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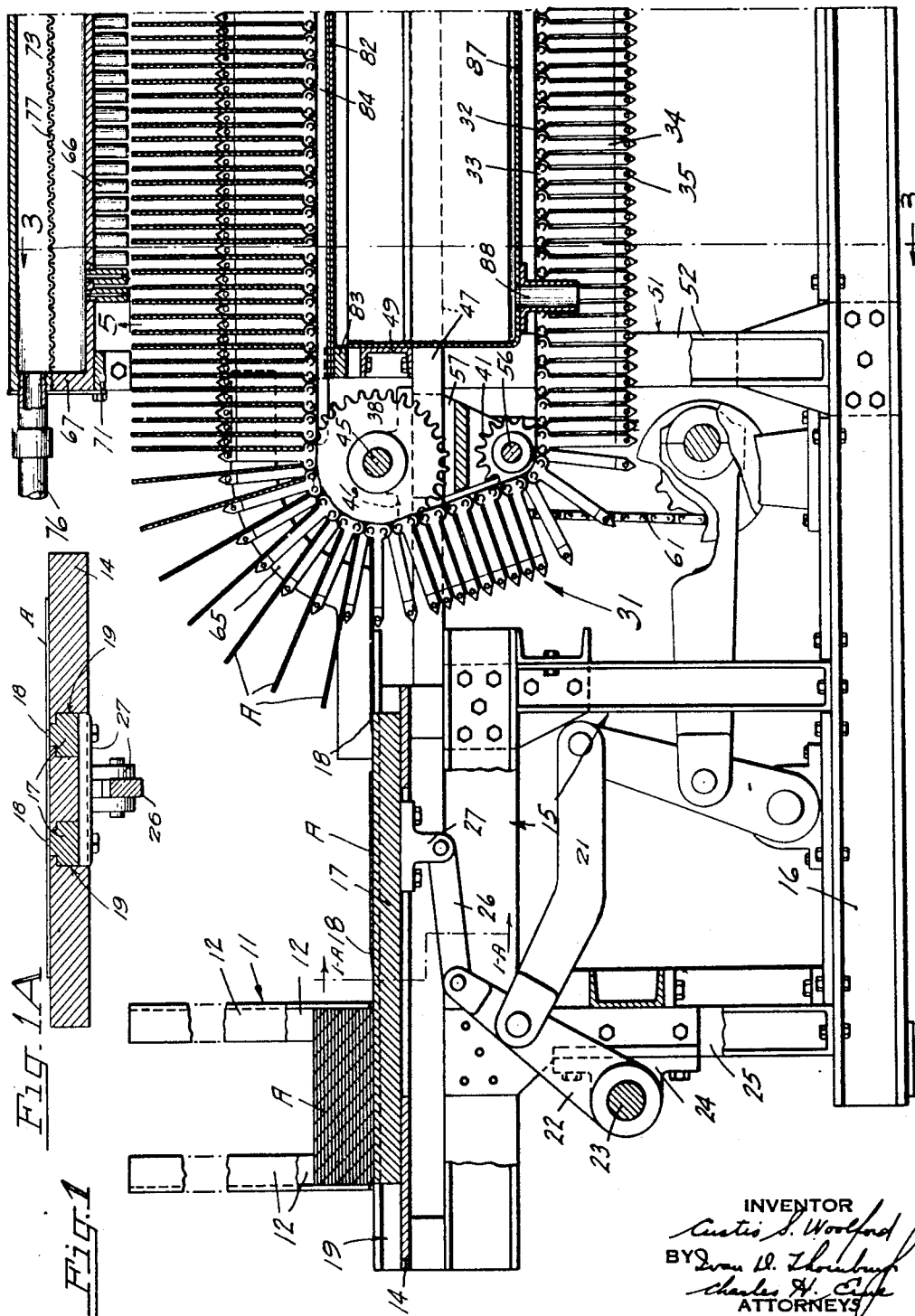
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2,302,730

