to each revived, reconverted, or nascent surface, so as to form a black or magnetic oxide thereon, and before the internal heat of the sheet or the external air can act to "raise" or free the oxide so formed I chill or cool the sheet to such a degree as to arrest further chemical action. In this way I get on each surface of each sheet a black oxide of uniform quality and thickness, and fix it so that the sheet is then in condition for further working. In doing this work various devices may be employed, and the right to patent such devices separately, so far as they may involve invention, is hereby reserved; but, that the present invention may be the better understood, I will describe one way of doing it, which I particularly claim as of my own invention. Over and along each surface of each sheet, as soon as it is uncovered or exposed, I play a series of jets of superheated steam under a high pressure, the jets being of such size and so close together, and striking the sheet at such angle, that they will thoroughly blow off the waste material remaining on the sheet, and at the same time will furnish to the hot sheet such amount of oxygen (by decomposition) as to convert the revived or nascent iron of the surface, or will form thereon a black or magnetic oxide over its whole surface, and practically uniform in thickness. This I follow quickly by an application through the use of a sponge, mop, brush, or otherwise, of cold water, in such manner and amount as to cool the sheet sufficiently to arrest further chemical action, either from the internal heat of the sheet or from the external air, and by so doing I fix the oxide so formed as against any tendency to raise or form a free scale; but other suitable means of doing the same work may be employed. Ordinarily the sheets will still be quite warm, and they may then be hammered to take out any irregularities—such, for example, as result from buckling in cooling. They are then matched up into packs as before, charged into a sheet-reheating furnace, and raised, say, to a fish-worm red, then hammered thoroughly all over by planishing-hammers in the manner already known in the art, and this reheating and planishing operation is repeated one, two, three, or more times, until the desired surface is obtained, which is a brilliant blue polished surface, superior in all respects to the best Russia.

I claim herein as my invention—

1. In the manufacture of planished sheet-iron, the improved method of preparing broken-down iron sheets for subsequent working, which consists in coating the same with a wash of red oxide of iron, carbon, and water, or other suitable liquid, substantially as set forth.

2. In the manufacture of planished sheet-iron, the improved method of preparing the broken-down iron sheets for subsequent working, which consists in rubbing up the red oxide formed on the sheets while being rolled and simultaneously applying and rubbing in an artificial wash of red oxide, carbon, and suitable liquid, substantially as set forth.

3. In the manufacture of planished sheet-iron, the improved method of preparing the sheets for treatment in a closed retort or chamber, which consists in coating the same with artificially-applied red oxide and pulverized carbon, substantially as set forth.

4. In the manufacture of planished sheet-iron, the improved method of treating the hot sheets as they come from the retort, which consists in quickly removing the waste material therein, reoxidizing the revived or nascent surface while still hot, and immediately cooling the sheet by artificial means, substantially as set forth.

5. The improved method of cleaning and simultaneously reoxidizing the revived or nascent surface of a sheet previously coated with an oxide and deoxidized in a closed retort or

chamber, which consists in causing a series of jets of superheated steam under high pressure to discharge or blow on and along the exposed surface of such sheet while still hot from the retort or chamber, substantially as set forth.

6. In the manufacture of planished-sheet-iron, the improved method of treatment embracing the following steps: first, subjecting the unscaled sheets in packs, with intervening layers or coatings of carbon, to the action of a high heat in a close chamber or retort; second, causing a series of steam-jets to discharge or blow on and along the exposed surface of each sheet while still hot from the retort or chamber; and, third, arresting further chemical action by artificial means, substantially as set forth.

7. The improvement in the process of making planished sheet-iron, which consists in artificially promoting thereon, substantially as described, the formation of an oxide surface, reviving such oxide surface, reoxidizing such revived or nascent surface, and fixing the oxide so formed, with intermediate heating and rolling and final heating and planishing, substantially as hereinbefore set forth.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

R. H. WHITTLESEY,  
C. M. CLARKE.

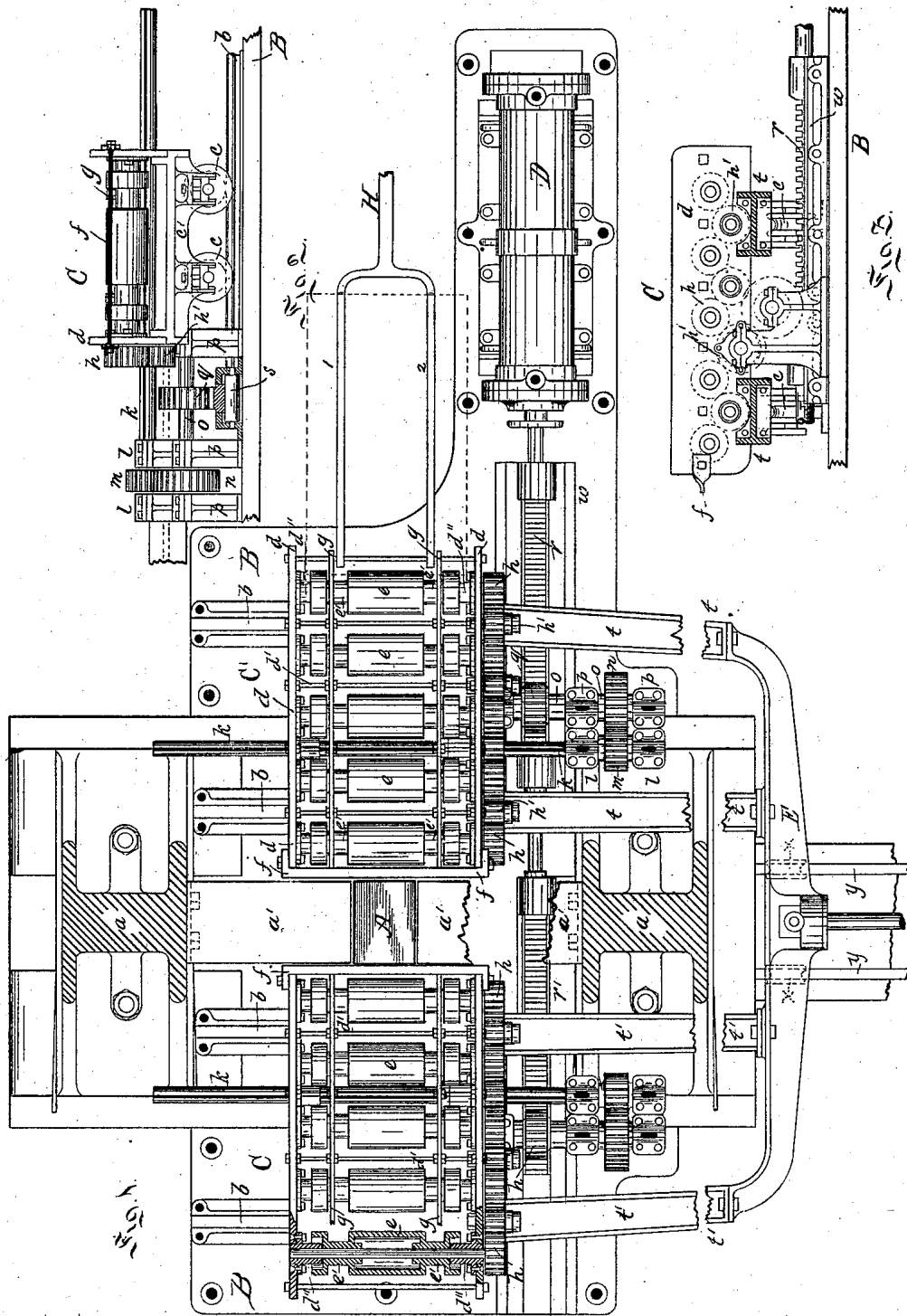
(No Model.)

