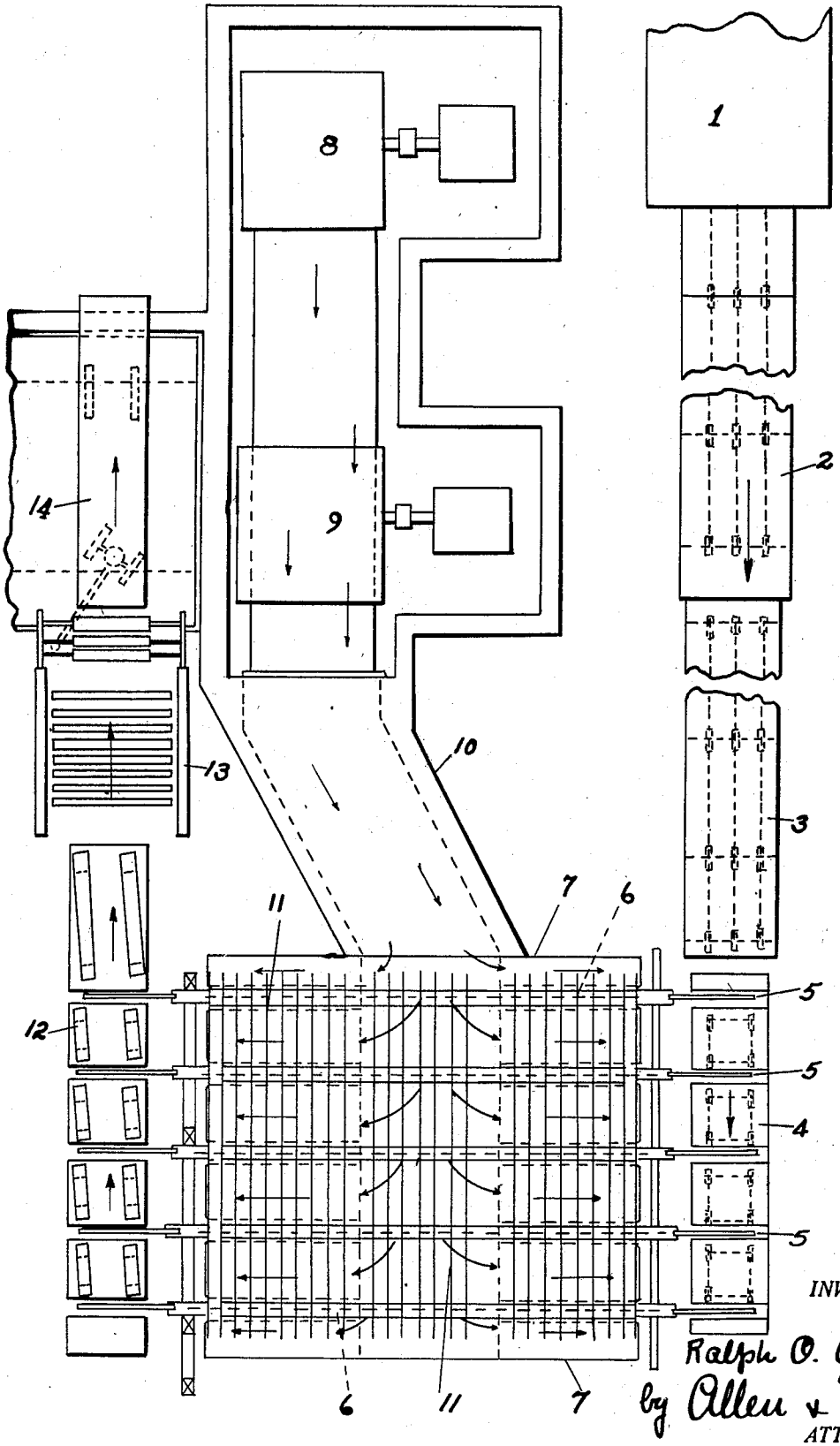
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GALVANIZING METAL SHEETS

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GALVANIZING METAL SHEETS

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5 Claims. (Cl. 91—70.2)

My invention is addressed to an improved process of galvanizing metal sheets, the primary objects of which are the production of softer, more malleable and more easily workable sheets, and sheets having a coating with enhanced properties. Ancilliary objects of my invention have to do with economy and convenience in operation. These objects, and others which may be pointed out hereinafter, or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that process which I shall hereinafter fully describe.