SHEET METAL TREATING MACHINE

Filed Feb. 28, 1940

4 Sheets-Sheet 1



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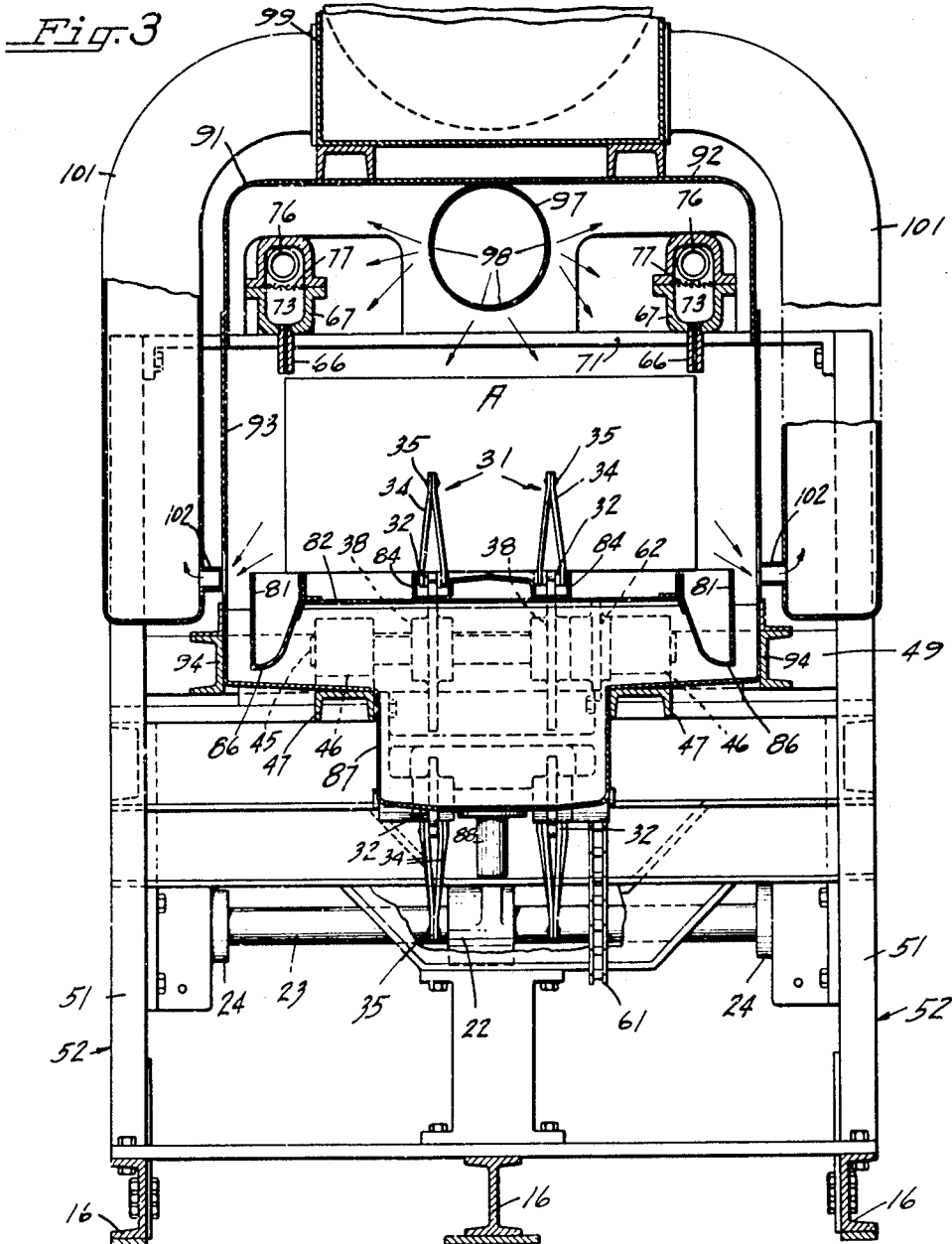
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SHEET METAL TREATING MACHINE

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4 Sheets-Sheet 3



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SHEET METAL TREATING MACHINE

