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2,295,617

SHEET METAL TREATING MACHINE

Filed Feb. 28, 1940

3 Sheets-Sheet 1

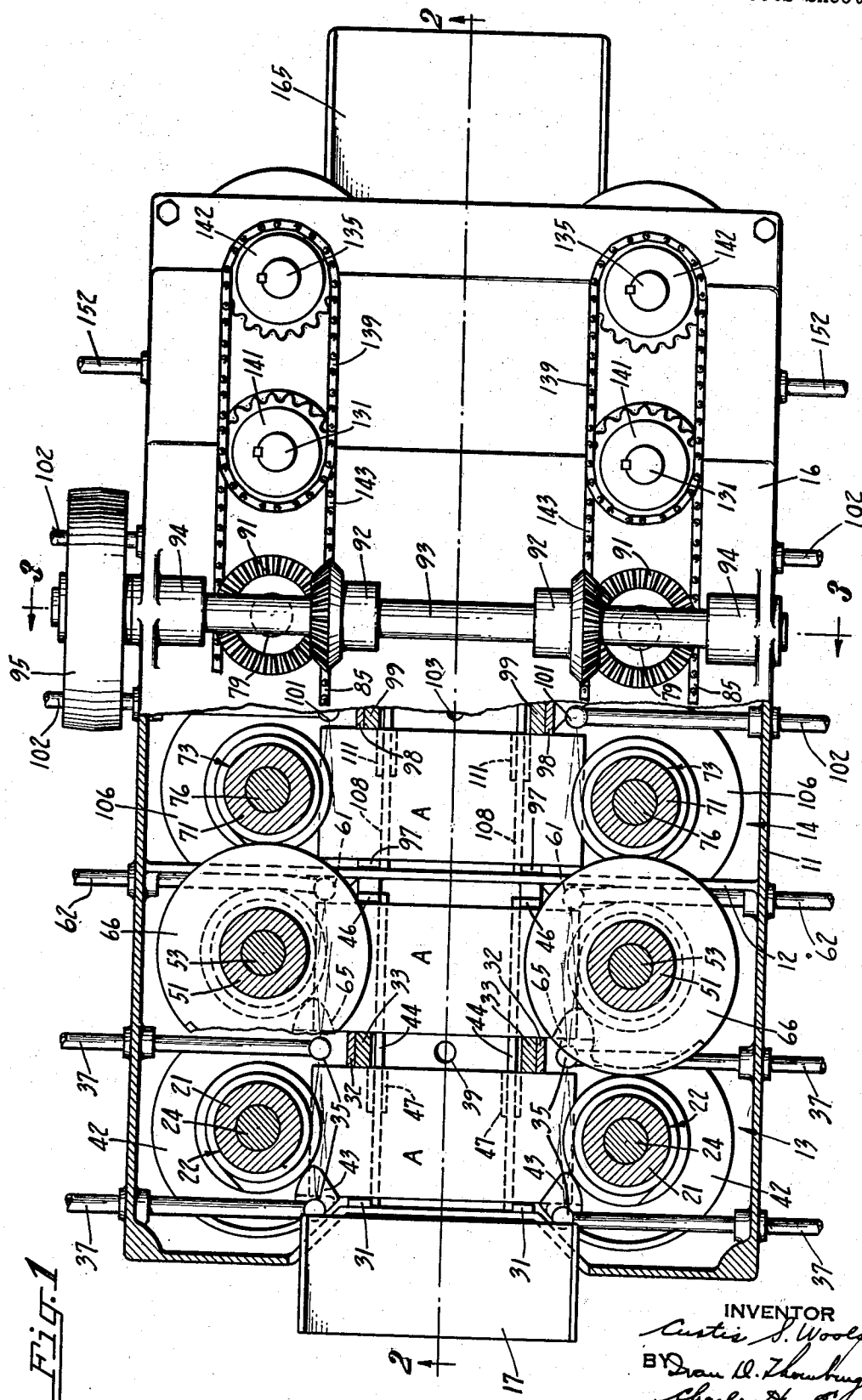


Fig. 1

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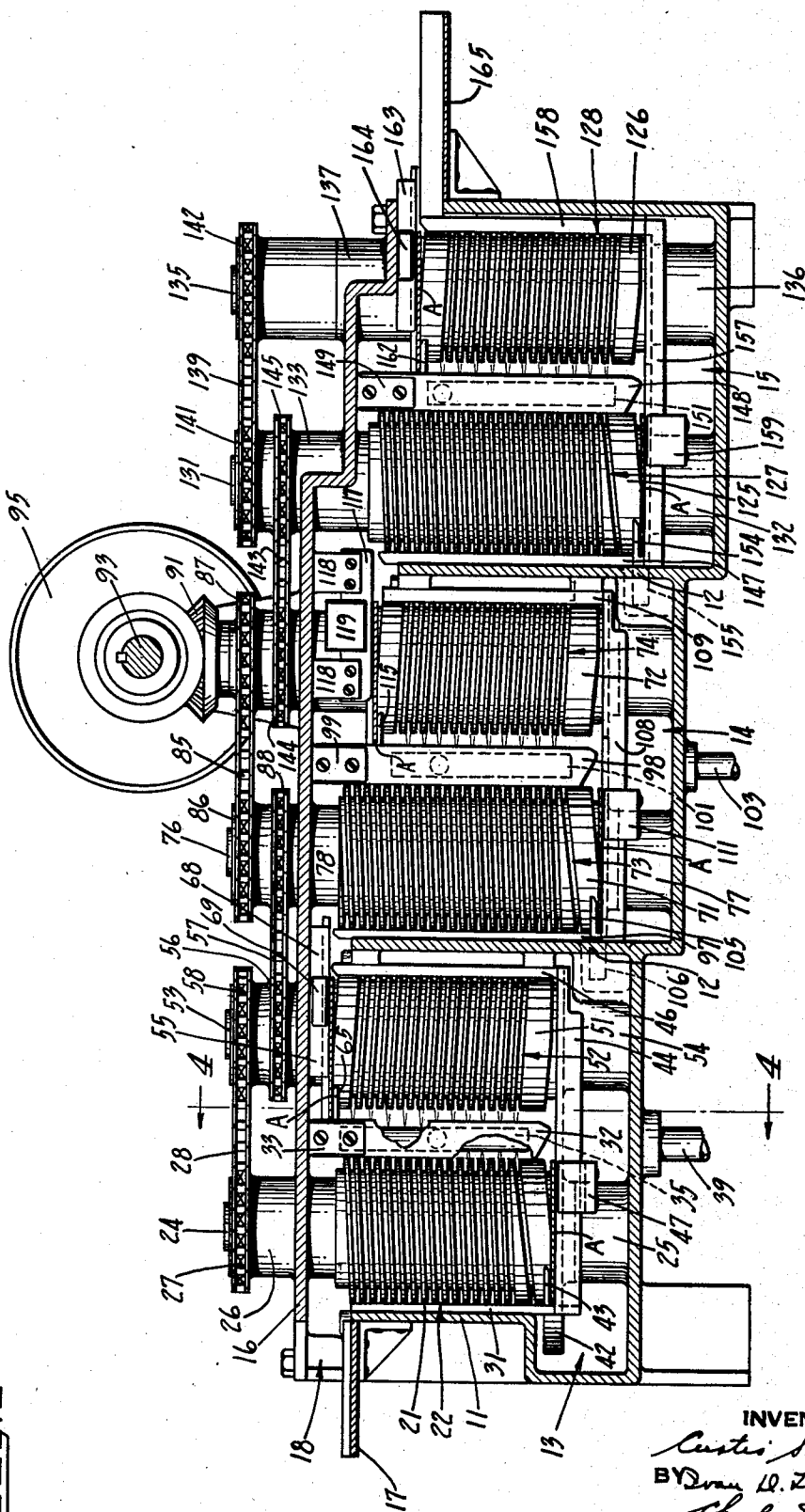