As is well known, common defects in galvanizing products are stiff sheets, peeled coating, and brittle coating. I have discovered after numerous tests that a primary cause of such defects is to be found in the handling of the sheets during and after the galvanizing process. The outgrowth of this has been my discovery that if galvanized sheets are cooled to a low temperature (120° F. or thereabouts) before roller leveling, a very much superior galvanized product results. If sheets are roller leveled above this temperature I have found that the leveling operation has both an embrittling effect upon the coating and a stiffening effect upon the sheets. Afterward, upon passing such sheets through the various bending and forming processes to which they are subjected in the hands of a purchaser, it becomes apparent that the brittle nature of the coating weakens its anchorage, and results in disrupting the continuity of the coating and a consequent peeling thereof. It has been demonstrated that this is a primary cause of defective galvanized sheets in commercial operation.

I have discovered that a working such as a roller leveling of galvanized sheets hot has, as indicated, not only an embrittling effect upon the coating but also a stiffening effect upon the sheet stock itself. It was noticed that certain black sheets before galvanizing were so soft as to take a decided permanent set in the middle when laid over on themselves, whereas the same sheets after galvanizing would not take a permanent set when tested in this manner. The galvanizing process seemed therefore to stiffen the sheets. This was demonstrated by stiffness tests upon a soft ingot iron sheet thus:

Black pickled sheet, average factor—25362.

Same sheet galvanized, average factor—41187.

Same sheet stripped, average factor—32725.

Thus, the tabulation indicates that the stiffness of the base metal has been increased in the neighborhood of 7,000 units by the operation to which it has been subjected, but since the material had not been cold rolled after annealing, it seemed impossible that the coating process itself could have resulted in the stiffening. I have demonstrated by a long series of tests with sheets of different base metals that the roller leveling produces the stiffening, and that the temperature controls the effect of the roller leveling. I now summarize a representative series of tests using a 26 gauge ingot iron as a base:

Black pickled sheet, not galvanized nor roller leveled—average factor—21780.

Same sheet galvanized, but not roller leveled—average factor—24300.

Same sheet, galvanized, roller-leveled hot, average factor 38850.

Stripped—average factor 36400.

Same sheet, galvanized, roller leveled cold, average factor—28190.

Stripped—average factor 24400.

Other tests have shown that the yield point and tensile strength are likewise increased. Hitherto, the commercial practice in galvanizing and finishing sheets has comprised the following operations:

1. Pickling
2. Fluxing
3. Coating
4. Leveling
5. Inspecting
6. Cooling
7. Piling

Briefly, my invention contemplates a process in which the sheets are cooled after the coating operation, preferably to 125° F., or lower, before the roller leveling. It is to be remembered that as a sheet leaves the galvanizing pot both the coating and the sheet itself will be at an elevated temperature, probably 800° F. It will be evident that the coating at such a temperature will approach a semi-plastic state, and experience has shown that if a zinc coating is disturbed while in that condition it will become brittle upon cooling and a weakness between the coating and the sheet will result; further a change occurs in the sheet when leveled at this temperature, my tests, as indicated, proving them to be much harder and without pliability. But if both sheet and coating are first cooled below 125° F. pliability is realized in both materials. The pliability may be gauged by determinations comprising a "forward and reverse" bending test. In each sample the number of bends is counted until the coating breaks. It is found that the material roller leveled cold is more easily bent, and will withstand a greater number of reversals before the coating fails. My process in commercial operation has satisfied the demand for a pliable sheet with a

durable coating, and so far as I am aware, for the first time.

The cooling may be accomplished in any manner desired, as by laying the coated sheets aside. It is not sufficient, however, to pile the hot sheets as they come out of the galvanizing pot, because the retarded dissipation of the heat will produce blistering and peeling of the coating in the center of the sheets. Sheets may be piled at a temperature of 225° F. or lower and left to cool below 125° F. in piles with good results; but this does not solve the problem of cooling them to the first mentioned temperature. It is possible to use the ordinary cooling wheel, preferably with an air blast, just after the sheets have left the galvanizing pot, but this is effective to cool the sheets to the required temperature only if the operation is conducted very slowly, and is therefore quite ineffective in commercial practice.