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4 Sheets-Sheet 4

Fig.4

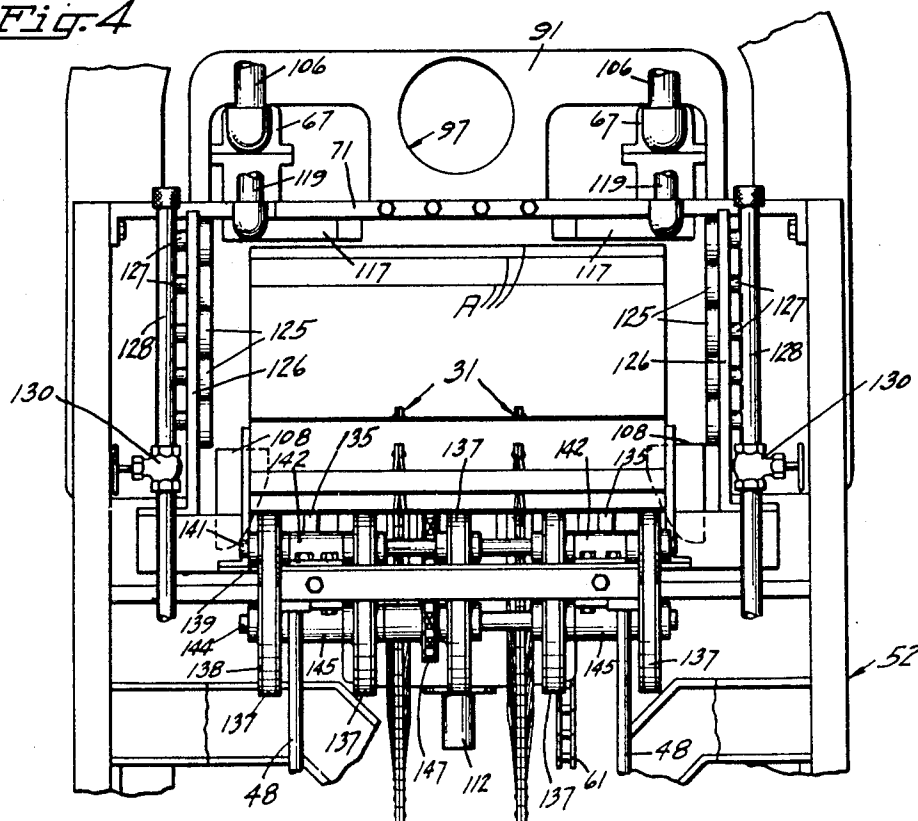


Fig. 5

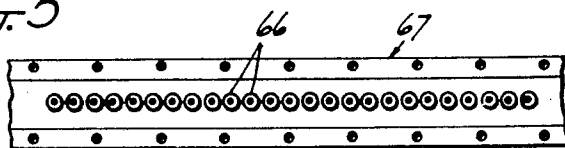


Fig. 6

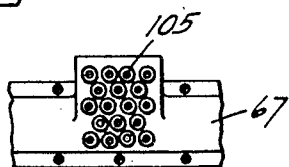
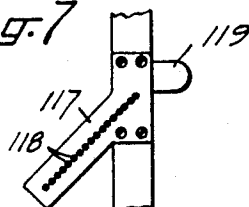


Fig. 7



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UNITED STATES PATENT OFFICE

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SHEET METAL TREATING MACHINE

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Application February 28, 1940, Serial No. 321,325

7 Claims. (Cl. 266—7)

The present invention relates to a machine for treating metallic sheet material and has particular reference to preparing such material for can manufacture or similar purposes wherein sealed joints or seams are produced and wherein the sheets are deoxidized preparatory to sealing of the seams.

In can manufacture, sheets or strips of steel or iron, usually referred to as black plate, are coated with tin to produce the well known commercial tinplate so widely used in the manufacture of tin cans. Cans made from tinplate are first blanked out and the blanks are formed into tubular shape. Edges of the blank are joined in a side seam to produce the tubular can body. Such a side seam may include an overlapping or an interfolding of the blank edges and these edges may be soldered or welded together to make a tight joint.

For some products, the use of untinned black plate has been suggested in the manufacture of cans. However, it has been found difficult to solder or weld the side seams of such cans because of the oxide surface of the black plate. The same is also true of some metallic coated sheets other than those which are tin coated. Such oxide surfaces may be prepared for soldering, etc., by deoxidization.

The instant invention contemplates a machine for overcoming this difficulty by preparing the blanks in a deoxidizing medium so that the side seam edge may be readily soldered or welded.

An object, therefore, of the invention is the provision of a black iron or other sheet metal treating machine wherein the sheets are deoxidized preparatory to being formed into cans and as an incident to having their edges sealed in a seam.

Another object is the provision of such a machine wherein a liquid deoxidizing medium may be applied to the sheets to remove the oxide on them and to thereby prepare them for container or the like manufacture.

Another object is the provision of a machine of this character wherein the liquid deoxidizing agent may be applied to certain defined side seam portions of the sheets so that these portions, after being deoxidized, may be readily soldered or welded together to produce a tight side seam for a container made from such a deoxidized sheet.

Another object is the provision of such a machine wherein the deoxidized sheets are immediately washed with hot clean water in order to remove the deoxidizing agent.

