

(No Model.)

2 Sheets—Sheet 1.

S. A. SAGUE.

APPARATUS FOR THE MANUFACTURE OF SHEET IRON OR STEEL.

No. 505,132.

Patented Sept. 19, 1893.

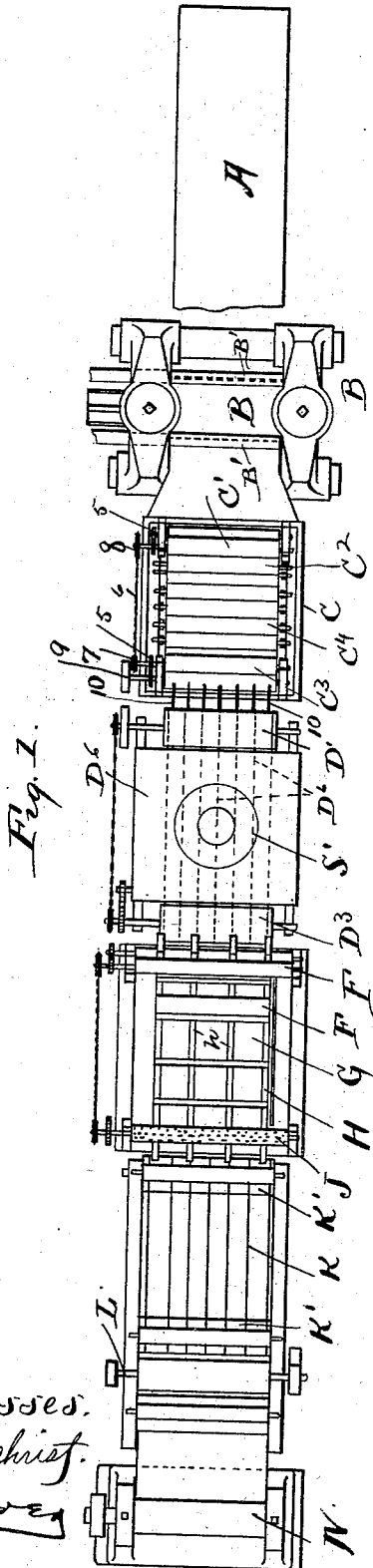
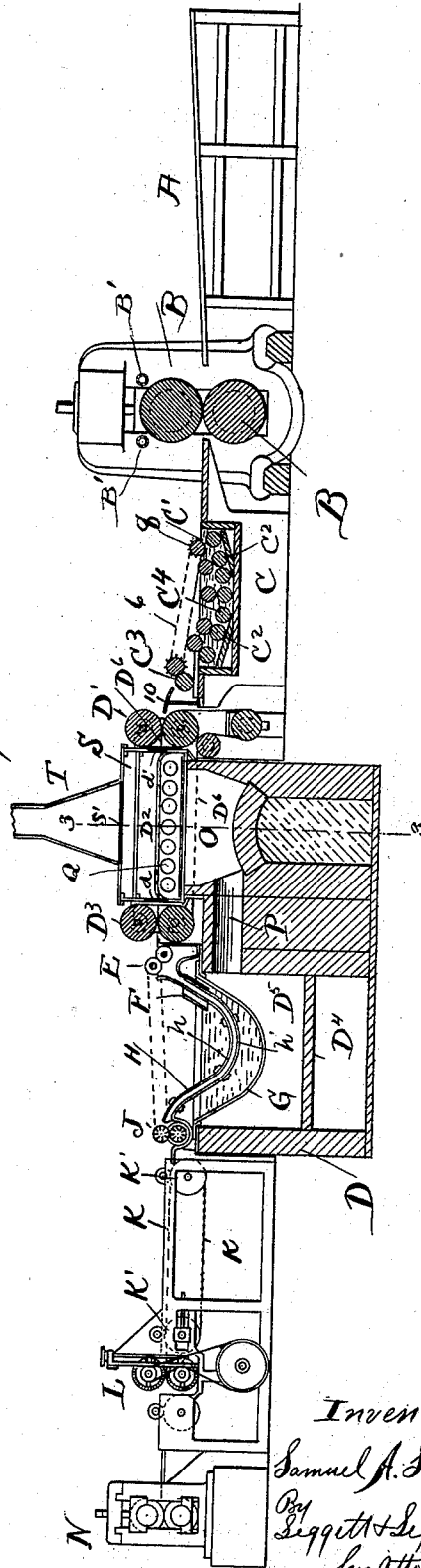


Fig. 2.