W. D. WOOD.

FEED TABLE FOR HAMMERING MACHINES.

No. 293,611.

Patented Feb. 12, 1884.



*Witnesses:*  
S. S. Wolcott  
L. M. Clark  
R. H. Whipple

*Inventor* W. Devereux Wood.  
*By* Attorney George H. Christy

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## FEED-TABLE FOR HAMMERING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 293,611, dated February 12, 1884.

Application filed September 26, 1883. (No model.)

*To all whom it may concern:*

Be known that I, W. DEWEES WOOD, a citizen of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Feed-Tables for Hammering-Machines; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a plan view of my improved feed-table, the upper part of the hammer being removed and the hammer-frame being shown in section. Fig. 2 is an end view of one-half of the table. Fig. 3 is a side view of one-half of the table, the gear-wheels and idlers being indicated by dotted lines to show their relative arrangement.

It is necessary, as the final step in the manufacture of Russia or planished sheet-iron, that the sheets should be subjected in packs to an equal and uniform hammering one or more times over the whole surface, in order to produce the bright polished surface characteristic of this kind of sheet-iron. It has been found necessary, in order to produce good and uniform results in this hammering operation, to use a hammer the face area of which is considerably less than the area of the sheets to be hammered, that is less in length and width; consequently, in the use of such a hammer, it is necessary to move the packs of sheet-iron longitudinally and transversely across the anvil of the hammer in order to bring every part of the sheet under the action of the hammer.

My invention relates to feed-tables to be used in connection with a suitable hammer, for the purpose of moving the packs horizontally and transversely across the hammer and at any desired speed, and as far at each movement as may be desired; and to this end my invention consists, in general terms, of a series of suitably-driven feed-rolls mounted on carriages located one on each side of the hammer or anvil, and constructed to move back and forth along the sides of the hammer on suitably-arranged ways.

A indicates the anvil, and *a* the standard, of a power-hammer suitable for the purpose, the

hammer used being that shown in patent to T. R. Morgan, No. 231,185, dated August 17, 1880. On each side of the anvil *A* are arranged on a suitable foundation, *B*, two parallel rails, tracks, or ways, *b*. On these tracks run the trucks or carriages *C C'*. As the two trucks are constructed exactly alike, the description of one of them will be sufficient. On the axles of the truck-wheels *c* is mounted the frame or bed *c'*, and to this frame or bed are attached the side bars, *d*, which are rendered more rigid by rods *d'*, which extend across the carriage and through the side bars, nuts being screwed upon the rods against the side bars. In these side bars, *d*, are mounted the shafts of the feed-rolls *e*, the bearings of the shaft being lengthened by flanged collars *d<sup>2</sup>*, bolted onto the inner side of the side bars, *d*, as shown by sectional view at the left hand of Fig. 1. At the end of the table toward the anvil is bolted to the side bars, *d*, the transverse bar *f*, which prevents the sheets of the pack from sagging down between the last feed-roll and the anvil. Attached to this bar *f* are the longitudinal bars *g*, which pass along the grooves *e'* in the feed-rolls *e* and prevent the sheets from sagging down into said grooves, which are formed in the rolls for the purpose of receiving the two prongs 1 2 of the lifting device *H*, which is used for placing the pack on the feed-rolls. These longitudinal bars *g* are further supported by the rods *d'*, which pass through them, the bars being retained in place by nuts on the rods.

On the shafts of the feed-rolls, which project beyond the side bar, *d*, on one side of the carriage, are mounted gear-wheels *h*, which mesh with idler-gears *h'*, mounted on the side bar, *d*. Through one of these idler-gears *h'* passes the shaft *k*, the gear and shaft being so splined together as to allow the gear to move longitudinally on the shaft, but to revolve with it. One end of this shaft *k* is mounted in suitable bearings, *l*, and has keyed to it between these bearings *l* a pinion, *m*, which meshes with a pinion, *n*, on a short shaft, *o*, mounted in bearings *p*. This shaft *o* is also provided with another gear, *q*. To revolve this gear, and by means of it, through the shafts and gears described, the feed-rolls *e*, first in one direction and then in a reverse direction, a rack, *r*, sliding on ways *w*, which are provided



with friction-rolls *s*, is reciprocated back and forth by a hydraulic ram, *D*, whose piston-rod is connected with the rack. This rack is connected to a similar rack, *r'*, and gives the requisite movement to the mechanism corresponding to that above described mounted on the other carriage, *C'*. To give to the carriage the transverse motion, a yoke, *E*, secured to the piston-rod of a hydraulic ram, (not shown, but similar to that shown at *D*,) is attached to one side of each of the carriages *C* *C'* by beams *t t'*. To relieve the beams *t t'* of the weight of yoke *E*, the center of the yoke is supported by rollers *x* on rails *y*. By the above mechanism a transverse motion is given to the carriage. Secured to the standards *a*, and extending from said standards to each side of the anvil, are plates *a'*, which support the pack on each side of the anvil and between the rolls of the carriages.

