3 Sheets--Sheet 1.

J. ELLS.

Manufacture of Sheet Iron.

No. 163,857. Patented June 1, 1875.

Fig. 1.

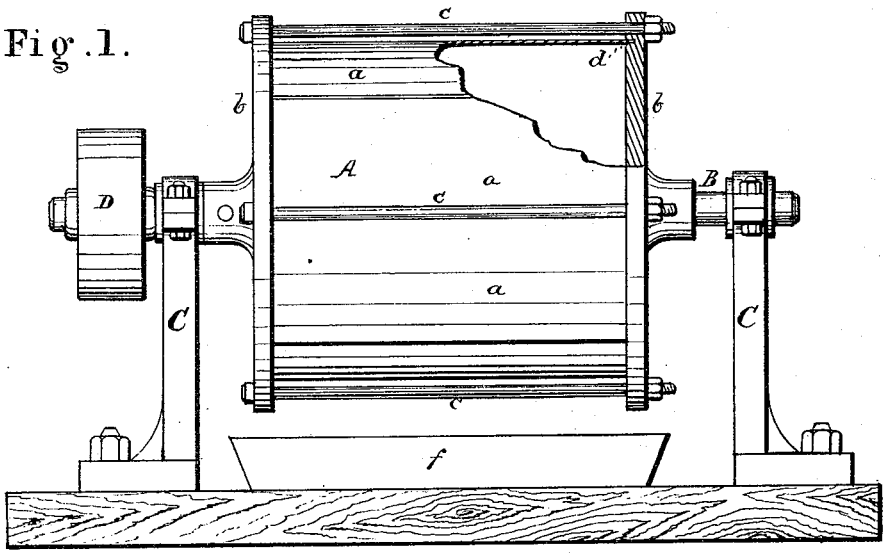
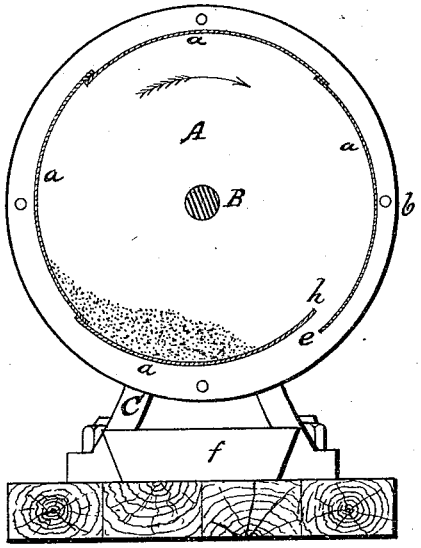


Fig. 2.



Witnesses.

Josiah W. Ells

Geo. C. Stewart

Inventor.

Josiah Ells

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

3 Sheets--Sheet 2.

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Fig. 3.

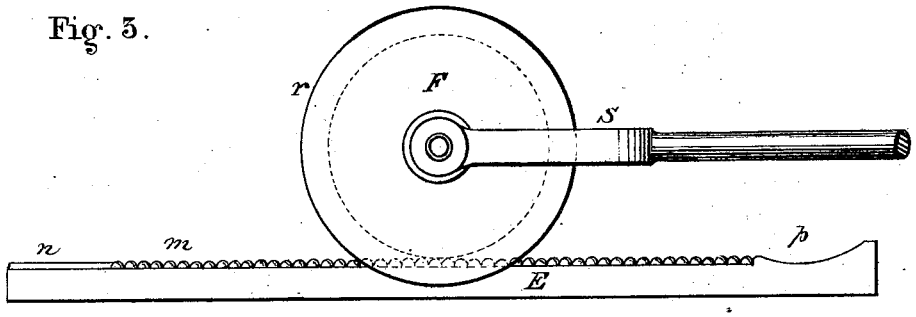
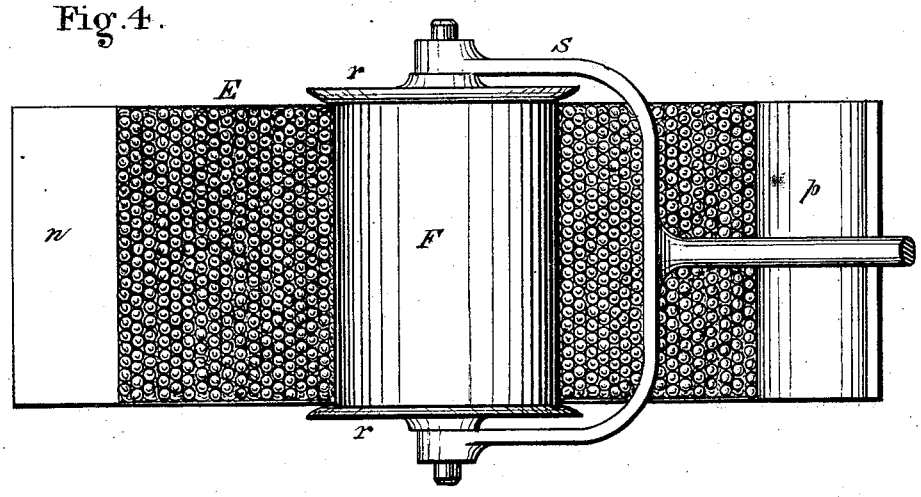


