

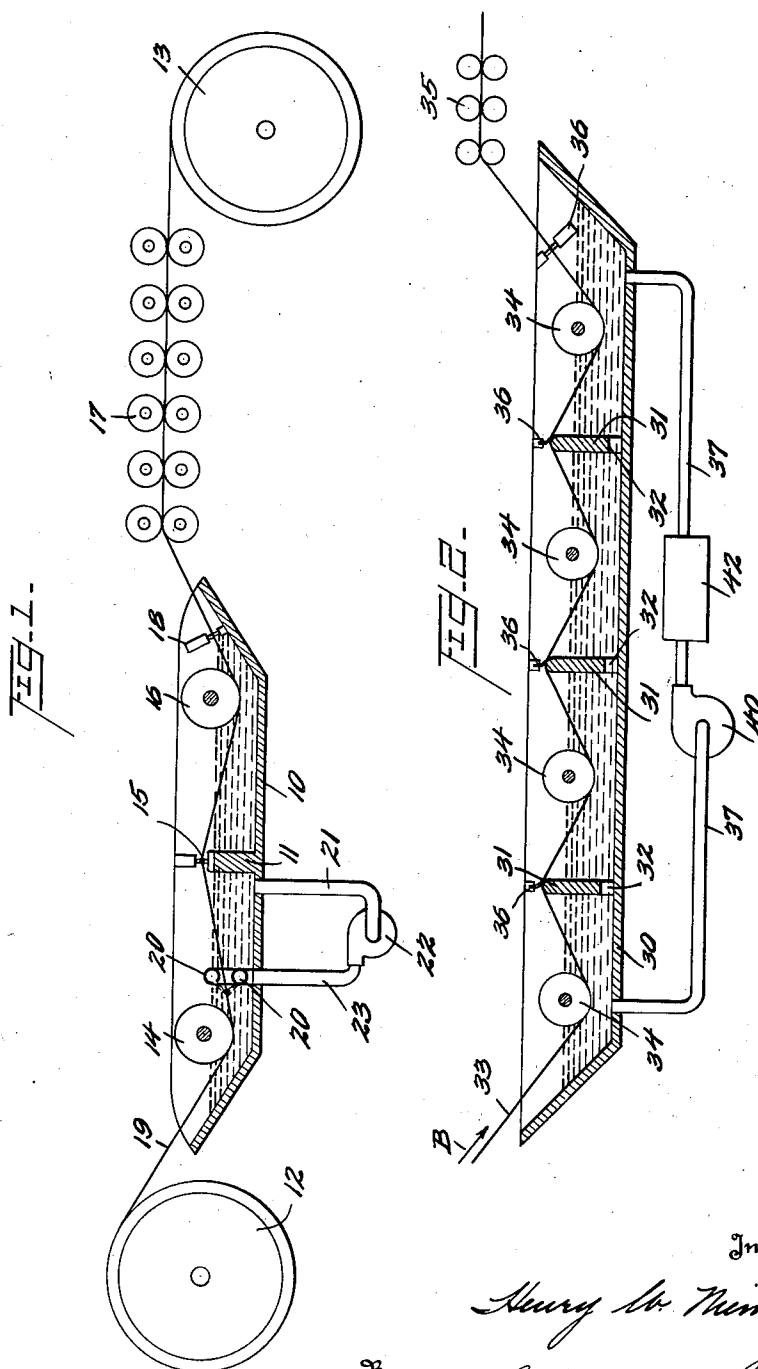
April 30, 1935.

H. W. NIEMAN

1,999,822

METHOD OF CLEANING METALLIC SHEETS

Filed Aug. 15, 1931



Inventor

Henry W. Nieman

By *R. S. C. Dougherty*
Attorney

UNITED STATES PATENT OFFICE

1,999,822

METHOD OF CLEANING METALLIC SHEETS

Henry W. Nieman, Bethlehem, Pa., assignor to
Bethlehem Steel Company, a corporation of
Pennsylvania

Application August 15, 1931, Serial No. 557,405

3 Claims. (Cl. 148—4)

The present invention relates to methods of and apparatus for removing oil or oleaginous material from the surfaces of metal strips or sheets.

Quite a large proportion of the metallic sheets manufactured are, subsequent to their fabrication, coated with tin. A satisfactory coating of tin can only be applied to a sheet or strip having a clean surface, and hence it is essential that the sheets or strips which are passed into the tinning machine be free of appreciable quantities of oil and in fact free of any liquid or solid matter which would tend to interfere in any way with the tinning process.

Sheets are now rolled to finished gauge by two principal processes known, respectively, as the hot rolling process and the cold rolling process. In the hot rolling process no oil is used, and hence the sheets come from the mill with their surfaces in satisfactory condition. In handling these sheets, however, they frequently become coated with oil, at least in spots, and hence it is necessary under such conditions to remove the oil or greasy matter. Oil is used very extensively in connection with the cold rolling process so that the sheets, as they come from the cold rolling mill, are generally quite oily or greasy.

The common practice now followed in preparing cold rolled sheets for tinning is to first anneal them and to thereafter pickle the annealed sheets prior to passing them through the tin pot. Prior to subjecting the sheets to the action of the annealing furnace, however, it is essential that the oil be removed since, if it is not, the annealing operation causes the oil to form a film of graphite on the surface of the sheet which resists the action of the pickling acids. It is found that the usual methods of removing oil, which methods comprise washing the metallic sheet in soda or other solution, or mechanical cleaning as by bran cleaners, do not effect complete removal of the oily substances so that extremely thin films of oil remain when the sheets are introduced into the annealing furnace, and the resulting graphite seriously interferes with the application of tin coating.