It will be observed that the feed-rolls of the carriages and the carriages themselves have a simultaneous and equal motion in like directions, the feed-rolls moving the packs longitudinally of themselves across the anvil, and the carriages carrying the packs transversely across the anvil or across the line of feed, and that both motions may be reversed by a reversal of the stroke of the pistons.

The side bars, *d d*, of one of the carriages may be extended, and, passing by the anvil, be united to the bars *d d* of the other carriage, and the gearing of one carriage be connected to that of the other carriage by a train of idler-gearing, and in such a construction only one of the racks *r r'* would be necessary, and the shafts and gears now used to transmit motion to the gears on one of the carriages would also be omitted.

The operation of the apparatus is as follows: The packs are taken upon the prongs of the lifting device, and by them deposited upon

the feed-rolls, the prongs of the lifting device dropping into or passing along the grooves of the feed-rolls, and on being relieved of the weight of the pack are easily withdrawn. The feed-rolls are then set in motion by the hydraulic ram *D*, feeding forward the packs under the hammer. Then the carriages are moved, carrying the packs transversely under the hammer, and by alternating these movements of the rolls and carriages, or reversing, if necessary, every part of the surface of the packs is successfully presented to the action of the hammer, and the operation is repeated or continued as often or as long as may be desired.

What I claim as my invention is—

1. In a machine for hammering sheet-iron, the combination of the anvil *A*, the reciprocating carriages *C C'*, the rolls *e*, mounted in said carriages, means for reciprocating said carriages, and means for rotating the feed-rolls, substantially as shown and described.

2. In a machine for hammering sheet-iron, the combination of the anvil *A*, the reciprocating carriages *C C'*, the feed-rolls *e e*, mounted in said carriages, the gear-wheels *h*, and idlers *h'*, the reciprocating rack *r*, means for transmitting motion from rack to the gears and idlers, and means for reciprocating the carriages, substantially as shown and described.

3. The combination of the carriage *C*, the feed-rolls *e*, provided with grooves *e'*, the longitudinal and transverse bars *g f*, the gears and idlers *h* and *h'*, and the means for rotating said gears and idlers, substantially as shown and described.

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

D. S. WOLCOTT,

R. H. WHITTLESEY.

(No Model.)

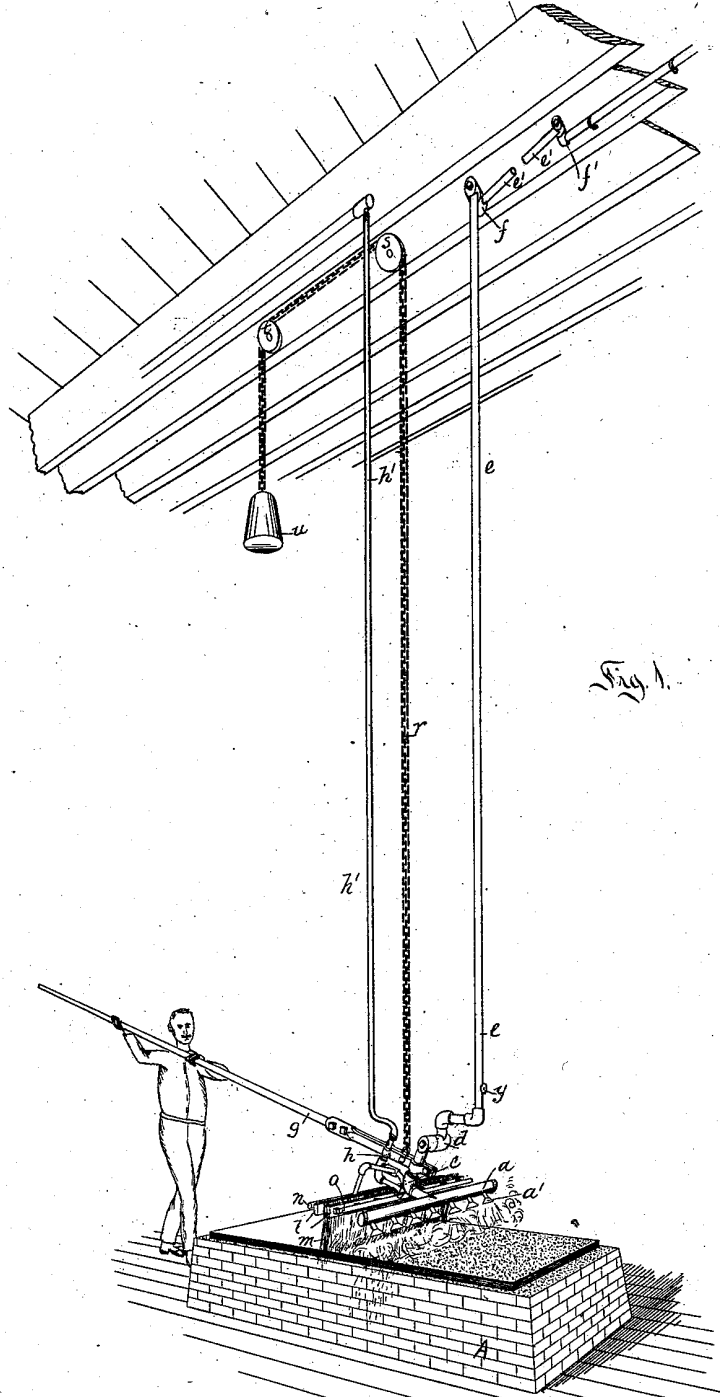
2 Sheets—Sheet 1.