Fig. 2

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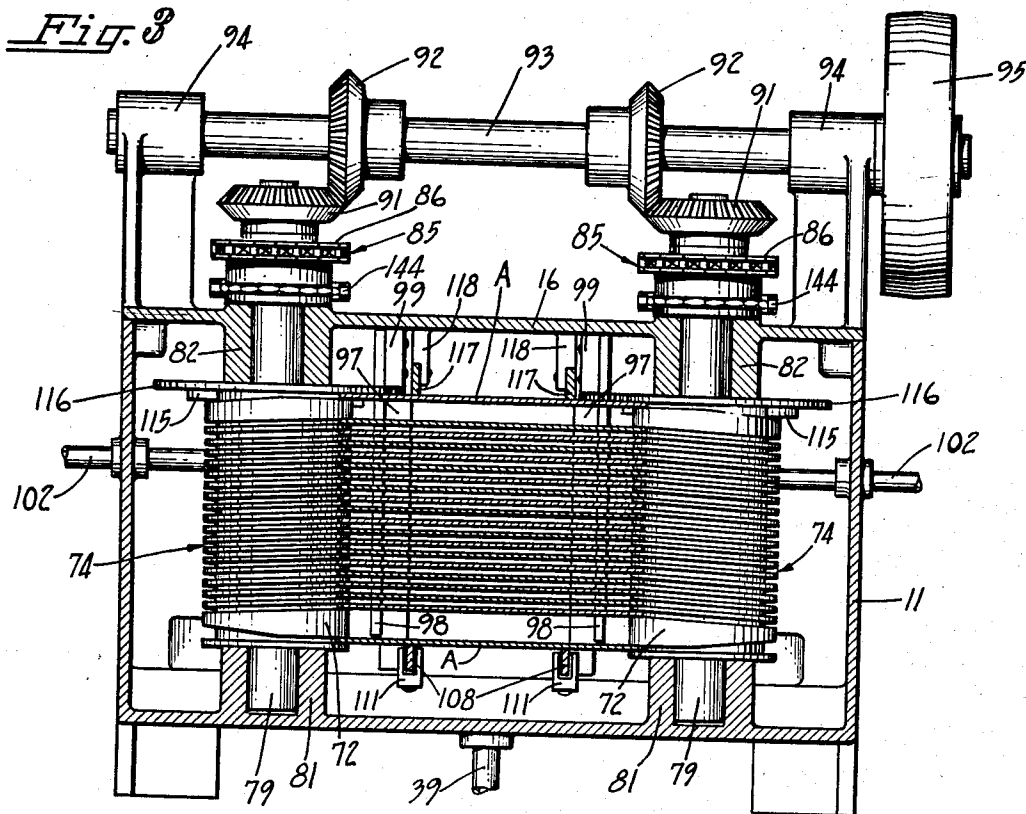
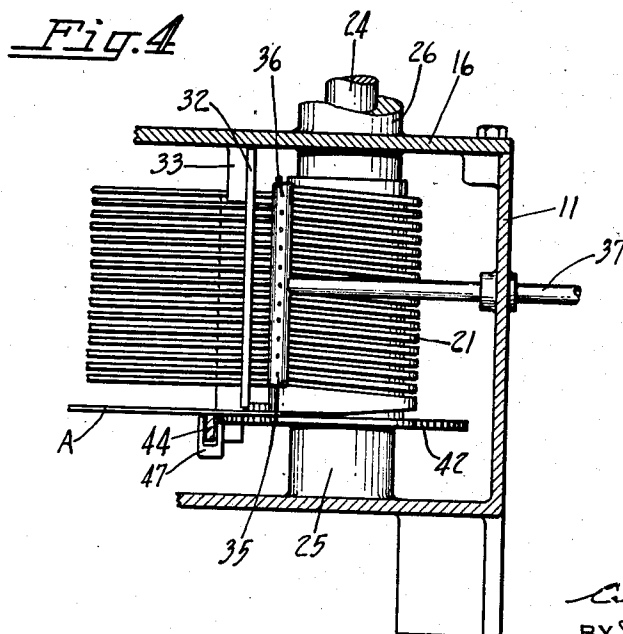
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SHEET METAL TREATING MACHINE

Filed Feb. 28, 1940

3 Sheets-Sheet 3



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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. 321,327

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 sprayed with a deoxidizing medium 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 found desirable for 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 edges 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 iron sheets are sprayed with a deoxidizing medium 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 the deoxidized sheets are immediately sprayed with hot clean water to wash off the deoxidizing medium and are then thoroughly dried to prevent rusting.

Another object is the provision of a machine of this character wherein the deoxidizing treatment may be localized or limited to certain definite portions of the sheets so that needless or unnecessary treatment of the entire sheet may be eliminated.

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 accompany drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a machine embodying the instant invention, parts being broken away and parts shown in section;

Fig. 2 is a longitudinal vertical sectional view taken substantially along the line 2—2 in Fig. 1;

Fig. 3 is a transverse vertical sectional view taken substantially along the line 3—3 in Fig. 1; and

Fig. 4 is a transverse vertical sectional view taken substantially along the line 4—4 in Fig. 2.

As a preferred embodiment of the invention the drawings disclose a machine in which metallic sheets A are subjected to a deoxidizing treatment prior to being formed into containers and container parts. In such a treatment the sheets are first sprayed with a liquid deoxidizing medium or agent such as for example, hot hydrochloric acid or hot sulphuric acid.