Witnesses.
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C. B. Gilchrist.

Inventor.
Samuel A. Sague
By Leggett & Leggett
his Attys.

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Fig. 3.

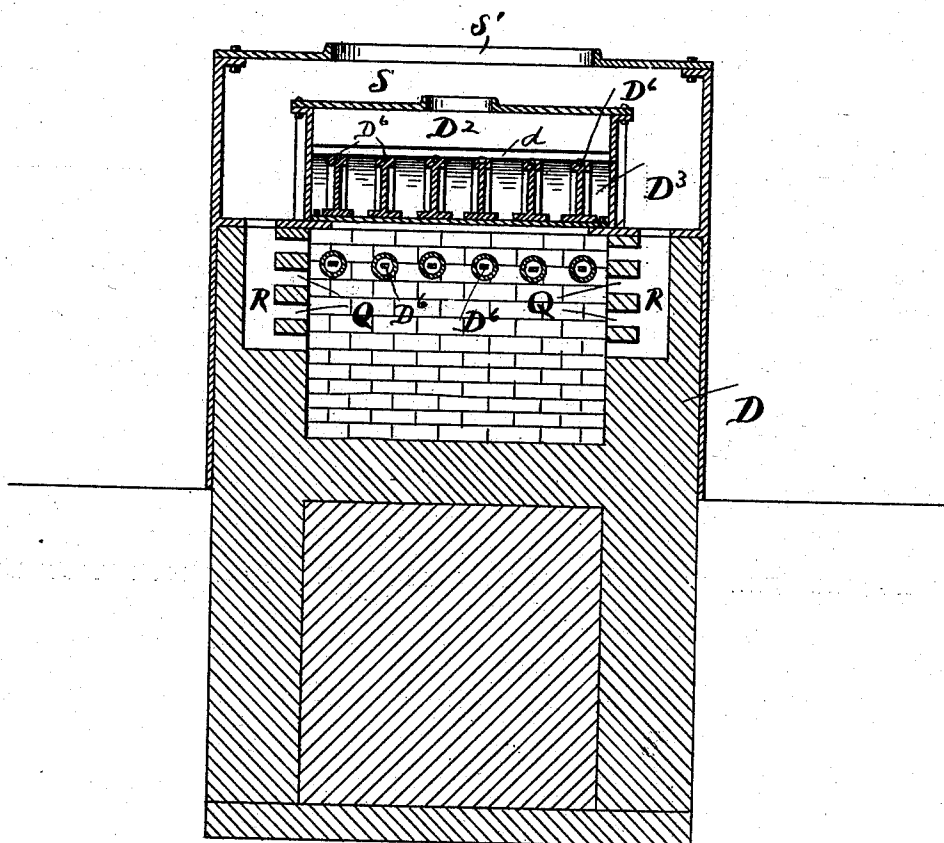
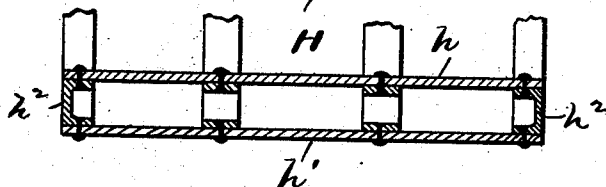


Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

SAMUEL A. SAGUE, OF CLEVELAND, OHIO.

APPARATUS FOR THE MANUFACTURE OF SHEET IRON OR STEEL.

SPECIFICATION forming part of Letters Patent No. 505,132, dated September 19, 1893.

Application filed August 20, 1892. Serial No. 443,606. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL A. SAGUE, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Apparatus for the Manufacture of so-called Sheet Iron and Steel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to an improvement in apparatus for the manufacture of so-called "galvanized" sheet iron and steel, the object being to facilitate the manufacture of such iron and steel and to make a better article at much less cost than was possible by the means heretofore employed.