W. D. WOOD.

APPARATUS FOR TREATING SHEET IRON.

No. 294,559.

Patented Mar. 4, 1884.



*Witnesses*  
D. S. Wolcott  
R. M. Clark

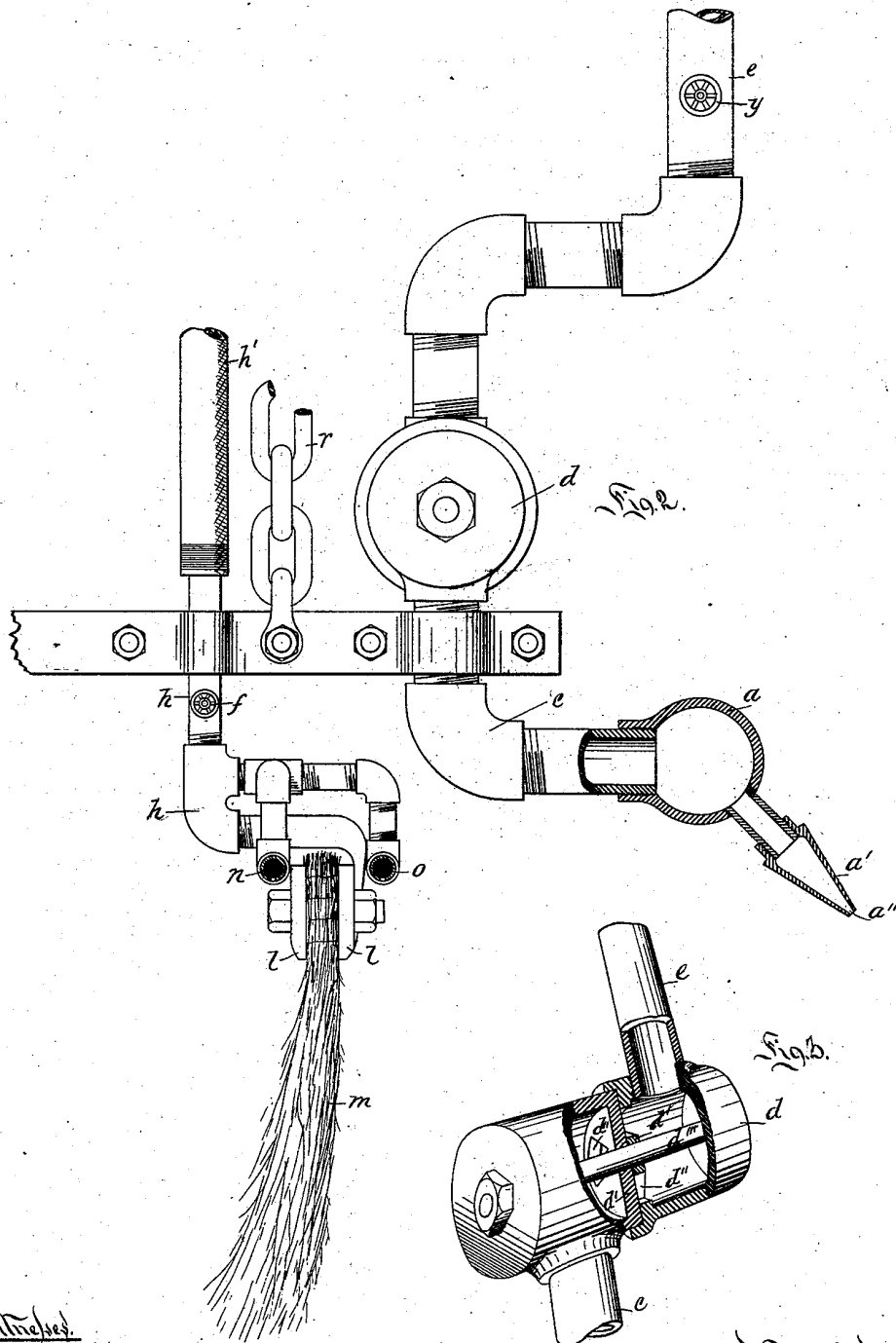
*Inventor* W. Devereux Wood.  
*By Attorney* George H. Christy

W. D. WOOD.

APPARATUS FOR TREATING SHEET IRON.

No. 294,559.

Patented Mar. 4, 1884.



*Witnessed*  
*D. S. Wolcott*  
*E. M. Clark*

*Inventor* *W. Dewey Wood.*  
*By Attorney* *George H. Christy*

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## APPARATUS FOR TREATING SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 294,559, dated March 4, 1884.

Application filed September 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, a citizen of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Apparatus for Treating Sheet-Iron; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a perspective view of my apparatus. Fig. 2, Sheet 2, is an enlarged detail view, certain parts being shown in section. Fig. 3, Sheet 2, shows the hinged joint, the side of the joint being broken away to show the steam-ports.

In an application, No. 96,919, filed June 21, 1883, I have described and claimed a process of manufacturing what is known in the art sometimes as "Russia" and sometimes as "planished" sheet-iron. This process consists, in general terms, in forming or building up on the surfaces of the sheet a comparatively heavy oxide coating, which is subsequently "revived," as it is called, or converted into nascent iron, and which latter is converted into a black or magnetic oxide, such that by subsequent heating and hammering the described polished surface is produced. One of the steps of this process consists in subjecting the sheets, just as they are taken from the reheating or annealing furnace, and at a bright-red heat, and covered with ashes and unconsumed charcoal—with which latter material they were packed previously to being heated or baked—to the action of superheated steam, thereby producing a black or magnetic oxide on the surfaces of the sheets. The sheets are then immediately to be chilled or cooled, so as to reduce the surface of the sheets to a temperature below that at which any further oxidation or injurious action under atmospheric influence can take place. This chilling may be effected in various ways—as, for instance, sponging off the sheets with cold water, or by means of broom or sprinkling device attached to the steam-applying apparatus.