Another object is the provision of such a machine wherein the deoxidized and washed sheets

are thoroughly dried to prevent them from rusting after such a deoxidizing and washing treatment.

Another object is the provision of a machine of this character wherein the sheets to be deoxidized move in a continuous procession through the machine and are subjected to the deoxidizing treatment in progressive stages.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figures 1 and 2 are longitudinal sectional views which when placed end to end illustrate a machine embodying the instant invention, parts being broken away;

Fig. 1—A is a detail transverse section on line 1—1—1—A of Fig. 1;

Fig. 3 is a transverse section taken substantially along the line 3—3 in Fig. 1, with parts broken away;

Fig. 4 is a fragmentary end elevation taken substantially along a plane indicated by the line 4—4 in Fig. 2; and

Figs. 5, 6 and 7 are horizontal detail views taken substantially along the respective lines 5—5 in Fig. 1 and 6—6 and 7—7 in Fig. 2.

As a preferred embodiment of the invention the drawings disclose a machine in which metallic sheet material in the form of can body blanks A are subjected to a deoxidizing treatment prior to the blanks being formed into container bodies. In this treatment the side seam edges of the blanks are passed through a plurality of running streams of a liquid deoxidizing medium or agent, such as hydrochloric acid or sulphuric acid which is maintained preferably at a temperature of approximately 180° F. The hot acid, coming in contact with the black iron or other sheet material deoxidizes it.

After such a deoxidizing treatment the acid which adheres to the blanks is washed off with hot clean water maintained at a temperature of approximately 180° F. The blanks are passed through a plurality of running streams of the water to effect this washing operation. The washed blanks are then thoroughly dried, first by jets of hot air which is played upon the moving blanks, and second by heat which is radiated against the sheet surface by radiant heaters. After this treatment the blanks are discharged from the machine to any suitable place of deposit.

The blanks A to be deoxidized are preferably fed into the machine in timed order from a supply of such blanks retained in a magazine 11 (Fig. 1) disposed at the entrance end of the machine. The magazine includes a plurality of vertical angle iron guide rails 12, preferably four in number and arranged at the corners of the blanks the better to retain them in a stack.

The lower ends of the guide rails 12 of the blank magazine are secured to a flat table 14 which is supported on a structural steel sub-frame 15 secured to a plurality of base rails 16. The stack of blanks in the magazine is supported on top of the table.

The blanks are adapted to be fed individually and in timed order from the bottom of the magazine. For this purpose there is provided a pair of spaced and parallel longitudinal feed bars 17 having spring held feed dogs 18 at intervals along their lengths. The feed bars slide in T-slots 19 formed in the top of the table 14. These bars are reciprocated by a link 21 which is actuated in any suitable manner in time with the other moving parts of the machine.

The actuating link 21 is connected to an arm 22 which is mounted on a cross-shaft 23 carried in bearings 24 secured to legs 25 of the sub-frame 15. The outer end of the arm is connected by a short link 26 to a clevis bracket 27 secured to both of the feed bars 17.

Hence when the feed bars 17 move through a forward stroke under the magazine 11, a pair of the feed dogs 18 engage behind the lowermost blank in the stack and carry it forward away from the magazine and deposit it at an idle station. The removed blank remains at the idle station while the feed bars move back on the return stroke. On the next forward stroke of the feed bars the removed blank is advanced another step by a second set of the feed dogs 18. This advancement of the blank brings it into the path of travel of a continuously moving endless chain conveyor 31 (Figs. 1 and 2).

The conveyor 31 primarily comprises two spaced and parallel endless chains 32 (see also Fig. 3) formed of connected links 33 having long prongs 34. There are two prongs on each link and at their outer ends the prongs meet and are secured together by a rivet 35. This construction greatly strengthens the prongs and makes them more rigid.

The conveyor chains 32 take over a pair of driving sprockets 38 (Figs. 1 and 3) disposed adjacent the feed-in end of the machine and then extend horizontally along an upper run toward the opposite or discharge end. At the discharge end of the machine, the chains take over a pair of main idler sprockets 39 (Fig. 2) and then extend downwardly and inwardly at an angle to the upper run where they take over a pair of small auxiliary idler sprockets 40 and return toward the entrance end of the machine along a horizontal lower run. At this end of the machine the chains take over a second pair of small auxiliary idler sprockets 41 (Figs. 1 and 3) and then pass up at an angle toward and over the driving sprockets 38.

