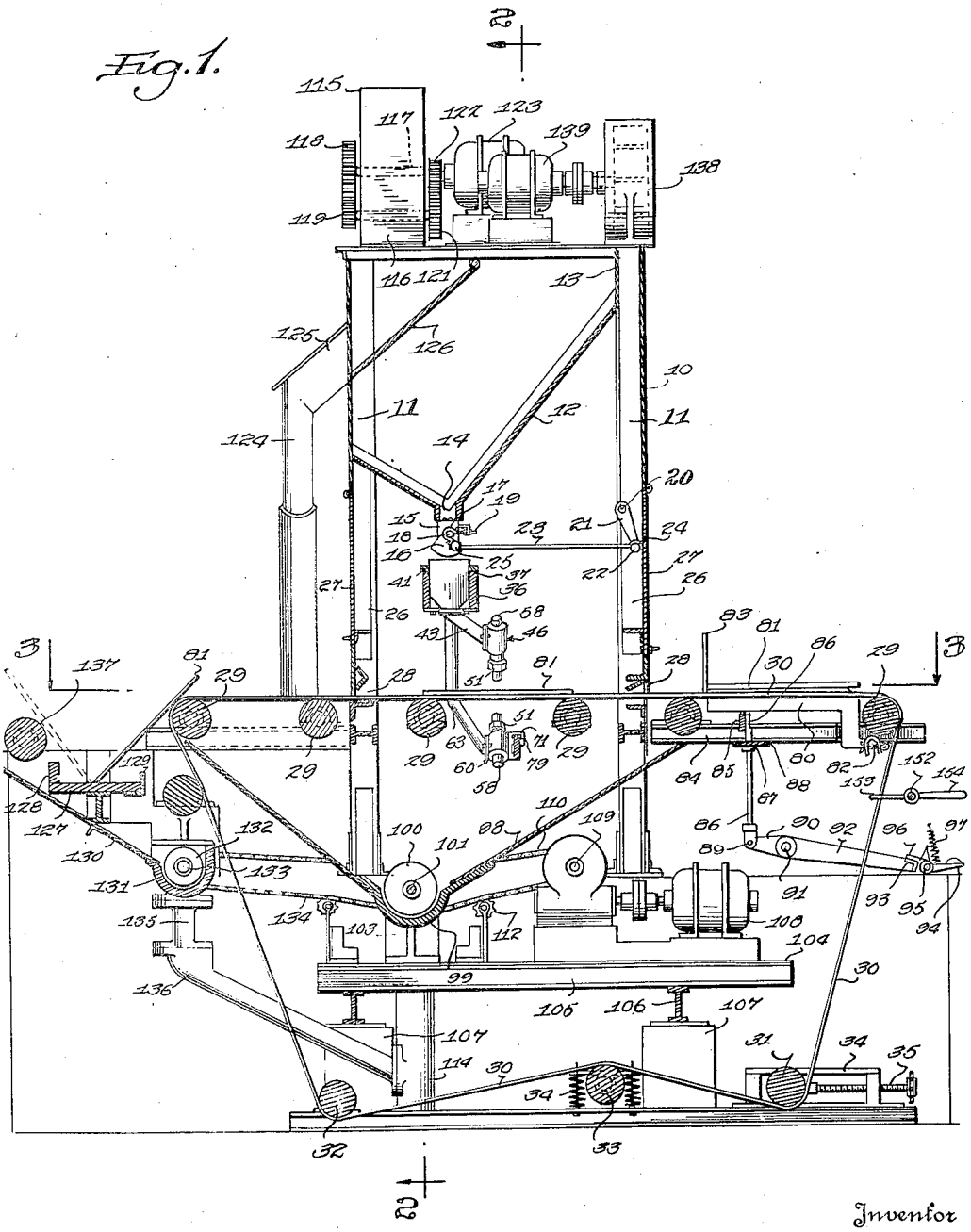
July 19, 1932. H. E. McCRERY 1,867,856

APPARATUS FOR TREATING METAL SHEETS

Filed Aug. 2, 1927 4 Sheets-Sheet 1

Fig. 1.