My present invention relates to an apparatus for applying steam against or on the sheet-iron, and for sprinkling and cleaning off the

sheets after being acted on by the steam. The sheets are taken from the furnace in packs composed of fifty or sixty sheets, more or less, and immediately, while at a red heat, placed upon a suitable bed, A, and then successively subjected on one side to the action of superheated steam, chilled, and cleaned. The sheets are then turned over onto an adjoining and similar bed, and the other side of the sheet is similarly treated.

To insure a complete and uniform distribution of the steam, I employ a transverse horizontal pipe, *a*, of a length at least equal to the breadth of the sheets, and provided with perforations or fan-tailed nozzles *a'*, which are constructed with long narrow slits, so that the steam will be directed and distributed in broad thin sheets against or on the sheets, so as to be applied with practical uniformity over the entire surface. The perforations or nozzles are arranged in such close proximity to each other that the sheets of steam will cross each other, and at such angle to the sheets that the ashes, &c., will be raised up and blown off from the sheets by the action of the steam, thereby insuring the contact of the steam with every part of the surface of the sheet. This transverse pipe *a* is connected by a short elbow, *c*, to one part of a hollow hinged coupling, *d*, which may be of any known construction suitable for the purpose, the one shown in Fig. 3 being of the swing joint style or pattern, wherein the abutting walls or diaphragms *d'* are provided with ports or openings, *d''*, which, by turning one part of the coupling, can be brought into register with each other. By this construction I enabled to cause a flow of steam from the nozzles *a'* by a slight turn of one part of the coupling on the rod *d<sup>3</sup>*, which holds the parts of the coupling together. The other part of this coupling *d* is connected by an elbow to the long vertical pipe *e*, which, at its upper end, is connected by a hollow hinged coupling, *f*, to one end of a horizontal pipe, *e'*. The other end of this pipe *e'* is also connected by a similar hollow coupling, *f'*, to the pipe *e<sup>2</sup>*, which is connected with a suitable steam generator and superheater. By this arrangement of pipes and couplings I am enabled to raise and lower the transverse pipe *a*, to bring it the proper distance from the pack on the table A. The pipe *e* is of such a length and is

pivoted at such a distance from the bed A that the arc of the circle in which the transverse pipe *a* swings is practically parallel to the bed.

5 To swing the transverse pipe *a* and to turn it vertically in its hinged coupling *d*, I employ the handle *g*, attached to the elbow *c* between the coupling and the transverse pipe. To the handle *g*, just in the rear of the elbow *c*, is secured a short pipe-elbow, *h*, to the upper end of which is attached a length of hose, *h'*, leading to a suitable water-supply. The other end of this elbow *h* is suitably secured to one of a pair of clamp-bars, *l*, arranged parallel to the transverse pipe *a*, and between these clamp-bars is secured the broom *m*, the two bars of the clamp being drawn together by suitable bolts and nuts. On each side of this broom, and at the top thereof, are arranged transverse perforated pipes *n* and *o*, by which water is supplied and directed on the broom in such quantities as to keep it thoroughly wet. These transverse water-pipes *n* and *o* are supported by and connected to the pipe-elbow *h* by means of short pipes *p* and *q*. To hold these devices at the proper height and aid in adjusting them up and down, I attach to the handle *g* a chain, *r*, which passes up over a pulley, *s*, and down over another pulley, *t*, and has a weight, *x*, attached to its free end. In the pipes *e* and *h* are arranged stop-cocks *x* and *y*, whereby the flow of steam and water is regulated. After the sheets are placed on the bed A, the workman slightly raises the handle *g* to turn one part of the coupling *d*, thereby bringing the ports *d'* into line with each other, and allowing the steam to escape from the nozzles. He then swings the whole device forward over the sheets, thus directing the steam to every part of the sheets and insuring a uniform formation of a black or magnetic oxide over the whole surface. The broom, which immediately follows, chills the sheets on the side under operation and sweeps off from the sheets all the residue of ashes and unconsumed charcoal thereon, leaving the sheets in condition for further operation. The broom, in addition to cleaning off the sheets, acts as a distributor of the water, bringing it into contact with every part of the sheet, but in such limited quantities as to chill only the surface under operation. This limited cooling is important, for the reason that the other sides of the sheets are to be similarly treated.

55 In some respects the construction of the devices thus described may be modified or

changed without any substantial departure from the scope of the present invention, and more particularly as regards the form and distribution of the jet openings or nozzles for the supply and distribution of the superheated steam, and as regards the construction of the water-distributing mechanism.

What I claim herein as my invention is—

1. In an apparatus for treating sheet-iron, the combination of a steam supply and distributing mechanism and a cooling or chilling mechanism, arranged for operation in immediate succession along the surface of the sheet under treatment, substantially as set forth. 65

2. An apparatus for applying superheated steam to sheet-iron surfaces, having a transverse pipe, *a*, provided with suitable jet-openings, for the uniform distribution of the steam over the surface of the sheet, and a valve, *d*, for turning on or shutting off the steam-supply, in combination with means for opening and closing the valve at will and reciprocating the transverse pipe over the surface of the sheet, substantially as set forth. 70

3. In an apparatus for treating sheet-iron, the combination of the steam supply and distributing mechanism, a water supply and distributing mechanism, and a mechanism for sweeping off the sheets by frictional contact therewith, arranged for operation along the surface of the sheet under treatment, substantially as set forth. 75

4. In an apparatus for treating sheet-iron, a steam supply and distributing mechanism and a water supply and distributing mechanism connected with the same operating-handle, *g*, in combination with a flexible supply to each, substantially as set forth. 80

5. In an apparatus for treating sheet-iron, the combination of the transverse pipe *a*, having perforations or nozzles, the pipe *e*, the perforated pipe *o*, and the hose *h'*, substantially as set forth. 85

6. In an apparatus for treating sheet-iron, the combination of the transverse pipe *a*, having perforations or nozzles, the hinged and ported coupling *d*, the pipe *e*, the perforated pipe *o*, the flexible pipe *h'*, and the handle *g*, substantially as set forth. 105

In testimony whereof I have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

D. S. WOLCOTT,  
R. H. WHITTLESEY.

# UNITED STATES PATENT OFFICE.

W. DEWEES WOOD, OF PITTSBURG, PENNSYLVANIA.

## METHOD OF MAKING SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 310,354, dated January 6, 1885.

Application filed May 13, 1884. (No specimens.)

