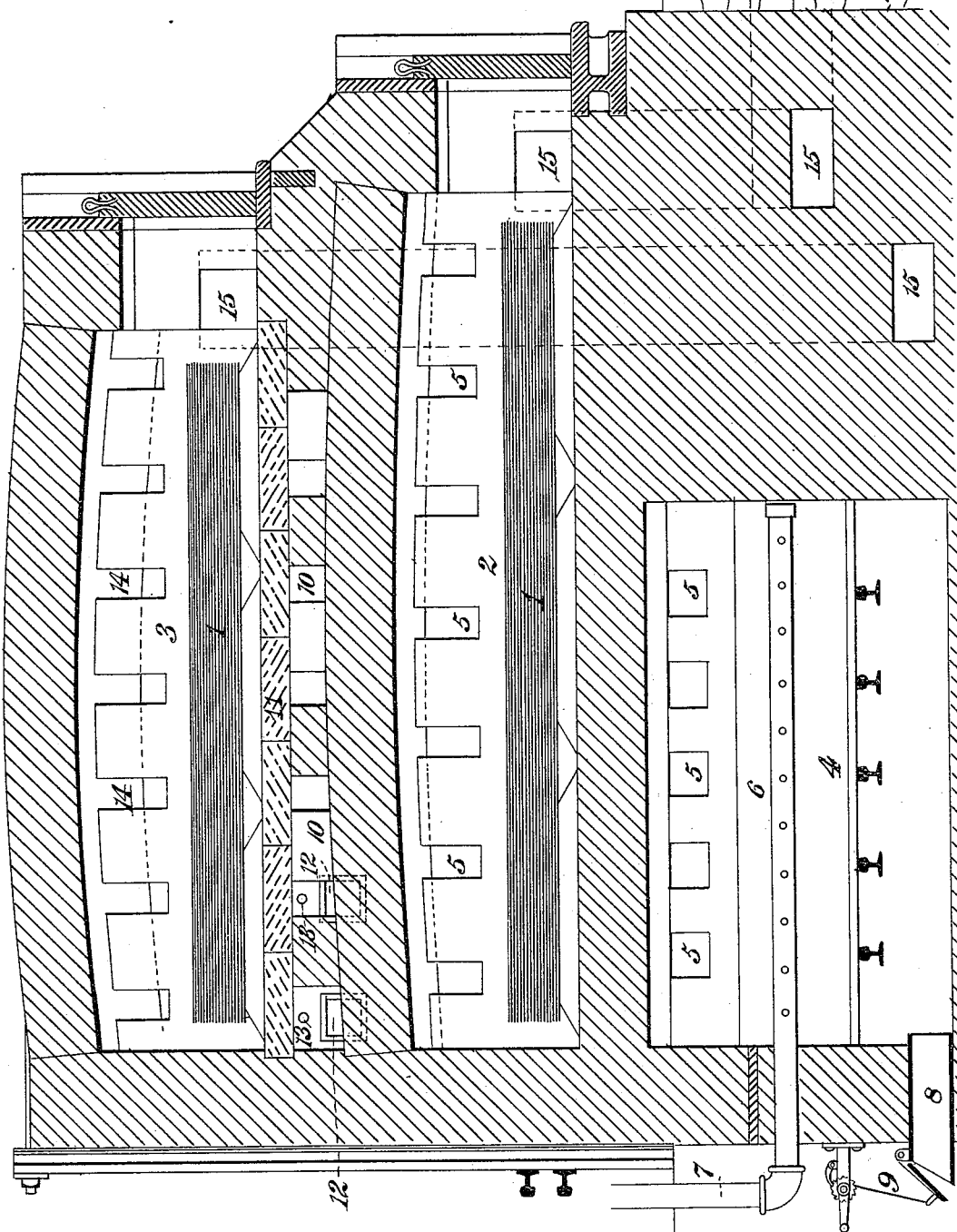


(No Model.)

R. G. WOOD.  
ART OF MAKING SHEET IRON.

No. 348,258.

Patented Aug. 31, 1886.



WITNESSES:

*Samuel S. Wolcott*  
*C. M. Clarke*

INVENTOR,

*Richard G. Wood.*  
*by George H. Christy* Att'y.

# UNITED STATES PATENT OFFICE.

RICHARD G. WOOD, OF McKEESPORT, PENNSYLVANIA.

## ART OF MAKING SHEET-IRON.

SPECIFICATION forming part of Letters Patent No. 348,253, dated August 31, 1886.

Application filed December 12, 1883. Serial No. 185,538. (No model.)

*To all whom it may concern:*

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

In the accompanying drawing, which forms part of this specification, is shown a longitudinal vertical section of a furnace suitable for carrying out my invention.

My present invention relates more particularly and chiefly to an improvement in the process described in Letters Patent of the United States No. 291,260, granted to W. Dewees Woods, January 1, 1884, and more particularly to that part of said process which may be termed the "baking operation," in which the sheets, being coated with red oxide, are piled one on top of another with intermediate layers of pulverized charcoal or charcoal-dust until a package is formed of, say, from twenty to one hundred sheets, more or less. Such package is then charged into an open chamber or retort of iron or clay or other suitable material and subjected to a high heat for from four to eight hours, more or less, substantially in the manner and with reference to the result therein set forth. This feature of the operation described in said patent is more particularly set forth on page 2 of a printed copy of the same, at the bottom of the first column and the top of the second. By reference to said patent it will also be seen that one purpose of the charcoal thus introduced between the sheets is to revive or convert the oxide surface of the sheets into metallic iron, or bring it so near to the condition of metallic iron as to be in what may be termed a "nascent state." I have discovered that by the use of natural gas in the retort or oven as a heating agent in the operations just referred to, such gas, while undergoing combustion and while acting in oven as a heating agent, is also peculiarly adapted to act at the same time as a chemical agent, reviving or reconverting the oxide previously formed on the surface of the sheets. The chemical action of the charcoal is so well