Fig. 4.



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3 Sheets--Sheet 3.

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Fig. 5.

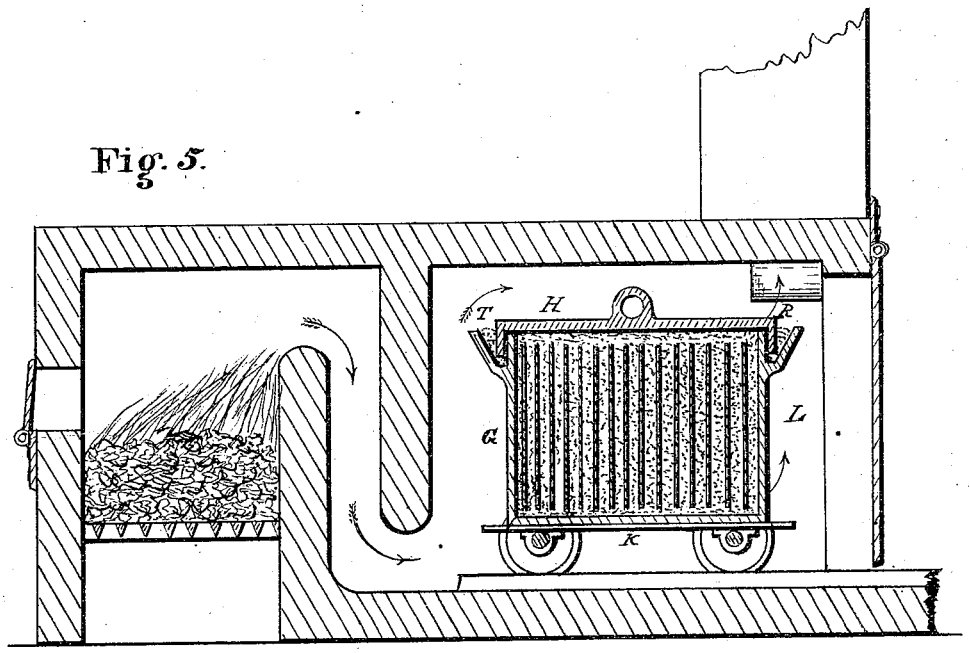
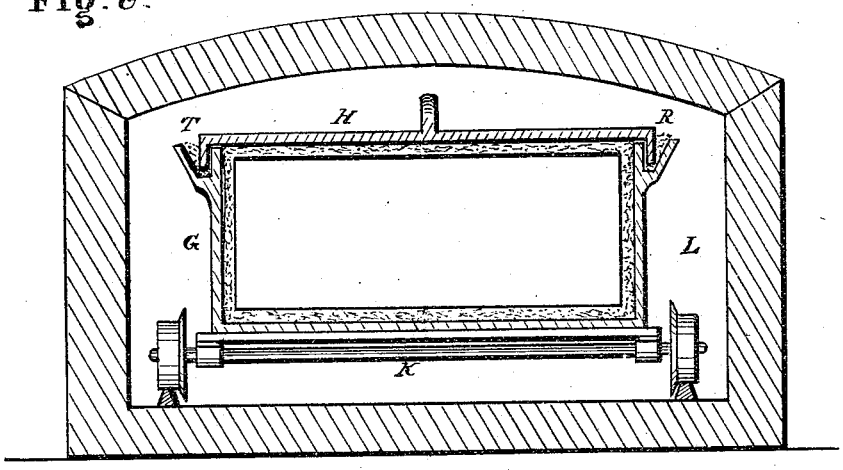


Fig. 6.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOSIAH ELLS, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF SHEET-IRON.