In accordance with the present invention, the cold rolled sheets with their oily or greasy surfaces, or the hot rolled sheet if such sheets have become wholly or partially grease-coated in handling, are subjected to a washing operation in a solvent which completely removes the coating of oil thereon. This solvent is of such character that it may be either completely removed

by mechanical means or, if not completely removed, will evaporate without leaving a graphite deposit on the sheet, so that the surface of the sheet is, after the annealing operation, in proper condition for the attack of pickling acids.

While various types of solvents may be used, I prefer to use kerosene as I have found this to work satisfactorily in practice and to be relatively inexpensive and easily handled. The term kerosene as herein used designates that member of the series of petroleum distillates having a boiling point lower than that of the lubricating oils but not so low as to cause it to give off inflammable vapors at ordinary temperatures. Other solvents of generally similar nature may be employed, however, if found more suitable under varying operating conditions.

The apparatus employed in cleaning the sheets or strips may vary widely in detail, the invention not being limited in this respect. In the accompanying drawing, two forms of such apparatus are illustrated by way of example.

In the drawing:

Figure 1 illustrates diagrammatically a preferred form of apparatus; and

Figure 2 illustrates a diagrammatic showing of a modified form.

In the form of the apparatus shown in Figure 1, a tank for the liquid solvent is indicated at 10, this tank being open at the top and having a central transverse partition 11 dividing the tank into two independent compartments. The sheet or strip to be cleansed is mounted upon the drum 12 and in the cleansing operation is unwound from this drum and is ultimately wound on a second drum 13 at the other end of the apparatus. The sheet passes under a roller 14 in the first compartment, then over the top of the intermediate partition 11 where it is subjected to the action of the rubber wiping devices indicated at 15, and thence beneath the second roller 16 and upwardly to the bran cleaner diagrammatically illustrated at 17. A second set of rubber wiping devices is indicated at 18.

Just after passing under roller 14, the sheet, which is indicated at 19, passes between two parallel manifolds 20, which manifolds are provided with apertures facing the sheet through which streams of solvent are discharged against the opposite sides of the sheet. A solvent outlet pipe is indicated at 21, this pipe being adapted to conduct solvent from the bottom of tank 10 to the inlet side of a pump 22. A pipe or conduit 23 conducts solvent under pressure from the outlet side of pipe 22 to the manifolds 20.

In the operation of the device, the greater quantity of the oily matter of the surfaces of the sheet is removed by the solvent in the first compartment of the tank, and this solvent, which is preferably kerosene, may be removed, purified, and replaced from time to time as is necessary. The solvent in the first compartment is prevented from entering the second by reason of the rubber wipers 15. In passing through the second compartment, any traces of the oily material on the surfaces of the sheets which may still remain are removed, and the solvent is removed from the surface of the sheet prior to the passage of the sheet to the tank by the rubber wiping devices 18. Any remaining traces of solvent are removed by the action of the bran cleaner 17 of well-known construction prior to the winding of the sheet on the drum 13.

The sheet thus treated may be readily subjected to the action of the annealing furnace, and, should any slight traces of solvent remain on its surface, this solvent will evaporate and not form graphite deposits which tend to interfere with the action of the pickling bath.

The form of the apparatus shown in Figure 2 is similar in its action, but in this instance the tank 30 is divided into a number of compartments by partitions 31. The compartments, however, communicate with each other below the level of the solvent, the partitions 31 being provided with relatively small apertures 32 for this purpose. The sheet 33 passes successively under rollers 34, one roller being located in each compartment, and successively over the partitions 31 and is finally removed, subjected to the action of the bran cleaner 35, and then wound upon a suitable drum. Rubber wiping devices are indicated at 36. A pipe or conduit 37 connects the two end compartments and, if the sheet is passed through the tank in the direction of the arrow B, solvent is removed from the first or entering compartment by the action of pump 40 and introduced into the last compartment, after first passing through a suitable purifying or distilling device 42 by means

of which the impurities may be removed. By constantly removing solvent from the entering compartment, purifying it, and returning it to the outgoing compartment and inducing a flow of solvent from one end of the tank to the other in a direction opposite to that in which the sheet is passed through, efficiency of cleansing action is promoted.

In adapting the invention to the treatment of sheets, strips, and the like which vary in size, shape, and surface characteristics, the design and arrangement of the various elements of the solvent tank may be changed considerably without departure from the teaching thereof. The precise composition of the solvent used may also be varied, when desired, to insure maximum efficiency of the process in treating all sizes and compositions of sheets and strips.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:—

1. In the process of producing metallic sheet, the steps of cold rolling a sheet while applying lubricant thereto, washing said sheet in kerosene, and subjecting said sheet to an annealing temperature.

2. In the process of producing metallic sheet, the steps of cold rolling said sheet while applying lubricant thereto, washing said sheet in kerosene, removing a portion of said kerosene from said sheet by mechanical means, removing a remaining portion of said kerosene from said sheet by subjecting said sheet to an annealing treatment, pickling said sheet and applying a coating of protecting metal to the surface thereof.

3. In the process of producing tin plate, the steps of cold rolling steel sheet material while applying lubricant thereto, washing said material in kerosene, removing adhering portions of said kerosene by subjecting said material to an annealing treatment, pickling said material and applying a coating of tin thereto.

HENRY W. NIEMAN.