After such an acid treatment the sheets are immediately washed off by being sprayed with hot clean water. This washing is followed by a drying treatment wherein hot air is blown against the sheets. The drying action prevents the sheets thus treated from rusting.

The machine for subjecting the sheets A to such a deoxidizing treatment preferably includes a casing 11 having transverse partition walls 12 which divide the casing into three separate chambers. These chambers include a deoxidizing chamber 13, a washing chamber 14, and a drying chamber 15. The chambers are preferably closed by a cover plate 16 which is bolted to the top of the casing.

The sheets A to be deoxidized are fed into the machine, preferably by hand and in a horizontal position, along a feed table 17 which is secured to the front end of the main casing 11. The sheets so fed enter the deoxidizing chamber 13 near the top and through an opening 18 provided in the casing just under the cover plate 16.

Sheets A entering the deoxidizing chamber 13 are received within and between a pair of vertically disposed screw conveyors 21 each having descending helical grooves 22 extending from top to bottom. These conveyors are spaced apart, one being adjacent each side of the chamber, so that a sheet may be inserted between them with its opposite edges disposed in the respective grooves 22.

The conveyors 21 are mounted on vertical shafts 24. The lower ends of the shafts are journaled in bearings 25 formed on the bottom of the casing 11. The upper ends of the shafts are journaled in bearings 26 formed in the cover

plate 16. The shafts are continuously rotated in unison and in the proper direction by sprockets 27 which are carried on their upper ends. The sprockets are preferably driven by endless chains 28. There is one of these chains on each side of the machine extending longitudinally thereof.

As the conveyor screws 21 rotate, a sheet A supported in the helical grooves 22 of the screws, is carried down into the deoxidizing chamber 13. Vertical guide rails 31, 32 disposed adjacent the unsupported edges of the sheets confine them to a vertical path of travel. Rails 31 are secured to the entrance end wall of the main casing 11, while rails 32 are secured at their upper ends to lugs 33 which depend from the cover plate 16.

As the body blank moves down into the deoxidizing chamber 13 its side seam edges (the edges supported in the helical grooves 22) are sprayed with the deoxidizing liquid hereinbefore mentioned. This spraying is effected by means of a pair of vertical spray heads 35 which are located, one adjacent each corner of the moving blank as shown in Fig. 1. Adjacent the blank the spray heads are formed with a vertical line of small spaced spray holes 36. Each spray head is formed on the inner end of a horizontal pipe 37 which extends through the side walls of the main casing 11. Outside the casing the pipe connects with any suitable source of supply of the deoxidizing medium.

Hence the deoxidizing liquid flowing through the main supply pipes 37, enters the spray heads 35 and is discharged from the holes 36 in a fine spray. The holes are located in the spray heads so that the spray issuing therefrom is directed longitudinally of the side seam edge of the blank since this is the only part of the blank which it is desired to be deoxidized. This spraying action is continuous along the entire length of the spray head and hence as the blank moves down through the spray both sides of both marginal side seam edges are thoroughly saturated with the deoxidizing acid. A drain pipe 39 is provided in the bottom of the chamber to drain off the residual or surplus acid and prevent its accumulation in the chamber.

Near the bottom of each of the conveyor screws 21 the helical groove 22 changes to a greater pitch so that the lowermost blank of the plurality moving down in the chamber, may be rapidly separated from the others for discharge from the conveyor. When a blank reaches this portion of the conveyor it quickly descends into engagement with discharge discs 42 which constitute the bottoms of the screws. There is one disc for each screw and each disc is formed with a discharge finger 43.

A blank upon reaching the upper surface of the discharge discs 42, is positioned in front of the discharge fingers 43 rotating with the screws. These fingers engage the rear edge of the blank and sweep it forward (toward the right in Figs. 1 and 2) away from the screws. During this advancement the blank slides along the top of a pair of horizontal support rails 44 which extend longitudinally of the deoxidizing chamber 13.

One end of each support rail 44 is secured to one of the vertical guide rails 31. The opposite end is secured to one of a similar pair of vertical guide rails 46 which are secured to the first partition wall 12 in the main casing 11. Permanent magnets 47, insulated from and secured to the support rails 44, tend to hold back on the moving blank, thus serving as a drag to prevent the

blank from moving ahead too fast when it is ejected from the deoxidizing conveyor screws.