Specification forming part of Letters Patent No. **163,857**, dated June 1, 1875; application filed November 18, 1874.

To all whom it may concern:

Be it known that I, JOSIAH ELLS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Mode or Method of Manufacturing Sheet-Iron; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

The object of my invention is to make sheet-iron that shall have a very close resemblance in finish and appearance to the article known as "Russian sheet-iron."

To this end I take American sheet-iron and remove therefrom all such oxide or scale as may be formed thereon in the hot-rolling process. This I accomplish by immersing the sheets in a bath consisting of sulphuric acid and water, or hydrochloric acid and water, or an equal volume of the two acids and water, in which the sheets are to remain until deprived of their original scale or coating of oxide, the acid leaving them with a clean dullish-gray metallic surface; and to assist the acid in this respect it may be warmed, and the sheets rubbed occasionally with sand and water. After all the scale has been removed they are to be washed in pure water, and then submitted to the action of an alkaline bath to neutralize, as far as possible, any remaining acid, in which state they may be kept without injury for some time. When taken from the alkaline bath they are to be a second time washed in pure water, and immediately dried by the application of sawdust, or by any other means found in practice most convenient. As a general thing the sheets, after undergoing the action of the acid, are found covered with numerous defects—for instance, small spots that have been covered by a thicker scale than others, leaving the sheets thinner at those points, and with a roughness extending, in some cases, over their entire surfaces. To remove this roughness and equalize the thickness of the sheets, they are to be passed cold between heavy chilled rolls, that may be highly polished, and similar to those used in rolling-mills, with the exception that the rolls, instead of being turned slightly concave, to allow for expansion caused by rolling the iron hot, are for my purpose turned with their peripheries perfectly parallel to, and on a line with, the axis, so as to bear equally and uniformly over the entire surface of the sheets as they are passed between them.

It will be readily understood that the immense strain the sheets must necessarily undergo in this cold-rolling process, leaves them somewhat hard and brittle, and to restore their flexibility the process of annealing must be resorted to, which may be conducted in any well-known manner; but I prefer to inclose them in a strong and tight cast-iron box, so arranged within a furnace as to bring them, without delay, to a low red heat, at which temperature they are to be maintained for some hours, and then allowed to cool. When quite cold the box can be withdrawn, and the sheets of iron taken out. They will at this stage be found very soft, and each with a deep bluish-gray bloom on its surface, due to a very thin coating of oxide, formed in this annealing process.

The sheets are next to be polished, and for this purpose are to be curved and arranged like the staves of a barrel, around and between two large disks, supported upon a horizontal shaft, so as to form a kind of drum, of which the sheets constitute the circumference, and in which may be placed a sufficient quantity of pulverized emery, corundum, or other similar material or substance that will, by its weight and sliding movement on the rotation of the drum, glide over, scour, and polish the inner surface of the sheets uniformly, and in a cheap, efficient, and expeditious manner.

Figure 1 represents a front elevation of the apparatus I have designed for this purpose. Fig. 2 is a transverse vertical section of the same.

By reference thereto will be seen a large barrel, A, mounted upon an axle, B, supported in suitable bearings in a frame, C, so as to be easily rotated by the application of power to

the pulley D, secured on one end of the axle, thus being, in most respects, like the common cylindrical tumbling barrel used for cleaning small castings, &c. The sheets *a a' a'' a'''* form the body of this drum, being arranged between the heads or disks *b b*, and each firmly held in position by the clamping force of long bolts *c c' c''*, passing through both heads. The ends of the several sheets are made to enter a small groove, *d*, in the disks, and overlap each other at their sides, the sheets being otherwise so arranged as to form a scroll, as seen in the cross-section, Fig. 2, so that as long as the barrel rotates in the direction of the arrow, its contents will remain inside and slide over the sheets; but if stopped and turned in the other direction until the aperture *e* comes underneath, the contents will be discharged into the receiving-box *f*.

