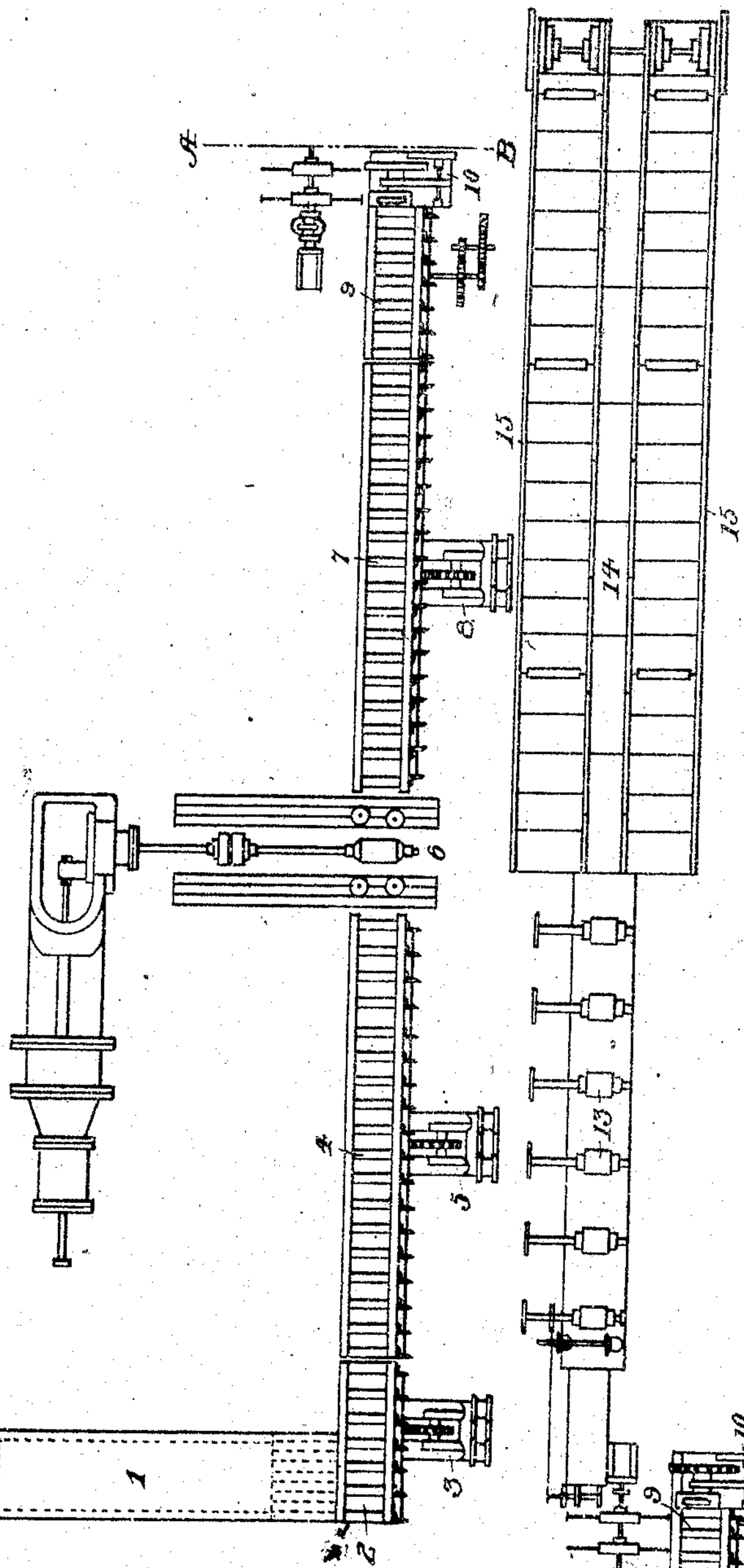
No. 865,055. PATENTED SEPT. 3, 1907.

E. NORTON.

PROCESS OF ROLLING SHEET METAL.

APPLICATION FILED SEPT. 17, 1906.



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PROCESS OF ROLLING SHEET METAL.

No. 865,055. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed September 17, 1906. Serial No. 335,030.

To all whom it may concern:

Be it known that I, EDWIN NORTON, a citizen of the United States, residing at New York, in the county and State of New York, have invented or discovered new and useful Improvements in Processes of Rolling Sheet Metal, of which the following is a specification.

My invention relates to the art of rolling sheet-metal, and more particularly to the art of rolling sheet-metal to such thin sheets as are made into tin-plate, sheet-iron, galvanized iron, etc.