A discharged blank A, moving along the support rails 44, comes to rest against the vertical guide rails 46 and is then between two auxiliary deoxidizing screw conveyors 51. These auxiliary conveyors are formed with ascending helical grooves 52. Each screw conveyor is mounted on a vertical shaft 53 journaled at its lower end in a bearing 54 which is formed in the main casing 11, and at its upper end in a bearing 55 formed in the cover plate 16.

The auxiliary conveyors 51 are rotated in time with the conveyors 21 by sprockets 56 which are carried on the upper ends of the shafts 53. These sprockets are driven by chains 57, there being one chain extending along each side of the machine. Adjacent the sprockets 56 there are other sprockets 58 which are carried on the shafts 53. It is these sprockets which drive the chains 28 and thereby rotate the main deoxidizing screws 21.

Hence when a transferred blank A comes into position between the auxiliary screw conveyors 51, its side seam edges enter the helical grooves 52. The rotation of the screws carries the blank up toward the top of the chamber. During this vertical lift movement the sheet is guided by the vertical rails 46 and also by the rear edge of the guide rails 32 hereinbefore mentioned.

While thus moving upwardly the side seam edges of the blank are again sprayed with the deoxidizing acid. This is brought about by spray issuing from a line of spray holes formed in the inner face of the middle spray heads 35 and also by a similar line of holes in a pair of spray heads 61 (Fig. 1). These heads are vertically disposed adjacent the guide rails 46 and are formed on the inner ends of main supply pipes 62 which extend through the side walls of the main casing 11. The outer ends of these pipes are connected with the supply of deoxidizing medium.

When a blank A reaches the tops of these auxiliary conveyor screws 51 its side seam edges are completely deoxidized and the blank is ready to be discharged from the deoxidizing chamber 13 preparatory to entering the adjacent washing chamber 14. Here the uppermost sheet is separated from the others in the same manner as in the main conveyor screws 21. A groove of greater pitch and forming a continuance of the groove 52 is provided for this purpose.

The discharge of the separated blank is effected by discharge fingers 65 which are identical to the discharge fingers 43 on the main screw conveyors 21. These fingers 65 are formed on discharge discs 66 on the top ends of the auxiliary conveyor screws. The fingers, rotating with the screws, engage behind the blank as it comes adjacent the discharge discs and sweep the blank forward (toward the right in Figs. 1 and 2) and clear of the screws.

The deoxidized blank A thus discharged from the deoxidizing chamber slides along a pair of inverted support rails 68 which depend from the bottom of the cover plate 16. Permanent magnets 69 insulated from and secured to the support rails hold the blank against the rails while moving therealong.

The detailed description of the machine thus far has been confined to the deoxidizing unit of the machine. The blank washing unit containing the chamber 14 and the blank drying unit with the chamber 15 are both identical in construction and operation, with one exception, to

the deoxidizing unit just explained. The exception is that in the washing unit, hot clean water is sprayed from heads similar to the spray heads 35, 61 and in the drying unit, hot air is preferably discharged from the spray heads to dry the blanks. In view of this similarity of parts it is thought that only a very brief description of the two following units will suffice for a clear understanding of the machine.

In the washing chamber 14 there are two pairs of spaced vertically disposed screw conveyors, a pair of entrance screws 71 and a pair of exit screws 72 arranged as in the deoxidizing chamber 13. The entrance screws 71 are formed with descending helical grooves 73 while the exit screws 72 are formed with ascending helical grooves 74. The entrance screws 71 are mounted on vertical shafts 76 which are journaled in bearings 77 formed in the bottom of the main casing 11 and in bearings 78 which are journaled in the cover plate 16. The exit screws 72 are mounted on vertical shafts 79 (see also Fig. 3) which are journaled in bearings 81 of the main casing 11 and in bearings 82 of the cover plate 16.

The shafts 76, 79 on each side of the machine are rotated in unison by endless chains 85 which take over sprockets 86, 87 mounted on the respective shafts. Sprockets 88 also on the shafts 76 operate the chains 57 of the auxiliary screws 51 in the deoxidizing chamber 13. The shafts 87 also carry bevel gears 91 which mesh with similar bevel gears 92 carried on a main drive shaft 93 journaled in bearing brackets 94 formed on the cover plate 16. This is the main drive shaft of the entire machine and may be rotated from any suitable source of power. A pulley 95 is provided for this purpose.