In order to enable others to more fully understand the value and importance of my invention, I will briefly describe the means heretofore employed in the manufacture of such iron and steel.

The sheets or plates, as received from the rolling-mills, in all cases, are first immersed in what is called a "pickling bath" that is composed of sulphuric-acid heated in any suitable manner, the object of thus pickling the sheets or plates being to clean the same, that is, to remove scales and dirt that may be adhering to the surface of the sheets or plates. The action of the sulphuric acid, however, produces a spongy and irregular surface, the original smooth surface of the sheets or plates being destroyed. Heretofore, after pickling, the sheets or plates were washed in a tank of water; thence taken and laid upon a table and scraped by hand. Workmen, by means of hand-scrapers, removed dirt and scales that still adhered to the sheets or plates and that could be thus removed.

The work last referred to was not only necessarily slow and laborious, but it was almost impossible to thus satisfactorily remove all impurities and foreign substances from the surface of the sheets.

Next the surfaces of the sheets or plates were prepared for the zinc or spelter coating by immersing the sheets or plates in a tank supplied with muriatic acid, resulting in the formation of a flux upon the surfaces of the sheets or plates to enable the zinc or spelter

to adhere thereto more closely and serving also to still further and more thoroughly clean the sheets or plates.

I would here remark that the sheets or plates undergoing treatment, must be thoroughly cleaned preparatory to their immersion in the zinc or spelter-bath. From the muriatic-acid bath the sheets or plates were loaded on an iron car and conveyed to a kiln where the sheets or plates were thoroughly dried. When dried the sheets or plates are ready for the zinc or spelter-bath. This loading and unloading of the sheets or plates and their transportation to and from the kiln also required much labor and time. The sheets or plates were next, with a longitudinal edge lowermost and in batches, immersed or dipped in the zinc or spelter-bath. A tank or "pot," as it is technically called, was filled with melted spelter or zinc, which was kept liquid by coke-fires constantly burning around the tank or pot, the zinc or spelter bath being protected in any suitable manner to prevent oxidation of the molten metal, and sal-ammoniac or a suitable flux being employed to give the coated sheet or plate a brighter appearance. Workmen handled the sheets or plates by means of tongs, and the sheets or plates were withdrawn or hoisted from the bath by said means and a suitable hoisting apparatus.

The treatment of the sheets or plates by the means just described, was not only objectionable in that it was exceedingly slow and laborious but the sheets or plates were not coated with uniformity. Some sheets or plates would remain in the bath longer than others, and consequently the coating of the different sheets or plates of a bath would vary in thickness. Then again, in withdrawing the sheets or plates from the bath, it was impossible, by the means just described, to withdraw them at a uniform speed, and the sheets or plates were very liable to be jerked. This irregularity in the withdrawal of the sheets or plates from the bath caused the spelter to adhere to the sheets or plates unevenly and in patches, resulting in a waste of zinc or spelter which is the more costly metal. Also by reason of the sheets or plates being placed in the tank lengthwise on edge, in withdrawing the same from the bath the mol-

ten metal coating of the sheets or plates would necessarily gravitate to the lowermost longitudinal edges of the sheets or plates, resulting in an increase in thickness in the coating along these edges, which was objectionable. After being coated with zinc or spelter the sheets or plates were wiped by hand, usually by means of canvas, and workmen brushed or scraped off any surplus matter adhering to the surface of the sheets or plates, which also required much labor and time. The sheets or plates were next, and lastly, run singly through calendering-rolls, for the purpose of straightening and smoothing them and to put them in proper condition for shipment.

To avoid the objectionable features hereinbefore enumerated, I have devised the plant illustrated in the accompanying drawings, wherein—

Figure 1 is a plan and Fig. 2 is a side elevation, partly in section, of the same. Fig. 3 is a vertical section on line 3—3, Fig. 2, looking in the direction of the arrow. Fig. 4 shows a transverse section of a cradle-like frame H.