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in the Manufacture of Planished Sheet-Iron, of which improvement the following is a specification.

In Letters Patent No. 291,260, granted to me January 1, 1884, I describe and make claim to certain improvements in the process of manufacturing planished sheet-iron, in which, after the sheets were broken down to about No. 20 wire-gage, (more or less,) means were employed for promoting thereon the formation of a red oxide, and after which the sheets in packs were heated and rolled to about the gage required in the finished product, and they were then treated first by packing in charcoal and baking and then by superheated steam, followed by heating and hammering, all substantially as set forth in said patent. The article thus produced possessed a highly-finished dark-blue glossy surface, perfectly or almost perfectly uniform in tint and glance. In such manufacture it has been usual to employ chilled-metal rolls having highly-polished surfaces, and to the use of such rolls the presence of the uniform fine smooth surface is largely due. In this kind of product a finished surface somewhat mottled in appearance is desirable, as thereby not only are its salable qualities improved, but also, I find, that under some conditions of use it is more durable and lasting. I have discovered that by varying this process in so far as to roll a portion of the sheets, say about one-third, (more or less,) by the use of soft rolls, or rolls made of mixed or mottled pig metal, thus reducing them from, say, No. 20 wire-gage to or approximately to the gage of the finished products, I secure on such sheets a roughened effect or mottled appearance, such that by then packing these soft-rolled sheets between the hard-rolled sheets the desired mottled or dappled effect or appearance may be imparted to the whole pack, or to all the sheets of the pack; hence, in working the present invention, and commencing at the point indicated, I employ one, two, or more trains of rolls,

sufficient in number for the rolling and reducing of, say, two-thirds of the sheets, (more or less,) such rolls being chilled and having each a highly-polished surface. For the rolling and reduction of the rest of the sheets, say 55 about one-third, (more or less,) I employ a train or trains of what are commonly known as "soft rolls," the same being made of mottled iron. These latter, partly in consequence of wear, soon become so roughened or mottled 60 on their surface as to impart a somewhat roughened or mottled surface to such sheets. Then in packing the sheets in charcoal or other material preliminary to baking, I arrange them alternately—that is to say, two 65 sheets of hard-rolled, then one of soft-rolled, and so on in succession until the pack is completed, after which the operations of baking, cleaning, &c., are carried on as described in the patent above referred to, or in other man- 70 ner, as may be desired; but in any event the operation of hammering and heating alternately must be employed to get the desired finish; or, in other words, after the baking is done the sheets are to be hammered, either 75 with or without some other intermediate treatment, so that as a result of heating and hammering the desired planished surface may be produced: I have found in practice that with the sheets thus alternately arranged the mot- 80 tled effect imparted to the soft-rolled sheets will in the final hammering be transferred, in part at least, to the hard-rolled sheets; and still further, the hard-rolled sheets reacting on the soft-rolled sheets lessen or reduce the mottled 85 effect previously imparted to them by the soft rolls. Consequently it will be seen that I secure in this manner a uniform mottled effect, not excessive in amount or degree, and one closely approximating or identical with that 90 found in imported Russia sheet-iron.

While I believe the best results are secured by proportioning the sheets one-third and two-thirds, and alternately arranging them by twos 55 and ones, as above stated, I do not limit myself in this regard to any definite proportion, as good results may be attained by changing these proportions to one-fourth and three-fourths or one-half and one-half, or other- 100 wise, as may be desired; nor do I limit my-

self as regards other features of the process,  
such as the artificial formation of an oxide  
before rolling or the use of steam after rolling,  
it only being essential that after the breaking-  
5 down operation, and before the final baking,  
some of the sheets be worked or reduced on  
soft rolls, so as to give the desired mottled  
surface thereon, and the rest of the sheets be  
worked and reduced on hard-chilled rolls,  
10 and that such sheets be alternately arranged  
in any desired order or number preliminary  
to baking or heating and final hammering, or  
an equivalent finishing operation by the use  
of rolls.

I claim herein as my invention—

15

The method of imparting a mottled appear-  
ance or surface to planished sheet-iron by  
reducing a portion of the sheets in soft rolls  
and another portion in hard rolls, and alter-  
nately arranging such sheets in packs prepar- 20  
atory to final hammering or rolling, substan-  
tially as set forth.

In testimony whereof I have hereunto set  
my hand.

W. DEWEES WOOD.

Witnesses:

R. H. WHITTLESEY,  
DARWIN S. WOLCOTT.

# UNITED STATES PATENT OFFICE

W. DEWEES WOOD, OF McKEESPORT, PENNSYLVANIA.

## IMPROVEMENT IN THE MANUFACTURE OF SHEET-IRON.

Specification forming part of Letters Patent No. 137,585, dated April 8, 1873; reissue No. 5,474, dated July 1, 1873; application filed June 18, 1873.

*To all whom it may concern:*

Be it known that I, W. DEWEES WOOD, of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Manufacturing Sheet-Iron; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention consists in the mode of finishing sheet-iron by, first, securing a non-oxidizable surface, in the manner hereinafter set forth; second, rolling and annealing; and, third, hammering in packs while cold.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same.

The iron, after being broken down into sheets by rolling, is cleaned of its scale by acid and alkaline baths, and washed with hot water in the manner usually practiced in the art, or the scale may be removed by other suitable process. The sheets are then immediately placed in a hot-air oven and thoroughly dried; and, while still warm and free from rust, they are plunged into a bath of graphite and oil, or an equivalent mixture of carbonaceous matter ground in oil, of suitable consistency for coating the sheets therewith. The sheets are then rolled in packs of three or

more at a good rolling-heat. After they are trimmed and annealed, I arrange them in packs of, say, from ten to one hundred, more or less, and, while cold, subject such packs to the operation of hammering over their entire surface. With a system of hammers operating at the rate of, say, twenty to forty blows per minute, a medium-sized pack can be ordinarily hammered sufficiently in about ten minutes, more or less, so as to impart to the sheets a polished surface superior to that of the best Russia sheet-iron.