Heretofore in rolling iron or steel into thin gages for the uses above named, it has been customary, first, to roll the billet, slab, or ingot of steel, into what is termed "sheet-bars" or "tin-bars". In modern mills, these bars are rolled in continuous mills directly from the heated ingot into long narrow bars approximately eight inches wide, from one-fourth to one-half of an inch thick, and from thirty to sixty feet long. After being thus rolled, these bars are delivered to a cooling table while they are still at a comparatively high or an oxidizing heat, and after being allowed to cool, are sheared into the desired lengths and supplied to the sheet and tin mills as their raw material. These sheared tin or plate bars are, in the usual practice, reduced to the desired thinness for tin-plate etc. in the following manner: They are first placed in heating furnaces and when hot, are taken therefrom by workmen with tongs and given several passes between the rolls of a tin-plate mill the bars being fed into the mill with their length parallel to the rolls of the mill. The bars are thus elongated until too cool for further rolling. They are next returned to a second furnace and reheated and again rolled, this time in two layers, one sheet being laid on another. After this step, they are doubled in the center into four thicknesses and the irregular ends caused by the rolling are sheared off. The doubled pack is then placed in the furnace and when properly heated, is drawn out by the rolls. The pack is again doubled, and its ends sheared off. This doubled pack, now having eight thickness is put into the furnace, reheated and finally rolled into the desired gage. It is then sheared at the ends, cut in the required lengths, opened, and put through the succeeding operations of annealing, pickling, cold rolling, and tinning or coating with the desired metal. From the foregoing, it will be seen that the labor and fuel required in these numerous heatings and rollings are important and costly items, while the loss from the numerous shearings amounts to about twelve per cent. of the weight of the bars.

In my improved process which I will now describe, all these items of cost are greatly reduced and the finished surface of the sheets produced thereby is greatly improved, as will be more fully hereinafter explained.

The drawing accompanying this specification and forming a part thereof represents diagrammatically a plan of a mill for the practice of my improved process. The drawings are not intended to show the machinery complete, but only the fact that machinery of different general characters is present. The drawing contains but a single view and is to be read as if the sections were arranged in tandem with the lines AB coincident.

In practicing my process, I heat the billet, ingot or slab in the furnace 1, which is preferably of the well-known continuous type. When sufficiently heated for rolling it is caused to pass to the conveying table 2, whose rollers are run by the motor 3 continuously in a direction to convey the billet, ingot or slab to the roller table 4, whose rollers are caused to rotate alternately in opposite directions by the motor 5 of any selected reversible type.

6 represents a universal reversing mill in line with the conveyer table 2, and 7, a second conveyer table, in line with the conveying table 4 but on the opposite of the mill 6 therefrom. The rollers of the table 6 are driven in opposite directions by the motor 8.

9 represents a conveyer table in line with the table 7, having in connection therewith any desired number of shears 10 by which the ends of the sheet may be cut off and the same divided into the desired number of sections.

11 is a pusher by which the sheared sheets are transferred to the conveyer 12, which may be of any type, and which places the packs of sheets, assembled on the table 9, in line with the rolls 13 of a continuous mill. This mill has its rolls running at successively greater speeds from left to right on the drawing. The mechanism for accomplishing this is well-known and need not be described. The packs of sheets delivered from the rolls 13 pass to the table 14, from which they may be pushed laterally upon one of the conveyer tables 15.

Returning now to the billet, ingot, or slab which I traced to the conveyer table 4, it is passed in a well-known manner back and forth several times through the reversing mill 6, or it is, in any other manner, reduced to a long plate varying in thickness from one-tenth to one-fourth of an inch and having any desired width. After being cross-sheared by the shears 10 into plates from eight to sixteen feet long, these plates are matched or piled, one upon another, by any suitable mechanism or by hand in piles of four to eight thicknesses, as desired, and after being reheated, if desired, they are transferred to the continuous train of reducing rolls.

The pack, as it passes through the rolls 13, is kept constantly stretched between passes, because the rolls are speeded so as to run at successively higher speeds in the direction of their feed, the speeds being set to secure the desired stretching action. The result of the stretching is that, when the sheets have been reduced to thin gages, they will leave the mill free from buckles and they will be prevented from adhesion, one to another, whereby the opening of the pack is facilitated. After

the packs have left the rolls 13, they are transferred to one or the other of the tables 15. They may then be sheared into shorter length. Referring again to the stretching of the packs by the rolls 13, I prefer that the space between the several stands of rolls shall be about seven feet from center to center, so that the metal, after the first pass, shall be held firmly in the bite of more than one stand of rolls. By so doing I am enabled not only to roll the metal, but also to stretch the same between passes. It thus becomes practicable to roll at a single heating and at one passage through the train all ordinary gages of sheet steel in lengths of approximately one hundred and sixty feet. The economy of my process over that in use at present is most apparent, as the pack rolling is thus completed before the shearing takes place. In place of shearing after each rolling, as required under present methods, the ends only require to be sheared. If, however, the conditions are such that a reheating becomes desirable, the plates or packs of them may be reheated.

While I prefer to roll the finished packs in four to eight thicknesses, it is obvious that any desired number of superposed plates or sheets can be rolled and stretched that can be conveniently placed one above another and fed into the continuous train of rolling and stretching mills.

Inasmuch as the metal is not allowed to cool from its initial heat, there is no formation of oxid on its surfaces after leaving the reversing or universal mill, the subsequent rolling being continued until the plates have passed the point where oxidation can occur, as they leave the last mill of the continuous train at a "black heat". For this reason the surfaces of the finished sheets are more smooth and take a higher polish in cold rolling than do plates or sheets rolled by the ordinary process from regular tin or sheet bars which have been allowed to oxidize after being rolled.

I claim,—

In a process of forming sheet-metal, rolling a pack or pile of sheets simultaneously at a plurality of places and concurrently therewith stretching the metal between consecutive roll passes, whereby the several sheets composing the pack or pile are prevented from adhering one to another and may be readily separated.

Signed at Dresden Germany this 3rd day of September 1906.

EDWIN NORTON.

Witnesses:
PAUL E. SCHILLING,
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