At the forward end of the plant is located a table, A, upon which the sheet or plate is placed after being pickled as heretofore and hereinbefore described. At the rear of table A and in suitable proximity to said table are located cold or hydraulic rolls, B, that are adapted to receive the sheet or plate from said table, the latter declining somewhat toward rolls B, as shown, to facilitate the delivery of the sheet or plate to said rolls. The rolls are preferably kept cold by sprays of water which issue constantly from water pipes B' B' against one or both rolls. The effect of powerful cold-rolling under water, after pickling the sheets or plates, is of vast importance, not only entirely removing the irregularities of the surface of the sheet or plate, which irregularities are the result of the action of the pickling-acid, but rendering the surfaces of the sheet or plate beautifully smooth and brushing and washing away all impurities and foreign substances. From rolls B the sheet or plate is fed to a muriatic acid coating-vat C, that is located at the rear and in suitable proximity to said rolls, the acid being represented by broken lines in Fig. 2. At the receiving-end and extending transversely of vat C are located a pair of suitable rollers, C', that are adapted to receive the sheet or plate from rolls B, and at the delivering end of vat C are located suitable wiper or wringer-rolls, C³, the trunnions of rollers C³ and rollers C' having bearing in suitable boxes provided at the sides of vat C. Between rollers C' and wiper-rolls C³ within and extending transversely of vat C, are located pairs of rubbing and scrubbing-rolls C² and single guide-rollers C⁴, rolls C² and rollers C⁴ being supported in any suitable manner. The sheet or plate is fed from rollers C' endwise through the acid-coating vat, between rubbing and scrubbing-rolls C² (that

also guide the sheet or plate) and over intermediate guide-rollers C⁴ to and between wringer or wiper-rolls C³. Rolls C³ rub the acid into the surface of the sheet or plate, resulting in a scrubbing and thorough cleaning of the entire surface of the sheet or plate, and in a proper preparation of the surface for the zinc or spelter-coating. The parts of the acid-coating vat exposed to the action of the acid, should, of course, be lined with a suitable substance non-corrosive to the action of the acid employed, such, for instance, as lead, and the surface of rolls C² and rollers C⁴ should, likewise, be of some suitable non-corrosive substance. The rollers of the pair of feed-rollers C', as well as the rolls of the wringer or wiper-rolls C³ are intergeared with each other, as at 5, and wringer or wiper-rolls C³ and feed-rollers C' are operatively connected with each other for instance, as shown, by an endless chain, 6, leading over a sprocket-wheel 7 mounted upon a trunnion of one of the wringer or wiper-rolls and a sprocket wheel 8 on a trunnion of one of the feed-rollers; 9 representing a driving pulley mounted on a trunnion of one of the wringer or wiper-rolls. I would here remark that pairs of rollers C' and rolls C³ are located such a distance apart that the sheet or plate in its passage through the acid-coating vat shall have been received by rolls C³ before it has become entirely disengaged from rollers C' and that motion is communicated to rubbing and scrubbing-rolls C² and guide-rollers C⁴ by the friction between said rolls and rollers and the traveling sheet or plate. At the rear and in suitable proximity to wringer or wiper rolls C³ are located one or more curved plates or bridges 10, the same being supported in any suitable manner, preferably by the supporting structure of the acid-coating vat. From bridge or bridges 10 the sheet or plate is fed to and between rollers D' to and through a drying-chamber D² that is heated by the products of combustion from a furnace, D. A pair of rollers, D³, substantially the same as rollers D', is provided at the opposite or delivering-end of drying-chamber D², rollers D' and D³ being supported and operatively connected in any suitable manner, and located such a distance apart that the sheet or plate in its passage through drying-chamber D², will be received by rollers D³ before it has become thoroughly disengaged from rollers D'. Drying-chamber D² is open, at opposite ends, as at d d', for the reception and delivery of the sheet or plate.

Furnace D may be of any suitable construction, D⁴ representing the furnace-grate. Directly over the fuel-chamber D⁵ of the furnace is located the "galvanizing" tank G (or "pot", as it is technically called) that contains the molten zinc or spelter, said tank or pot being supported in any suitable manner by the surrounding walls of the furnace-casing.