The driving sprockets 38 are mounted on a short cross-shaft 45 which is journaled in bearings 46 carried on a pair of spaced, horizontal support rails or channel beams 47. These rails extend nearly the full length of the machine. At the entrance end of the machine the rails are supported on the sub-frame 15. At the discharge end of the machine they are supported on a pair

of tie rods 48 which are bolted to the machine base 16. Intermediate the length of the rails they are bolted to cross-beams 49 the ends of which are secured to vertical legs 51 of a structural steel main frame 52. The legs are bolted to the machine base 16.

The main idler sprockets 39 are mounted on a cross-shaft 55 which is journaled in bearings similar to the bearings 46 and are secured to the channel beams 47 at the discharge end of the machine. The auxiliary idler sprockets 40, 41 are mounted on cross-shafts 56 which are carried in bearing brackets 57 bolted to the channel beams 47.

The conveyor is actuated by a chain 61 (Figs. 1 and 3) which takes over a sprocket 62 carried on the driving sprocket shaft 45. The chain may be actuated in any suitable manner operating in time with the other moving parts of the machine.

Hence as the conveyor 31 travels up over the driving sprockets 38 the prongs 34 of the conveyor spread apart in radial fashion as shown in Fig. 1. It is while the prongs are in this spread position that a blank A, being advanced by the feeding mechanism, is introduced into the conveyor and is received between a pair of the spread prongs. The received blank is carried upwardly over the conveyor driving sprockets by the prongs from a horizontal position into a vertical position as shown in the figure. During this elevation of the blanks they are guided and shifted transversely into processional alignment by curved guide plates 65 which are secured to the top of the feed table 14.

When the prongs 34 and the blanks carried between them come into the path of travel of the straight upper run of the conveyor, the prongs close in, i.e., move from their spread positions and come into vertical parallel positions. This change in position of the prongs clamps the blanks between adjacent prongs and thus holds the blanks firmly while they are carried through this portion of the machine. It should be noted that the holding of the moving blanks is effected near their longitudinal center so that their projecting vertical outer edges will be fully exposed. It is these edges which are to be incorporated in the side seam of a can body made from the blank and it is also these edges which are to be subjected to the deoxidizing treatment hereinbefore mentioned. This treating of the blank edges is done while the blanks move along the upper run of the conveyor as will now be described.

The protruding vertically disposed side seam edges of the blank A carried by the conveyor first move through the deoxidizing section of the machine where such localized portions of the blank are subjected to a plurality of small streams of the hot deoxidizing acid. These streams of acid issue from deoxidizing nozzles 66 (Figs. 1, 2, 3 and 5) which are arranged in a longitudinal row and which are disposed above the path of travel of the blanks and in line with the side seam edges thereof. There is a row of nozzles along each side of the machine.

The deoxidizing nozzles 66 are secured into the bottoms of a pair of manifolds 67 which extend nearly the full length of the conveyor 31. These manifolds are supported on cross-bars 71 which are secured to the legs 51 of the main frame 52. Each manifold is formed with a transverse partition wall 72 which divides the manifold into two compartments 73, 74. The first of these compartments, indicated by the numeral 73, is adjacent the feed-in end of the

machine and constitutes the acid or deoxidizing agent receiving manifold. The nozzles 66 communicate with this compartment 73.

The deoxidizing agent which is here indicated as a liquid, is received in the compartment 73 by way of an inlet pipe 76 which is threaded into the outer end of the manifold adjacent the upper portion thereof. This pipe leads from any suitable source of supply of the hot deoxidizing agent. A longitudinal screen 77 is provided in the deoxidizing manifold between the inlet pipe and the nozzles to facilitate distribution of the incoming deoxidizing liquid to all the nozzles.

Thus as the deoxidizing liquid flows from the nozzles 66 it falls in small streams across the path of travel of the side seam edges of the moving blanks A. Since the moving blanks are maintained in a vertical position the deoxidizing liquid runs down and saturates both sides of the blank edges. The streams being small in diameter the area of the blank which is to be deoxidized is restricted as desired. In the instant case only the edge of the blank for a distance inwardly of about one-quarter inch is treated. The flowing acid runs down the blank edge along substantially a straight vertical path and drips off the bottom edge of the blank.

The excess deoxidizing agent which runs off the passing blanks is caught in a trough 81 which extends under and along the path of travel of the blanks on each side of the machine. These troughs are secured to the outer longitudinal edges of a flat plate 82 (Figs. 1, 2 and 3) which is carried on spacer blocks 83 secured to the cross-beams 49. The plate also carries a pair of tracks 84 in which the upper runs of the conveyor chains 32 operate so that they will be maintained in a straight line path of travel.