In a copending application of Kristian Kronborg and Benjamin P. Finkbone, Serial No. 379,741 filed July 20, 1929, having the same assignee as this one, as recorded liber 0140, page 666, transfer of patents, an apparatus is described and claimed which will satisfactorily take hot sheets from the galvanizing bath and cool them below 120° F. speedily, and without retarding modern rapid production programs. This apparatus comprises means for conveying the sheets on edge over a manifold, where they are uniformly bathed in continuous currents of expanding air.

In the commercial practice of my invention I have found it preferable to follow these steps, as distinguished from the ordinary practice referred to above.

1. Pickling
2. Fluxing
3. Coating
4. Cooling
5. Roller leveling
6. Piling
7. Inspecting

I find that this order of steps, in addition to ensuring the main objects of my invention, has certain incidental advantages, such as a lessening of handling costs, uninterrupted production, a smaller necessary floor space and consequently lower investment in buildings, and a facilitation of inspecting, since the work is done on cold sheets.

In the drawing I have shown semi-diagrammatically a mechanism adapted to the practice of my process and illustrative of the steps thereof.

In this drawing 1 indicates the usual galvanizing pot, which being well known, requires no description. It will be understood that the sheets are first thoroughly cleaned and pickled, and that flux is applied to them before they come into contact with the molten coating metal. They emerge from the pot coated with zinc or an alloy thereof, at a temperature close to 800° F., and are carried by conveyors 2, 3 and 4 to a position in which they may be picked up by arms 5 operating on conveyor chains 6, which carry the sheets edgewise above a manifold 7. Fans 8 and 9, motor driven as shown, supply air to the manifold through the duct 10, and vanes indicated at 11 in the upper open part of the manifold direct the currents of air which envelope the sheets. The vanes are so arranged as to direct the air in blanket form over the sheets, thus bathing them uniformly and completely throughout their entire width. Thus, before any bending or working operations have been performed upon the coated sheets, they are uniformly cooled to a low temperature, below 125° F. The particular arrangement described has been found satisfactory to cool sheets to at least as low as 110° F. even in the hottest midsummer weather.

The cooling mechanism delivers the sheets to a conveyor 12 which carries them into the roller leveler 13 from which they are piled on a truck 14 and inspected.

It will be understood that modifications may be made in this apparatus without modifying that process which is my invention, or the novel product which is the result thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. That process of galvanizing metallic sheets which comprises coating said sheets with a molten galvanizing metal, promptly cooling said sheets to substantially 125° F., and then roller leveling said sheets, all during the substantially continuous travel of said sheets.

2. That process of galvanizing metallic sheets, which comprises coating said sheets with a molten galvanizing metal comprising zinc, promptly cooling said sheets to substantially 125° F., and then roller leveling said sheets, all during the substantially continuous travel of said sheets.

3. That process of galvanizing metallic sheets, which comprises coating said sheets with a molten galvanizing metal, and promptly cooling said sheets to substantially 125° F. by uniformly bathing both surfaces of said sheets with currents of expanding air, all during the substantially continuous travel of said sheets, and prior to bending said sheets.

4. That process of galvanizing metallic sheets, which comprises coating said sheets with a molten galvanizing metal comprising zinc, and promptly cooling said sheets to substantially 125° F. by uniformly bathing both surfaces of said sheets with currents of expanding air, all during the substantially continuous travel of said sheets, prior to bending said sheets, and afterwards roller leveling said sheets.

5. That process of galvanizing metallic sheets, which comprises passing said sheets continuously through a coating zone and applying molten galvanizing metal comprising zinc to said sheets, carrying said sheets on edge and in interspaced relationship through a cooling zone and bathing both surfaces of said sheets uniformly with currents of expanding air substantially at room temperature until said sheets reach a temperature not substantially greater than 125° F., all without bending said sheets, and through a leveling zone in which said sheets are bent to level the same.

RALPH O. GRIFFIS.