The graphite and oil may be applied separately, if so desired.

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

In the process of finishing sheet-iron, the combination of the following steps: First, coating the sheets separately with a mixture of graphite, or other carbonaceous matter ground in oil; second, rolling and annealing; and, third, hammering in packs while cold, substantially as set forth.

In witness whereof I, the said W. DEWEES WOOD, have hereunto set my hand.

W. DEWEES WOOD.

Witnesses:

F. STANDISH,  
T. B. KERR.



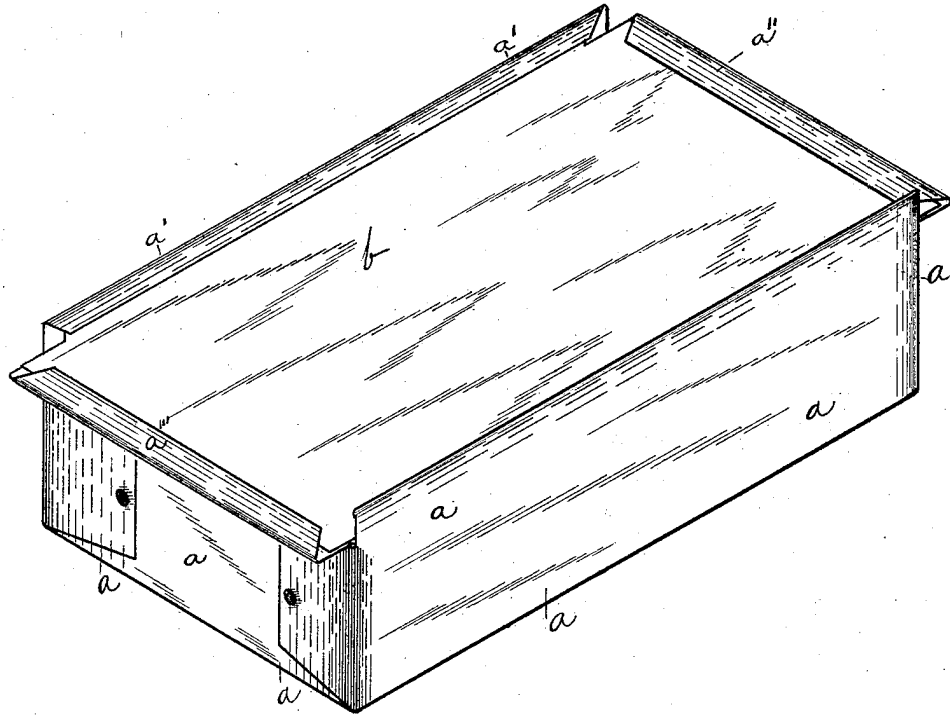
(No Model.)

W. & W. H. ROGERS.

MANUFACTURE OF PLANISHED SHEET IRON.

No. 380,822.

Patented Apr. 10, 1888.



*Witnesses:*

*J. H. Cooke*  
*J. C. Barnes.*

*Inventors.*

*Wm Rogers.*  
*Wm H. Rogers.*  
*By James D. Ray,*  
*Attorney.*

# UNITED STATES PATENT OFFICE.

WILLIAM ROGERS, OF PITTSBURG, PENNSYLVANIA, AND WILLIAM H. ROGERS, OF WHEELING, WEST VIRGINIA.

## MANUFACTURE OF PLANISHED SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 380,822, dated April 10, 1888.

Application filed March 9, 1887. Serial No. 230,211. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM ROGERS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, and WILLIAM H. ROGERS, of Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Improvement in the Manufacture of Russia or Planished Sheet-Iron; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to the manufacture of what is known in the art as "Russia sheet-iron," this sheet-iron having a polished surface or skin which protects it from rusting, and at the same time adds greatly to its appearance, so that it is in great demand for the manufacture of stoves, stove-pipe, and other light sheet-metal ware.

It is well known that in the rolling of sheet-iron a scale or surface of metallic oxide is formed on the surface of the rolled sheet, this scale adhering only partially to the metallic iron; and in case the sheet is heated, or is exposed for any long period, the scale either becomes loosened from the surface of the metal and a new surface of oxide is formed thereon, or the oxide gradually penetrates into the body of the sheet, as the scale is not permanently attached to the body of the sheet and does not sufficiently protect it. It is well known, however, that metallic oxide—such as the scale formed on and falling from the surface of blooms or rolled metal during the rolling operation—is not affected by the atmosphere, and that it may be exposed for a long period in the presence of moisture without losing its color or being further affected thereby. In the manufacture of finished sheet-iron—such as the ordinary American polished or imitation Russia sheet-iron—it has been customary to remove this scale from the body of the sheet by pickling operation, the acid eating off the scale and exposing the metallic body of the sheet, and by suitable means a coating being formed on the surface of the pickled sheet, this coating acting to some extent to protect the metal from further oxidation; but the sheet metal heretofore manufactured is found to be less durable than the genuine imported Russia sheet-iron. It is believed that the best protection to the surface

of the sheet is to have permanently united thereto a coating or "hide" composed largely, if not entirely, of the black magnetic oxide of iron, as such oxide, having absorbed the maximum quantity of oxygen, has no tendency to undergo a further change, which is the great objection to most of the American-made "Russia" iron.

The object of our invention is to utilize the oxide or scale coating formed on the sheet during the rolling by increasing the thickness of the scale coating and changing its condition to that of the magnetic oxide and uniting this oxide coating securely to the sheet. This we accomplish by inclosing the sheets as they come from the rolls in a box, so that a certain amount of air may have access to the sheets, placing between the sheets a layer of fine charcoal, and heating said box and contents to about a red heat, and while hot hammering the sheets in the box, then reheating the sheets in an air-tight box and hammering the same in the box to unite the coating securely to the sheets, as will be more fully hereinafter set forth.

To enable others skilled in the art to practice our invention, we will describe the same more fully, referring to the accompanying drawing, which shows a perspective view of the inclosing sheet-metal box containing the pack of sheet metal to be treated.