understood that it need not be further explained. The natural gas, the general formula of which is  $\text{CH}_4 + \text{C}_x\text{H}_x + \text{H}$ , is by combustion converted into carbonic oxide and water. The former of these ingredients combines with the oxide surfaces of the iron in like manner, it is believed, as the carbonic oxide ordinarily evolved in the combustion of the charcoal, and hence to this extent furnishes simply an additional reducing agent in performing the chemical work referred to. The hydrogen of the gas having a still greater affinity for the oxygen present in the surface oxide attacks and eliminates the same with still greater readiness and rapidity than the carbonic oxide alone, so that in this way and by the use of this agent the chemical effects desired—namely, the reviving of the oxide surface—is more quickly and effectively secured; and it is also true that in so far as the charcoal introduced between the sheets is in a granular state or one of comparatively coarse subdivision, the pores or interstices thereof provide an open path through which the ingredients of the natural gas find ready access to the oxide surfaces of the sheets, whereby their reducing or reviving action is correspondingly facilitated.

I omitted to state above that it is well in most cases to lightly cover the packs of sheet-iron ends, sides, and top with coarse granular charcoal, though this does not of itself constitute any part of my invention, except as the natural gas co-operates therewith in the reducing or reviving work above referred to. I also include, as within the invention which I desire to protect, the like use of natural gas in the treatment of sheet-iron preliminary to planishing, whether such sheet-iron is packed in boxes or retorts or in an open furnace, and under this head I include the process described in this application to packs of sheet-iron prepared, made up, and otherwise treated, as described in United States Letters Patent Reissue No. 5,474 of July 1, 1873; No. 210,735, of December 10, 1878; No. 172,235, granted January 11, 1876; No. 186,959, granted February 6, 1877, all to W. D. Wood, as also patent No. 280,799, granted July 10, 1883, to Isaac E. Craig, it being a feature of all these patents that solid carbon-

aceous material is introduced between the separate sheets preliminary to a treatment under high heat, such that chemical action takes place between the carbon so introduced and the contiguous surfaces of the sheets.

In carrying out my invention a pack of sheets, 1, prepared as above described, is placed in either one of the heating-chambers 2 and 3, and there heated to the desired heat. The chamber 2 is connected with the fire-chamber 4 by flues 5, and in said fire-chamber is located the burner 6, connected by pipes 7 to any suitable gas-supply. The front of the fire-chamber is closed, except at the bottom, where an air-inlet, 8, is arranged, said inlet or flue being provided with a regulating-damper, 9. The chamber 3 is located above the chamber 2, a space, 10, being formed between the top of the chamber 2 and the bottom 11 of the chamber 3. This space or chamber 10 is provided with air-inlets 12, provided with suitable damper, and into said space above the air-inlets is inserted gas-pipes 13, provided with suitable burners. The flame and products of combustion after circulating through the chamber 10 are conducted by flues 14 into the chamber 3. The chambers 2 and 3 are connected to a suitable stack by the exit-flues 15. After the packs have been properly heated, during which operation the air-inlets are open to supply the proper amount of air for good combustion, as are also the dampers on the top of the stack, the air-inlets and the dampers on the stack are closed, or partially so, thereby reducing the combustion of the gas, and hence permitting large quantities of partially-consumed gas to flow through the chambers 2 and 3 in contact with the heated plates. During the heating operation care should be taken not to admit such quantities of air as will produce an oxidizing effect on the sheets. In lieu of placing the packs in the open chambers 2 and 3, they may be packed in boxes or retorts, through which the gas or partially-consumed gas is allowed to pass while the sheets are being heated.

I do not limit myself to the furnace herein shown and described, as other forms of furnaces may be used; nor do I make any claim

to the furnace as of the subject-matter of the invention herein, as said furnace, in so far as it presents patentable subject-matter, will be set forth in another application to be filed in due time.

Instead of using charcoal in the manner above described any suitable solid carbon may be employed, or any porous highly-refractory and neutral substance may be employed, by which I mean one which will provide the proper openings or interstices between its grains, so that the natural gas or the products of combustion thereof may have ready access to the surfaces of the sheet, and also will be so refractory that it will not fuse, or under the high heat employed will not, by adhesion or otherwise, affect injuriously the surfaces of the sheets; or, in the third place, one of such character that, though subject to a high heat, it will have no injurious effect on the iron under treatment; and for this purpose I believe that fire-clay or other non-fusible refractory neutral clays may be advantageously used; also, these clays, or such of them as are suitable for these purposes, may be mixed in any desired proportions with the carbonaceous matters above referred to; or other matter—such as is sometimes used in this branch of the art—may in like manner be mixed with such carbonaceous material.

I claim herein as my invention—

1. A method of treating sheet-iron in packs, with intermediate layers of charcoal or other carbonaceous material, mixed or unmixed with other matter, by the application thereto of natural gas during or after partial combustion, substantially in the manner above set forth.

2. A method of treating sheet-iron in packs, with interposed layers of suitable porous solid material, by the application thereto of natural gas during or after partial combustion, substantially in the manner above set forth.

In testimony whereof I have hereunto set my hand.

RICHARD G. WOOD.

Witnesses:

DARWIN S. WOLCOTT,  
R. H. WHITTLESY.