The troughs 81 merely prevent the used acid from splashing back onto the blanks and is not intended to be used as a receiving tank. The acid so received, however, flows out of the troughs through holes 86 formed in the trough bottom and this acid is caught in a receiving tank 87 which is disposed below the troughs. The receiving tank is supported on the conveyor support beams 47. Outlet pipes 88 located in the bottom of the tank adjacent each end thereof are provided for carrying the used acid to any suitable place of deposit.

In order to prevent outside air currents from deflecting the falling streams of acid with consequent splashing of the acid over the surface of the blanks, the entire upper portion of the machine is preferably encased in a hood 91 (Fig. 3). This hood comprises thin sheet metal top and side walls 92, 93 which are secured to longitudinal channel beams 94 which extend along the top edge of the acid receiving tank 87. The ends of these beams are secured to the cross-beams 49 of the main frame 52.

Certain kinds of deoxidizing liquids will break up into vapors or gases upon heating and in order to prevent accumulation of such gases within the hood 91, a suitable ventilation of the hood is desirable. For this purpose an air intake conduit 97 is provided in the hood and extends the full length thereof. The ends of the conduit are secured in the upper end walls of the hood and are open to the outside atmosphere. Spaced holes 98 are formed in the conduit along its entire length so that air may be drawn into the hood.

The air is drawn through the conduit 91 by way of a fan located in a casing 99 which is mounted

on top of the hood. The fan casing communicates with a pair of sheet metal outlet conduits 101 which extend down adjacent the sides of the hood and are connected into the hood by way of short exhaust pipes 102.

Hence when the fan is in operation, air entering at the top of the hood 91 by way of the intake conduit 97 is gently circulated through the hood in the directions generally indicated by arrows and is drawn out at the bottom of the hood through the exhaust pipes 102. The air continues on up through the outlet conduits 101 and is exhausted by the fan to the outside atmosphere or to any suitable place of discharge. This gentle circulation of air through the hood keeps it free from any gases which may otherwise accumulate therein.

As hereinbefore mentioned deoxidizing of the side seam edges of the blanks is followed by a washing operation in a succeeding washing or rinsing section of the machine, which thoroughly removes any traces of the deoxidizing agent from the blanks. For this purpose there is provided a plurality of washing nozzles 105 (Fig. 2) which are located above the path of travel of the blanks and in line with the side seam edges of the blanks.

The washing nozzles 105 on each side of the machine are preferably divided into two groups of eighteen nozzles arranged in a pattern best shown in Fig. 6. These nozzles are secured in the bottom of a water manifold being a part of the manifold 67 which encloses the compartment 74 and separated from the acid compartment 73 by the partition wall 72. Clean hot water is introduced into the water compartment by a service pipe 106. One end of the pipe is threaded into the end of the manifold while the other end of the pipe leads from any suitable source of supply of water.

Hence the water introduced into the compartment 74 of the manifold, issues from the nozzles 105 in small streams which flow over the acid treated surfaces of the blanks as they pass along with the conveyor 31. The arrangement of the nozzles is such as to spread the washing water over a greater portion of the blank adjacent its edge than is treated with the acid so that removal of all acid is positively insured.

The used water runs off the lower edges of the moving blanks and is caught in troughs 108 (Fig. 4) which are identical in construction with and function in the same manner as the acid troughs 81. The water troughs 108 empty into a water tank 109 which is an extension of the acid tank 87 and is separated from it by a partition wall 111. In the bottom of the tank there is formed an outlet pipe 112 (Fig. 2) which may lead to any suitable place of discharge for the used water. An overflow pipe 113 is also provided in the tank to prevent flooding of the tank in case the water should flow into it faster than it can be carried off by the regular outlet pipe. This overflow pipe may also lead to any suitable place of discharge for the used water.

While the treated and washed blanks are still carried by the conveyor 31 they are advanced through a drying section of the machine and thoroughly dried to free them of all water. This prevents rusting. As hereinbefore mentioned, this drying is done by heated air and radiant heaters. The heated air is blown onto the moving blanks from above by a pair of air heads 117 (Figs. 2 and 7) which are located one on each side of the machine and just above the path of travel of the washed portions of the moving

blanks. The air heads are secured to the frame cross-bar 71 and are preferably set at an angle, as best shown in Fig. 7, so that the heated air is projected downwardly across the path of travel of the blanks, thus progressively stripping the adhering water outwardly toward the edges.