In practicing our invention a sheet-metal box is formed capable of holding about forty to sixty sheets and so constructed as to admit a small amount of air.

The box may be of any desired form, that shown in the drawing being well adapted for the purpose. This box is made with its sides *a* and bottom from one sheet of metal, in the manner well known to those skilled in the art, the upper edges of the sides being bent over, as at *a'*, to form a seam with the lid or cover *b* when the latter is put in place after the sheets have been laid in the box. The ends of the box are bent outward, as at *a''*, so that when the lid or cover *b* is slid in under the edges *a'* of the sides these ends can be bent over the end of the lid, as at *a'''*. The sides and end seams thus formed allow, during the heating of the box and contents, sufficient air to enter the box to accomplish the desired purposes,

and when the box is placed under the hammer the seams *a'* and *a''* will be forced down on the box, closing it, so that the air does not have access to the contents of the box during the hammering operation.

The sheets of metal are laid in the box, a sprinkling of charcoal being placed between each sheet for the purpose of preventing the sheets from rubbing on each other and thus grinding off the scale, and to prevent any possibility of the sheets welding together when heated. After from forty to sixty sheets have been so placed in the box the cover or top of the latter is secured in place and the whole charged in a suitable heating-furnace, when the box is raised to a red heat and kept for about fifteen or twenty minutes. During this heating operation the air passing in on the hot iron still further oxidizes the same and increases the thickness of the coating or hide, and at the same time causes the coating to form an intimate union with the metal, so that when the box and contents are taken out while hot and hammered the hide or oxide coating will be fastened to the metal of the sheets, so that it will not scale off. This hammering operation is commenced upon the box while the metal is hot and continued until the metal has cooled to a black heat, the hammer preferably striking quick sharp blows over the surface of the box. The sheets are held together by the box so that they do not rub upon each other and become distorted by the hammering operation. When the hammering operation is completed and the sheets cooled, the latter are taken from the box and carefully examined, those on the outside the pack and those in the pack which show an irregular and imperfect coating being laid aside, to be again subjected to the treatment heretofore described, the remainder being placed in an air-tight box with a sprinkling of charcoal between each sheet; and for the purpose of cutting off all access of oxygen or air to the sheets and neutralizing the effect of the carbon on the oxide coating of the sheets during the heating operation the sides and ends of the box are packed with wet wood, wet sawdust, or sawdust soaked with oil. The box and its contents are then closed securely, so as to be as near air-tight as possible, and charged into a suitable furnace, where it is raised to a red heat and kept for some time, when the box is taken out hot and hammered until the sheets are at a black heat. After this final hammering it will be found that the sheets are covered with a uniform coating, which is highly polished and permanently attached to the sheet, so that it will not peel off.

The effect of the wet wood or sawdust on the sheets is not yet determined; but we think the steam produced by the heating of the same neutralizes the reducing effect of the charcoal on the sheet, and in some way produces the necessary change in the nature of the coating, so as to get a substantially black oxide coating. As the sheets are separated by the car-

bonaceous material, there is no liability of their adhering to each other when subjected to the hammering operation at a high heat; and this carbonaceous material acts in connection with the force of the blows to which the packs of sheets in the box are subjected to polish the outer surface of the oxide skin on the sheets and impart a fine polished surface thereto, while at the same time this carbonaceous material between the sheets acts to impart to the sheets formed the mottled appearance which is found in the genuine Russia sheet metal, the sheets being rendered slightly uneven on account of the carbonaceous material between the sheets, which cannot practically be held in a perfectly smooth layer or a layer of even thickness between the sheets. The size of these slight indentations imparting the mottled appearance to the sheets may also be varied to some extent by the size of the carbon particles employed between the sheets, coarse particles increasing this mottled effect. Practical use has shown that the oxide surface may in this manner be permanently secured to the body of the sheet, and that a highly-polished surface may be formed on the sheets, which is permanent and which adds greatly to the appearance thereof. As the sheet metal is not subjected to the ordinary pickling operation and no acid is employed in the treatment thereof, it is evident that the metal of the sheets is not liable to rust under the surface of the protective coating or skin formed thereon, and that for this reason a much more durable surface for and polish to the sheet metal is obtained. The cost of treating the sheets in the manner above described is not great, requiring only the inclosing of them in the sheet-metal box, the heating of the box, and the hammering operation, which is much more simple than the ordinary treatment by means of which a polished protective coating has heretofore been formed on sheet metal. We also find that the quality of metal is greatly improved by our method of treatment.

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

1. The herein-described process of forming a protective coating on sheet metal, consisting in heating the sheets while permitting the access of oxygen thereto, so as to form an oxide coating thereon or increase the coating thereof, hammering said sheets while in a heated condition, and finally reheating the sheets to a red heat while protected from the atmosphere, and subjecting the sheets while so protected and heated to a hammering operation, substantially as set forth.

2. The herein-described step in the art of forming a protective coating on sheet metal, consisting in taking ordinary sheets of metal and heating them, while permitting the access of oxygen thereto to increase the thickness of the oxide coating thereon, and then hammering the sheets while hot and inclosed in a box, substantially as set forth.

3. The herein-described step in the art of forming a protective coating on sheet metal, consisting in inclosing the ordinary sheets of metal in a box, heating said box, while per-  
5 mitting the access of a small amount of air to the sheets therein, and then hammering said box and the contents while hot, substantially as set forth.

10 4. The herein-described step in the art of forming a protective coating on sheet metal, consisting in inclosing sheets having an oxide coating thereon in an air-tight box, heating the same, and finally hammering the box and contents while hot, substantially as set forth.

15 5. The herein-described step in the art of

forming a protective coating on sheet metal, consisting in raising sheet metal having an oxide coating thereon to a red heat while protected from the atmosphere, and subjecting the sheets while so protected and heated to a  
20 hammering operation, substantially as set forth.

In testimony whereof we, the said WILLIAM ROGERS and WILLIAM H. ROGERS, have hereunto set our hands.

WILLIAM ROGERS.

WILLIAM H. ROGERS.

Witnesses:

NELLIE HENRY,

HARDY HENRY.