

UNITED STATES PATENT OFFICE.

ISAAC E. CRAIG, OF CAMDEN, OHIO.

MANUFACTURE OF SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 237,963, dated February 22, 1881.

Application filed March 20, 1880. (No specimens.)

To all whom it may concern:

Be it known that I, ISAAC E. CRAIG, a citizen of the United States, residing at Camden, in the county of Preble and State of Ohio, have invented a certain new and useful improvement in the manufacture of sheet-iron and other iron articles by producing a surface thereon composed of iron and other or foreign substances, firmly adherent to the body of the iron, without at the same time so coating or plating the sheets as to conceal the iron from view or give to the surface the appearance of the foreign element so used; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

I choose sheet-iron the surface of which has in its manufacture been well and pretty uniformly oxidized. These sheets I then clean or deoxidize by a method already understood and practiced, and which is not claimed as any part of this invention, as follows, to wit: The sheets are sprinkled or strewn with powdered charcoal, and made up into convenient-sized packages in such manner as to have a thin layer of charcoal between each sheet and that next above it. The package is then heated to bright redness in a furnace, and, without access of air, maintained at this temperature from one to three hours. When cooled, cleansed of charcoal-powder, and examined, it is found that the surface-metal formerly oxidized is now revived or reduced without fusion to the metallic state, and covers the sheets as a highly porous coating, having but about one-half the specific gravity of ordinary iron, and not easily detached from the body of the sheets. This covering is easily susceptible of a high polish; but, being many times more porous than ordinary iron, is quite sensitive to the influence of air and moisture. To reduce its tendency to corrosion and at the same time utilize its open and porous condition, as a means of causing it to receive and retain other substances within its meshes and cavities, and also preserve its facility of polish and much of the characteristic appearance and qualities of iron, are the objects of this invention. This I accomplish by applying to the revived surfaces the substance or element

desired to be used, in a state of minute subdivision either as a powder or in solution, so as to charge the same into the cavities of the spongy iron; and for this purpose I make use of the metallic oxides hereinafter named, either singly or as a composition consisting of any two or all of them, as the object may, in some measure, be attained in either way.

In practice I prefer that the application should consist of the following substances, in the proportions here named, to wit: Oxide of tin, by weight, five parts; oxide of antimony, five parts; oxide of lead, one part, finely ground together. This powder I dust on each sheet through the meshes of a fine sieve or bag made of loose cloth and then rub the surface with leather or cloth held in suitable shape until all parts have been gone over. After this the loosely-adhering portion of the powder is shaken off. If the articles to be treated are other than sheet-iron the process of obtaining a spongy coating and then charging the same is conducted in all respects similarly to the foregoing. The sheets or other articles so treated I then inclose in a metallic wrapper or case, so as to prevent the air from circulating among them, and heat them in a suitable furnace to faint redness. At this stage the metals of the applied oxides are, by the action of the now heated and liberated hydrogen or other reducing gases, reduced to the metallic state and fused within the meshes of the fibrous or spongy iron, while the metals revived from the small portion of the powder remaining on the outer surface after shaking are, by the capillary action of the spongy metal, drawn within its pores and there retained. The sheets or other articles so treated may now be burnished by any of the methods commonly employed in polishing metallic surfaces. They are somewhat capable of being united by the soldering process, and have a power of resisting hydro-oxidation superior to the surface of ordinary sheet-iron. The chief value, however, consists in their qualities after being submitted to the following additional treatment, well understood by the manufacturers of sheet-iron: They are heated to gentle redness, with exposure to atmospheric air, so as to slightly oxidize their surfaces, and then polished by repeatedly passing them

through rollers, at a low heat, in packages of
from three to six sheets each, or done up in
bundles of from ten to twenty sheets, and ham-
mered, at suitable temperature, under power-
5 hammers. The oxide thus formed and polished
is much less liable to scale and crumble off
from the sheets when bent, and less liable to
speck and separate from the iron, on account
of internal corrosion, than is the oxide from
10 sheet-iron similarly treated in all respects, ex-
cept as to filling the pores of the revived metal,
and is much superior in durability of luster to
iron which at any stage in its manufacture has
been treated in a bath of mineral or other acids
15 as a solvent of its oxides.

I am aware that it has heretofore been prac-
ticed to coat sheets of iron, after dissolving the
oxide away from their surface, in acid-baths
with foreign elements, in such a manner as
20 may introduce a small part of the substance
so used into the microscopic cells, more or less
existing on the surface of all iron. I am also
aware that in the manufacture of sheet-iron
certain metals and their oxides—to wit, tin
25 and zinc, and perhaps others—have been used
in such manner that a portion alloys with the
surface of the sheets, while the remainder ad-
heres as a superficial coating; but I am not
aware that anyone has heretofore availed him-
30 self of the spongy state or open condition in
which iron is found to exist on the surface of
sheets or other articles when reduced without
fusion from a superficial coating of oxides to
mix or incorporate therewith other elements
35 found to be useful in forming a composite sur-

face. Nor am I aware that in any manufac-
ture of iron it has been practiced to make sur-
face applications as a protection to the iron,
except where the applied substance is designed
to adhere, and in fact does adhere, as an ex- 40
ternal covering, concealing more or less per-
fectly the iron from view, and giving to the
surface so treated the color and appearance of
the applied substance.

In heating the sheets immediately before the 45
process of polishing I am careful not to oxidize
them so deeply as was done in their original
manufacture, and I find their diminished tend-
ency to oxidation enables me to expose them
to air at about the same heat as that at which 50
sheet-iron is usually worked without exceed-
ing the proper depth of oxidation.

Having fully described my invention, what
I claim, and desire to secure by Letters Pat-
ent, is— 55

As an improvement in the manufacture of
sheet or other iron, the process herein described,
consisting in applying to the revived surfaces
one or more of the following oxides, namely:
oxide of antimony, oxide of tin, oxide of lead, 60
in a finely-ground condition, then inclosing
the articles treated in such a manner as to
prevent the circulation of air among them, and
heating them in a furnace to faint redness, and
finally polishing them by burnishing, rolling, 65
or hammering in the usual way.

ISAAC E. CRAIG.

Witnesses:

J. H. L. BOHN,
BENJAMIN MYERS.