When a deoxidized blank A is discharged from the deoxidizing chamber 13 it is pushed directly into the helical grooves 73 of the entrance screws 71. The rotating screws carry the blank down into the washing chamber 14. During this downward movement of the blank, it is retained in its vertical line of travel by vertical guide rails 97, 98. Rails 97 are secured to the chamber partition wall 12 while rails 98 are fastened at their upper ends to lugs 99 which depend from the cover plate 16.

While the blank is being carried down into the washing chamber 14 its side seam edges are washed thoroughly to free them of any of the deoxidizing acid which may adhere to the blank. This washing is effected by sprays of hot clean water which issue from a line of small spaced holes formed in a pair of water spray heads 101. These spray heads are located on each side of the machine between the entrance screws 71 and the exit screws 72 and adjacent the side seam edges of the moving blank so that a spray of water may be projected entirely across the blank longitudinally of the seam edge. The spray heads are formed on the inner ends of water supply pipes 102. These pipes extend through the side walls of the main casing 11 and lead from any suitable source of hot clean water. A drain pipe 103 is provided in the bottom of the chamber to drain away the used water.

When a partially washed blank A reaches the bottom of the entrance screws 71 it is separated from the other blanks in the conveyor and is pushed directly into the grooves 74 of the exit screws 72. This transfer is brought about by transfer fingers 105 which are formed on discharge discs 106 on the bottom of the screws.

While traveling from one set of screws to the

other the moving blank is supported on horizontal support rails 108. One end of each rail is secured to the vertical guide rails 97. The other end is secured to a similar pair of guide rails 109 which are fastened to the second partition wall 12 of the main casing 11. Permanent magnets 111 insulated from and secured to the support rails keep the blank in engagement with the rails and serve as a drag to prevent uncontrolled movement when the blank is ejected clear of the entrance screws 71.

The blank received by the exit screws 72 is immediately picked up by its ascending helical grooves 74 and is thereby elevated to the top of the screws. During this upward movement the blank is guided by the vertical guide rails 98, 109. The side seam edges of the blank are again washed off as they ascend through the water sprays of the spray heads 101. This washing is done by sprays which issue from a second set of holes which are formed in the other side of the spray heads. This completes the washing of the blanks.

When a completely washed blank reaches the top of the exit screws 72 it is separated from the other blanks in the conveyor and is discharged from the washing chamber 14 by discharge fingers 115 which are formed on discs 116 on the top of the screws (see also Fig. 3). The discharged blank slides along a pair of inverted support rails 117 secured to lugs 118 which depend from the top plate 16. Permanent magnets 119 insulated from and secured to the rails hold the moving blank against the rails. The discharged and completely washed blank thus passes from the washing chamber 14 and enters the adjacent drying chamber 15.

In the drying chamber 15 there are two pairs of spaced vertically disposed screw conveyors consisting of a pair of entrance screws 125 and a pair of exit screws 126 arranged as in the deoxidizing chamber 13 or as in the washing chamber 14. The entrance screws 125 are formed with descending helical grooves 127 while the exit screws 126 are formed with ascending helical grooves 128. The entrance screws 125 are mounted on vertical shafts 131 which are journaled in bearings 132 formed in the bottom of the main casing 11 and in bearings 133 which are journaled in the cover plate 16. The exit screws are mounted on vertical shafts 135 which are journaled in bearings 136 of the main casing 11 and in bearings 137 of the cover plate 16.

The shafts 131, 135 on each side of the machine are rotated in unison by endless chains 139 which take over sprockets 141, 142 mounted on the respective shafts. These shafts are driven by the main shaft 93 through endless chains 143 which operate over sprockets 144 carried on the exit screw shafts 79 in the washing chamber 14 and over sprockets 145 which are carried on the entrance screw shafts 131 in the drying chamber 15.

When a washed blank A is discharged from the washing chamber 15 it is pushed directly into the helical grooves 127 of the drying entrance screws 125. The rotating screws carry the blank down into the drying chamber 15. During this downward travel of the blank it is retained in a vertical line of travel by vertical guide rails 147, 148. Rails 147 are secured to the second partition wall 12 while rails 148 are fastened at their upper ends to lugs 149 which depend from the cover plate 16.