Each air head 117 is formed with a row of small and closely located apertures 118 which communicate with the interior of the heads. Hot air under pressure is introduced into each head by way of an inlet pipe 119. One end of the pipe is threaded into the head while the other end leads from a suitable supply of the hot air.

Hence while the wet blanks pass along below the air heads 117 a plurality of small jets of hot air issue from the apertures 118 and impinge against the blanks. The apertures purposely are located close together so that the combined jets of air issuing from them will constitute a sheet of air instead of a number of individual jets. This sheet of air blows a great deal of the water off the blanks and simultaneously evaporates what remains in order to leave the blanks dry.

To make further assurance that no water remains on any part of the blanks, they are carried by the conveyor 31 through a region of the machine drying section which is affected by radiant heaters 125 (Figs. 2 and 4). These heaters are preferably located adjacent the air heads 117. The drawings show two groups of such heaters, one on each side of the machine. Each group of heaters is mounted in a deflecting plate 126 secured to the channel beams 94 (see Fig. 4).

Each heater group preferably comprises five rows of heaters with three heaters to a row and each row is connected by a feeder pipe 127 with a main gas supply pipe 128. Such a pipe leads from any suitable supply of gas fuel. Valves 129 are provided in each of the feeder pipes so that both the number of heaters used and the amount of opening for each may be obtained as desired. A main service valve 130 in the main supply pipes 128 gives further regulation of the gas used.

When heaters 125 are in operation heat from both sides of the machine is simultaneously radiated across the path of travel of the blanks. The entire blank is subjected to this radiated heat and therefore any wet portion of the blank is immediately dried. In some cases, as when small or narrow blanks are being treated both forms of drying elements are not required and only one will be used.

Drying of the blanks completes the deoxidizing treatment and the blanks are thereafter discharged from the machine. This discharging of the blanks is preferably done as the conveyor 31 passes over the main idler sprockets 39. While passing over these sprockets the conveyor prongs 34 again spread apart in radial fashion and thereupon release their hold on the blanks. As prongs leave the upper run of the conveyor (Fig. 2) they pass from a vertical position, through a horizontal position and into a depending position. Thus the deoxidized blanks are also shifted into a depending position at the time they are released for discharge.

To facilitate the discharge of the blanks from the conveyor, a pair of stationary transversely spaced curved discharge rails 135 (Figs. 2 and 4) are located adjacent the chains 32 and are bolted to the longitudinal conveyor beams 47. These rails are outwardly and downwardly curved and located relative to the endless conveyor so that when a blank is carried over the main idler sprockets 39 the inner edge of the blank engages

the rails with the result that the blank is pushed by said rail engagement radially outwardly from between the conveyor prongs as best seen in Fig. 2.

As the blanks are removed from the conveyor 31 they fall onto a plurality of moving endless discharge belts 137 (Figs. 2 and 4) which carry the blanks to any suitable place of deposit. In the drawings there are shown four of these belts and they may be of any desired length.

The discharge belts 137 take over driving pulleys 138 and idler pulleys 139. The idler pulleys are carried on a cross-shaft 141 which is journaled in bearings 142 secured to the conveyor beams 47. The driving pulleys are mounted on a driving shaft 144 which is journaled in bearings 145 bolted to the conveyor beams 47.

Actuation of the driving pulleys 138 is effected by an endless chain 147 (Fig. 2) which is operated in time with the conveyor 31. The chain takes over a driving sprocket 148 which is mounted on the conveyor idler sprocket shaft 55 and over a driven sprocket 149 which is carried on the pulley shaft 144.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising means disposed in said deoxidizing section in the path of travel of said sheets for ejecting a stream of a liquid deoxidizing medium against localized edge portions only thereof to deoxidize such portions, means disposed in said washing section in the path of travel of said sheets for ejecting a liquid washing medium against said localized edge portions only of the sheets to remove said deoxidizing medium after the deoxidizing operation, and means engageable with said sheets for removing the same from the conveyor at the discharge end of the machine.

2. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising means for clamping the sheets in vertical position on said conveyor for continuous advancement through the machine, a nozzle disposed in said deoxidizing section in the path of travel of said sheets for ejecting a stream of a liquid deoxidizing medium against localized edge portions only thereof to deoxidize such portions, an auxiliary nozzle disposed in said washing section in the path of travel of said sheets for ejecting a stream of a liquid washing medium against said localized edge portions of the sheets to remove said deoxidizing medium after the deoxidizing operation, means disposed in said drying section in the path of travel of the sheets for drying the same after the deoxidizing and washing operations, means for releasing said clamping means, and means engaging said sheets thus

treated for discharging the same from the conveyor at the exit end of the machine.

3. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising means for clamping the sheets in vertical position on the conveyor, a nozzle disposed in said deoxidizing section in the path of and above said sheets for ejecting a stream of a liquid deoxidizing medium downwardly against localized edge portions only thereof to deoxidize the same, a nozzle disposed in said washing section in the path of and above said sheets for ejecting a stream of water downwardly against said localized edge portions to remove the deoxidizing medium after the deoxidizing operation, means including an air nozzle disposed in said drying section in the path of and above the sheets for projecting air downwardly against said localized edge portions of the latter for drying the deoxidized and washed sheets, and means for discharging the sheets thus treated from their clamped position on the conveyor at the exit end of the machine.

4. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising nozzle means disposed in said deoxidizing section in the path of and above the moving sheets for projecting downwardly a stream of a liquid deoxidizing medium between said sheets and against localized edge portions only thereof to deoxidize the same, a nozzle disposed in said washing section in the path of and above the sheets for projecting downwardly a stream of water against the deoxidized edge portions of the sheets to remove the remaining deoxidizing medium, a plurality of spaced electrical radiant heating devices disposed in said drying section on opposite sides of the path of travel of said sheets for radiating heat therebetween in lateral directions to all portions thereof to completely dry the deoxidized and washed sheets, and means for discharging the sheets thus treated from the machine.

5. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising nozzle means disposed in said deoxidizing section in the path of and above the moving sheets for projecting downwardly a stream of liquid deoxidizing medium between said sheets and against localized edge portions only thereof to deoxidize the same, a nozzle disposed in said washing section in the path of and above the sheets for ejecting a stream of water against the deoxidized edge portions of the sheets to remove the remaining deoxidizing medium, an air drying nozzle disposed in said drying section above the sheets for projecting air downwardly therebetween to dry the sheets, radiant heating devices mounted adjacent said drying section on opposite

sides of the moving sheets for projecting and radiating heat laterally therebetween from opposite directions to further dry the sheets, means for discharging the sheets thus treated from the machine, a hood enclosing such portions of the machine as contain the said streams of liquid to prevent air currents from disturbing and deflecting said streams, and means for ventilating said hood and for drawing off gases generated by said deoxidizing medium.

6. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising a manifold disposed in said deoxidizing section extending longitudinally of the machine above the path of travel of the sheets for receiving a supply of a liquid deoxidizing medium, a row of nozzles secured into said manifold and arranged to project said deoxidizing medium in continuous vertically directed streams along a straight line longitudinally of the machine so as to contact localized edge portions only of said sheets to deoxidize the same, a water manifold disposed in said washing section adjacent said deoxidizing manifold and in longitudinal alignment therewith, water nozzles secured to said water manifold and arranged to project continuous vertically directed streams of clean water over a greater area relative to the edge portions of the sheets than is covered by said deoxidizing streams, to wash residual deoxidizing medium from all portions of said sheets, and drying devices disposed in said drying section adjacent said water manifold and in the path of travel of the sheets for drying the same after said deoxidizing and washing treatments and while the sheets are being carried by said conveying means.

7. In a machine for treating metallic sheets to permit soldering and welding thereof, including in adjacent relation a deoxidizing section, a washing section, a drying section and an endless conveyor for continuously advancing the sheets therethrough: the improvement comprising a plurality of outwardly projecting prongs disposed in spaced relation on said conveyor for conveying and clamping therebetween sheets to be treated while in a vertical position and resting on one edge on said conveyor, means disposed in said deoxidizing section in the path of the moving sheets for projecting deoxidizing liquid along a vertical edge portion of a said sheet while the same is carried by said conveyor to deoxidize said edge portion of the sheet, means in said washing section for rinsing off the said deoxidizing medium after it has performed its function, means at the entrance end of the machine for spreading apart said chain prongs to permit the insertion of sheets therebetween, means for successively feeding sheets to be treated to between said prongs, means at the discharge end of the machine for similarly spreading apart said prongs to unclamp the sheets, and sheet engaging devices at said machine discharge end for forcing said sheets outwardly from between said prongs as the latter are spread apart.

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