One advantage of this plan is, that the opening *e* extends the whole length of the cylinder, and the discharge, when required, takes place from the interior instantly. Facility of charging is another advantage, and the projection *h* of the inside sheet makes a fall for effectually rattling and mixing the scouring and polishing material, thus continually bringing fresh particles to act upon the surface of the sheets. As soon as the sheets are polished on one side, the barrel may be discharged in the manner hereinbefore stated, when, on unscrewing the bolts *c c*, the heads or disks *b b* can be separated and the sheets released, and, if desirable, may be turned over with the unpolished surface inside, the heads screwed up, the emery returned to the cylinder, and the opposite sides of the sheets scoured and polished in a manner similar to the preceding.

When the sheets have been properly polished each sheet is to be placed upon a heavy cast-iron table, the face of which is covered with multitudinous small protuberances or configurations, and a very heavy roll made to pass over it, by which the configurations on the table will be partially transferred to, and imprinted on, the sheet, giving it the dappled and mottled appearance of Russian sheet-iron.

Fig. 3 represents a side elevation of the table and roll; Fig. 4 a plan or top view of the same.

The protuberances or configurations *m* extend the whole width, and nearly the entire length, of the table E, being equal in extent to the full size of the sheets. One end, *n*, of this table is left perfectly flat to enable the roll F to pass the sheet without running off; and the other end is formed with a concave, *p*, in which the roll may rest when not in motion. The roll F is provided with flanges *r r* at its extremities to keep it fairly in position with respect to the work; and it is also furnished with a yoke, *s*, to which power may be applied to drive it back and forth upon the table. This roll should be made of chilled iron, turned perfectly true, and polished upon its face, and heavy enough to produce the desired effect upon the sheets.

The several sheets after undergoing the mottling process are ready to be blued, and which is accomplished by subjecting them to heat in a close iron box properly arranged within a furnace. Such an arrangement is shown in the longitudinal vertical section, Fig. 5, and the transverse section, Fig. 6. The box G should be rectangular in shape, and large enough inside to receive the sheets and leave a space around and between them to be filled with fine wood-ashes; and provided with a V-shaped cavity, T, at or near its upper edge, and on all four sides, into which the overhanging ledges R of the lid H may enter, leaving room for the reception of sand that may be packed around to exclude or keep out the atmospheric air. This box, as shown, is secured on a truck, K, provided with flanged wheels so arranged as that it may be run in and out of the furnace L, on a properly-constructed rail-track. When the sheets have been thoroughly polished and dappled they are to be arranged within this box on their edges in "open order," or their sides a short distance apart, as shown in Fig. 5, and the spaces between the sheets filled with very fine wood-ashes, which are also to be closely packed between the box and the sheets, so that no part of them will be in direct contact with any metallic substance or thing; otherwise they are very apt to become discolored at that point. The sheets having been arranged as stated, and completely packed and covered with wood-ashes, the lid H of the box is to be lifted into place, and the air excluded by filling the V-shaped cavity T with sand. The box is then to be run into the furnace L, and heat applied, as in any ordinary annealing process, but only at a temperature sufficient to give the sheets a blue color, which can easily be ascertained by practice, when they must be allowed to gradually cool, in which condition they can be taken from the box.

This mode of bluing the sheets with an interlayer of wood-ashes greatly improves their appearance and finish, and is especially important in the manufacture of glazed or polished sheet-iron, for unless the sheets are kept separate and apart, and from contact with any metallic substance, and that by some non-conducting pulverulent matter or material, like wood-ashes, the result will be a considerable discoloration of the sheets, and the formation thereon of a brittle scale having no great adherence to the iron, and liable to come off on being bent. But by my process of annealing and bluing a very fine, tough, blue oxide is created on the sheets, that will bear the necessary bending and hammering consequent upon the shaping of such sheets

into the various and complex articles required in commerce.

I claim—

1. The mode or method of scouring and polishing sheet-iron—that is to say, causing the loose scouring and polishing material or substance to slide over the inner surface of the sheets, in the manner shown and described.

2. A table studded over with small hemispherical protuberances, in combination with a roll, the surface of which is plain and smooth, as and for the purposes set forth.

3. The mode or method of bluing sheets of iron by arranging them in open order within a close cast-iron box, and alternated with an interlayer of wood-ashes, in the manner shown and described.

JOSIAH ELLS.

Witnesses:
JOSIAH W. ELLS,
GEO. C. STEWART.