While the blank is being carried down into the

drying chamber 15 its side seam edges are dried thoroughly of any of the washing water which may adhere to the blank. This drying is effected by sprays of hot air which issue from a line of small spaced holes formed in a pair of air spray heads 151. These spray heads are located on each side of the machine between the entrance screws 125 and the exit screws 126 and adjacent the side seam edges of the moving blank so that a spray of hot air may be projected entirely across the blank longitudinally of the seam edge. The spray heads are formed on the inner ends of air supply pipes 152. These pipes extend through the side walls of the main casing 11 and lead from any suitable source of hot air.

When the partially dried blank A reaches the bottom of the entrance screws 125, it is separated from the other blanks as hereinbefore described. It then is pushed directly into the grooves 128 of the exit screws 126. This transfer is done by way of transfer fingers 154 which are formed on discharge discs 155 on the bottom of the screws.

While traveling from one set of screws to the other the moving blank is supported on horizontal support rails 157. One end of each of these rails is secured to the vertical guide rails 147. The other end is carried on a similar pair of guide rails 158 which are secured to the end wall of the main casing 11. Permanent magnets 159 insulated from and secured to the support rails keep the blank in engagement with the rails and serve as a drag to prevent uncontrolled movement when the blank is ejected clear of the entrance screws 125.

The blank received by the exit screws 126 is immediately picked up by its ascending helical grooves 128 and is thereby elevated to the top of the screws. During this upward movement the blank is guided by the vertical guide rails 148, 158. The side seam edges of the blank are again subjected to the drying treatment as they ascend through the air sprays of the spray heads 151. This second drying is done by sprays of hot air which issue from a second set of holes formed in the opposite side of the spray heads. This completes the drying of the blanks.

When the completely dried blank reaches the top of the exit screws 126 it is separated from the other blanks in the conveyor and is discharged from the drying chamber by discharge fingers 162 which are formed on discs on the top of the screws. The discharged blank slides along a pair of inverted support rails 163 secured to the top plate 16. Permanent magnets 164 insulated from and secured to the rails hold the moving blank against the rails. The discharged and completely dry blank thus passes from the drying chamber 15 and falls into an adjacent chute 165 which is supported on the end wall of the main casing 11. The blanks are delivered from this chute in any suitable or preferred manner to a desired place of deposit.

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 deoxidizing metallic sheets to permit soldering or welding of localized por-

tions thereof into tubular can bodies, the combination of a plurality of vertically disposed conveyors arranged in spaced pairs respectively for engagement with opposite marginal portions of the sheets to move the same successively in opposite vertical directions through the machine, means cooperating with said conveyors for progressively transferring said sheets from one pair of said conveyors to a succeeding adjacent pair at the termination of a vertical movement of the sheets in one direction to obtain a further vertical movement of the sheets in the opposite direction, and means disposed between said pairs of conveyors adjacent opposite ends of the sheets for spraying localized opposite edge portions only of the moving sheets to deoxidize such portions for the purpose described.

2. In a machine for treating metallic sheets to permit soldering or welding thereof, the combination of a plurality of vertically disposed conveyors arranged in spaced pairs respectively for engaging opposite marginal portions of a said sheet to move the same alternately in opposite vertical directions through the machine, means for transferring said sheets from one pair of said conveyors to another at the termination of each vertical movement in one direction, means disposed adjacent an initial pair of said conveyors for spraying localized edge portions only of the moving sheet to deoxidize such portions, means disposed adjacent a succeeding pair of said conveyors for washing the surplus deoxidizing medium from said edge portions thereof, and means disposed adjacent a further succeeding pair of said conveyors for drying the sheet after the deoxidizing and washing operations.

3. In a machine for treating metallic sheets to permit soldering or welding together of localized portions thereof into tubular can bodies, the combination of a plurality of vertically disposed screw conveyors arranged in spaced pairs respectively for engagement with opposite marginal portions of the sheets to move the same alternately in opposite vertical directions through the machine, means disposed between and cooperating with said pairs of conveyors for progressively transferring said sheets from one pair of said conveyors to another at the termination of a vertical movement of the sheets in one direction to obtain a further vertical movement of the sheets in the opposite direction, means disposed between initial pairs of conveyors adjacent opposite ends of the sheets for spraying localized opposite edge portions only of the moving sheets to deoxidize such portions while the sheets are moved in opposite vertical directions by said initial pairs of conveyors, means for transferring the deoxidized sheets from the second of said initial conveyor pairs to a succeeding pair of conveyors, means disposed between the second of said initial conveyor pairs and said succeeding pair of said conveyors for washing the surplus deoxidizing medium from said edge portions of the sheets while the latter are moved vertically by said succeeding conveyor pair.

