# UNITED STATES PATENT OFFICE.

ISAAC E. CRAIG, OF TROY, OHIO.

## METHOD OF MANUFACTURING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 501,705, dated July 18, 1893.

Application filed January 31, 1893. Serial No. 460,462. (No specimens.)

*To all whom it may concern:*

Be it known that I, ISAAC E. CRAIG, a citizen of the United States, residing at Troy, in the county of Miami and State of Ohio, have invented a certain new and useful Improvement in the Manufacture of Sheet-Iron, of which the following is a specification.

My invention relates to the production of sheet iron having a pleasing and uniform dark color over its surface without resort to the slow and expensive method of rolling known as the loose process. This object I attain by the application of a strong jet of steam or water to the edges of piles or packages of sheets in the manner hereinafter set forth; and I do hereby declare the following to be a full clear and exact description of the invention, which will enable others skilled in the art to which it relates to make and use the same.

In the ordinary or tight method of reducing iron to sheets, the entire pack consisting usually of from four to six sheets are allowed to stick firmly together and by successive passes between the rolls while hot reduced to the desired gage. In this method the air is in a great measure excluded from the interior surfaces of the sheets, and when finished they show very imperfect and irregular oxidation and the variety of colors corresponding thereto, and this is but slightly improved by the subsequent annealing either in the tight box or open furnace.

To carry my invention into effect I roll and anneal in the tight box in the ordinary way—excepting only—that instead of allowing the charge of the box to cool before the box is opened, I wait only until such time as the box has become black and then by the ordinary means lift the inverted box from its bed-plate on which the charge is piled up, when the charge will be found to be still at a moderate red heat. At this time a workman approaches one side of the pile of red hot sheets so uncovered, bearing the nozzle of a steam hose which said nozzle should consist of a piece of one half inch gas pipe connected by strong three quarter inch vulcanized rubber hose, with any source of steam supply of not less than sixty to one hundred pounds pressure per square inch, and direct from the nozzle piece of gas pipe, which should be of sufficient length namely six or seven feet a current of steam against the edge of the top of the pile moving the nozzle from end to end thereof. With the steam pressure above stated the current is sufficiently energetic to slightly lift and open up so as to allow admission to the current, thirty to fifty sheets on top of the pile. When the nozzle has thus been passed two or three times from end to end, with its point in contact or nearly so with the edges of the sheets—the pile should be begun to be taken down by workmen grasping fifteen or twenty sheets at a time with tongs in the usual manner and removing them to the place where it is desired to again pile them up, and the jet of steam be continued on the edge of the top of the pile until it is all in this manner removed. I find it best in practice and prefer that the end of the nozzle piece should be so flattened as to reduce its opening to a slit about one thirty second of an inch across and in using it hold it in such a manner that the greater dimension or length of this slit be kept up and down. Sheet iron so treated is found to have acquired from decomposition of steam and attendant oxidation of the sheets a close and continuous coating of magnetic oxide, showing, however, some difference of color between the oxide formed by the steaming operation and the patches of oxide formed while being rolled. This however is entirely avoided when the charge of the annealing box has been pickled or otherwise cleaned of its oxide before being stacked up for annealing in which case a handsome and uniform color is given to the entire sheet. The same effect is produced in substantially the same manner when instead of steam the nozzle discharges water, preferably hot, in the form of spray, which on entering between the sheets is immediately converted into steam, and while under some conditions and circumstances this latter method may be preferred it will ordinarily be found best to use the steam jet.

I am aware that the well known power of red hot iron to decompose steam and appropriate the oxygen has been utilized in various industrial operations and that it has been to some extent practiced to oxidize sheet iron by handling one sheet at a time and directing at right angles or nearly so against its

surface a considerable number of jets of steam—a method which on account of it leaving the sheets greatly warped and buckled is not available for ordinary use—but believe that steam oxidation of sheets by introducing the steam or water between the edges of the sheets while in packs or piles has not heretofore been used.

It sometimes happens that from inattention the charge of an annealing box is allowed to become so hot that the lower part of the contents having great weight above resting on it is caused to slightly adhere sheet to sheet. In annealing to afterward color as here described this overheating must be avoided.

Having fully described my invention, what I claim, and desire to protect by Letters Patent, is—

The improvement in the manufacture of sheet iron herein set forth substantially consisting in oxidizing the sheets by directing against the edges of packages or piles of sheets while at a red-heat a strong current of steam or water in such manner as to cause it to enter between the sheets contained in such package or pile.

ISAAC E. CRAIG.

Witnesses:
ALEX. R. HAWTHORNE,
C. P. SAUNDERS.