H represents a curved or cradle-like frame that, when tank or pot G is supplied with the zinc or spelter-bath, is, excepting at its outer

ends, submerged in said bath. Frame H comprises upper and lower sections $h\ h'$ that are suitably connected with each other at their longitudinal ends preferably by means of channel-bars, h^2 , frame H being of such size as to just freely permit the passage endwise, between its upper and lower sections, of the sheet or plate to be coated with zinc or spelter, curved or cradle-like frame H serving as a guide to the sheet or plate in its passage endwise through the zinc or spelter-bath and being supported in any suitable manner, by the surrounding-walls of the casing of furnace D. The receiving-end of frame H extends through a flux-box, F, (that extends transversely of tank or pot G and is supported in any suitable manner) to and in suitable proximity to a pair of rollers E at the rear of rollers D³. The sheet or plate is passed from rollers D' to D³, upon endless chains D⁶ (that operatively connect the lower rollers of said pairs of rollers) through the drying-chamber; thence to rollers E; thence into frame H through the flux in box F and through the molten zinc or spelter in tank or pot G, to and between pair of rollers J located at the delivering or rear end of tank or pot G, rollers J being adapted to receive the sheet or plate before the latter has become entirely disengaged from rollers E. Rollers J deliver the sheet or plate onto endless chains K that lead over rollers K' and convey or deliver the sheet or plate to a brushing machine L, where the sheet or plate is brushed and cleaned, and from the brushing machine the sheet or plate is fed to calendering rolls N located at the rear of the brushing machine and adapted to smoothly finish the sheet or plate and deliver the same in proper condition for shipment. Rollers C', wiper or wringer-rolls C³, rollers D' and D³ at the respective ends of drying-chamber D², rollers D and J endless-chains K and the brushing-machine are, of course, all operatively connected with each other in any suitable manner, or so co-operate, that the sheet or plate, without interruption, is fed from one end of the plant to the other. The work of galvanizing the sheet or plate is therefore continuous, the sheet or plate being carried through the plant endwise with the two longitudinal edges of the sheet or plate at the same elevation.

In addition to the advantages of my improved plant already indicated, and aside from the facility and dispatch with which the work can be effected, may be mentioned that no handling of the sheet or plate being required in its passage from the muriatic acid bath to the zinc or spelter-bath, it follows that the sheet or plate reaches the zinc or spelter-bath in a first-class condition to receive the coating of zinc or spelter; each

sheet or plate is passed through the molten zinc or spelter at the same speed. Consequently the thickness of the coating of zinc or spelter on each sheet or plate is absolutely uniform throughout, resulting in a bright and well-spangled sheet of the highest standard of quality, and avoiding any waste of zinc or spelter.

As shown very clearly in Figs. 2 and 3 and as already indicated, the products of combustion from furnace D that is employed to maintain in fusion the zinc or spelter in tank or pot G, are utilized to impart the desired heat to drying-chamber D². Referring to said figure of the drawings, O represents a chamber located below drying-chamber D² and in open relation with the fuel-chamber of the furnace by means of a flue, P, and in open relation, by means of ducts or checker-work, Q, and vertical flues, R, with a chamber S that extends about the drying-chamber at the top and sides of the latter, the products of combustion passing from the fuel-chamber of the furnace through flue P into chamber O, thence through ducts or checker-work Q, into flues R and up the latter into chamber S about the sides and top of the drying-chamber, and finally escaping through an opening S' in the top of chamber S to the chimney T. By the construction just described, but one fire or furnace is required.

What I claim is—

1. The combination with an acid vat, and a spelter tank, of a drying chamber located between the vat and tank, and a furnace connected to both the drying chamber and the tank, substantially as set forth.

2. The combination with an acid vat, spelter tank, and drying chamber, of a furnace connected to both the spelter tank and drying chamber for supplying heat to the tank and chamber, means for conducting the plates to be treated through the chamber and tank, and a flux box located in the tank through which the plates are passed, substantially as set forth.

3. The combination with an acid vat, spelter tank, and drying chamber, of a furnace connected to both the spelter tank and drying chamber for supplying heat to the tank and chamber, a brushing machine at the rear or delivery end of the spelter tank, and means for conducting the plates to be treated through the chamber and tank, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 21st day of April, 1892.

SAMUEL A. SAGUE.

Witnesses:

C. H. DORER,
WARD HOOVER.