4. In a machine for treating metallic sheets to permit soldering or welding thereof into tubular can bodies, the combination of a plurality of vertically disposed screw conveyors arranged in spaced pairs respectively for engaging opposite marginal portions of said sheets to move the same alternately in opposite vertical directions through the machine, independent means disposed between adjacent pairs of screw conveyors for transferring said sheets horizontally from

one pair of said conveyors to another at the termination of each vertical movement in one direction, means disposed between adjacent initial pairs of said conveyors for spraying localized edge portions only of the moving sheets while the latter are moved vertically in opposite directions by said initial conveyor pairs to deoxidize such localized sheet portions, means disposed between the second of said initial pairs of conveyors and a succeeding pair of conveyors for washing the surplus deoxidizing medium from said edge portions thereof, and means disposed between said succeeding conveyor pair and a still further succeeding pair of said conveyors for drying the deoxidized and washed sheets, and means for discharging the sheets thus treated from the machine.

5. A machine for treating sheets of black iron plate and the like to permit soldering and welding thereof into tubular bodies, which comprises in combination: a plurality of vertically disposed rotatable screw conveyors arranged in pairs for propelling sheets along a predetermined path of travel in horizontal position and in opposite vertical directions, means for transferring said sheets in a horizontal direction from one pair of conveyors to another, means adjacent an initial pair of said conveyors for depositing a deoxidizing medium onto predetermined localized edge portions only of said sheets to remove scale and rust therefrom, devices disposed adjacent a succeeding pair of said conveyors for washing said deposited deoxidizing medium off said localized edge portions of the sheets, and instrumentalities disposed adjacent a still further succeeding pair of said conveyors for drying said sheets to prevent rusting thereof after the deoxidizing and washing operations.

6. A machine for treating sheets of black iron plate and the like to permit soldering and welding thereof, which comprises in combination: a plurality of vertically disposed cooperating rotatable screw conveyors arranged in successive pairs for conveying sheets in horizontal position along a predetermined vertical path of travel in opposite vertical directions, means associated with each pair of conveyors for transferring the sheets along a horizontal path of travel from one pair into the next adjacent pair, vertical guide rails disposed adjacent said screw conveyors for retaining said sheets in proper position, means disposed between said pairs of screw conveyors for guiding the sheets during their transfer from one pair of said conveyors to another, magnets disposed adjacent said guiding means for maintaining the sheets in contact therewith during the transferring operation, and deoxidizing,

washing and drying devices respectively disposed adjacent succeeding pairs of said conveyors for depositing a deoxidizing medium on localized edge portions only of said sheets and for washing the remaining deoxidizing medium off said localized portions after it has performed its function and for drying the deoxidized and washed sheets, all of said deoxidizing, washing and drying operations taking place while the sheets are being conveyed in opposite vertical directions between successive pairs of said vertically disposed cooperating screw conveyors.

7. In a machine for treating sheets of black iron plate and the like to permit soldering and welding thereof into tubular can bodies, the combination of a pair of spaced and parallel vertically disposed rotatable screw conveyors each having a helical screw thread of uniform pitch for engaging sheets adjacent opposite edges and for moving the sheets while in horizontal position along a vertical path of travel, said screw thread at one end thereof changing into a steeper pitch to more rapidly separate the outermost sheet from the remainder of the sheets engaged by said conveyors, a disc rotatable with each of said conveyors and located adjacent an end thereof and each having a rotatable transfer finger for engaging against an end of the separated sheet and for shifting it out of engagement with said pair of conveyors while maintaining said sheet in a horizontal plane, a second cooperating pair of screw conveyors vertically disposed adjacent said first mentioned pair, each having a helical screw thread for receiving the said sheets as they are discharged from said first mentioned pair of screw conveyors and for propelling them while in horizontal position along a vertical path of travel in the opposite direction, said thread having a change of pitch adjacent an end of said last mentioned pair of conveyors for rapidly separating the outermost sheet from the remaining sheets in the conveyors, a disc mounted on the end of each of said second mentioned pair of conveyors and each having a rotatable finger for engaging and discharging the separated sheet to a suitable place of deposit, and means disposed between said pairs of screw conveyors adjacent opposite ends of said sheets for spraying a deoxidizing medium upon localized edge portions only of both sides of said sheets at opposite ends of the latter for deoxidizing and removing scale and rust from said localized edge portions thereof while the sheets are engaged and moved in said opposite vertical directions by said adjacent pairs of screw conveyors.

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