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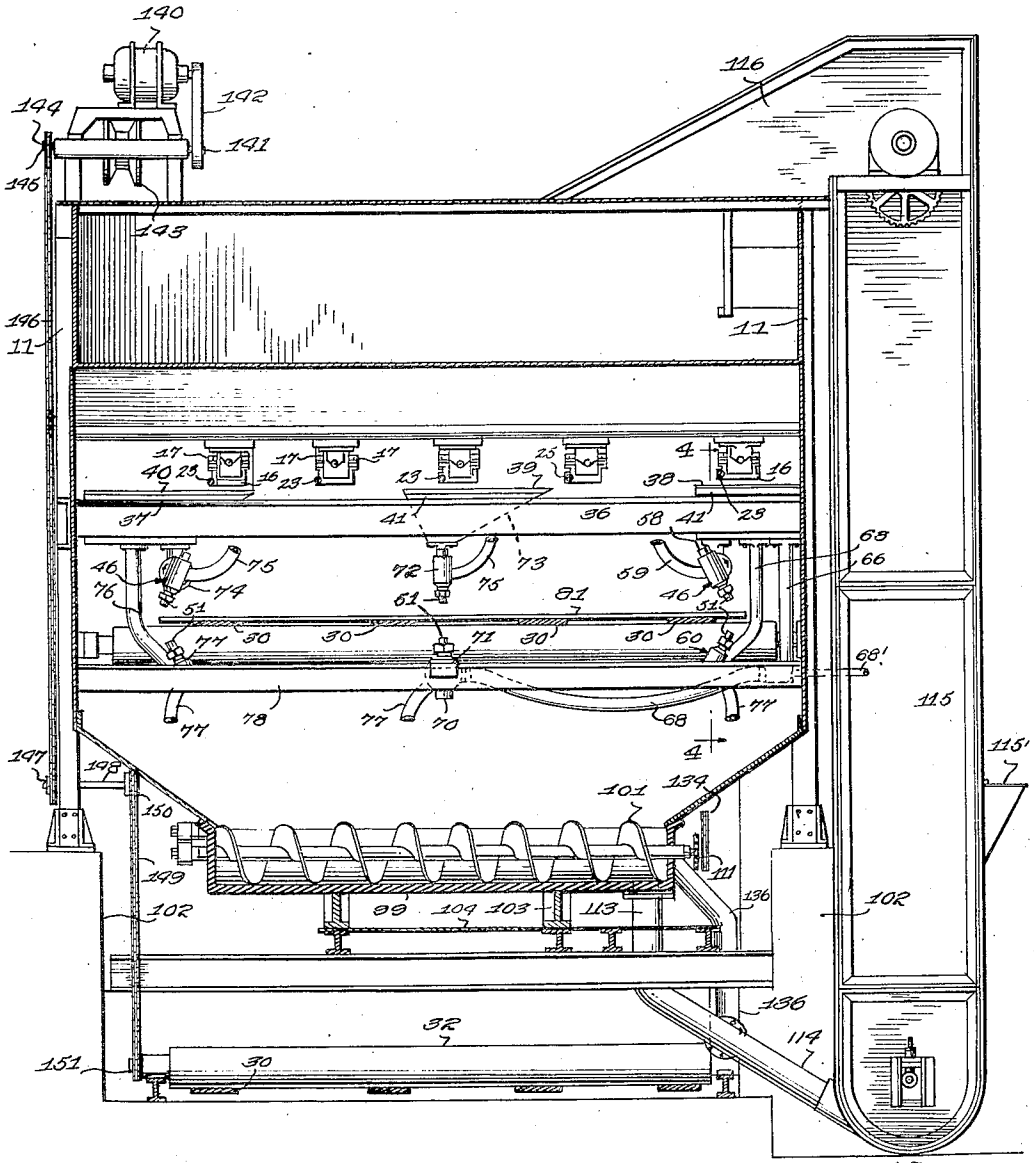
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APPARATUS FOR TREATING METAL SHEETS

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Fig. 2.



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APPARATUS FOR TREATING METAL SHEETS

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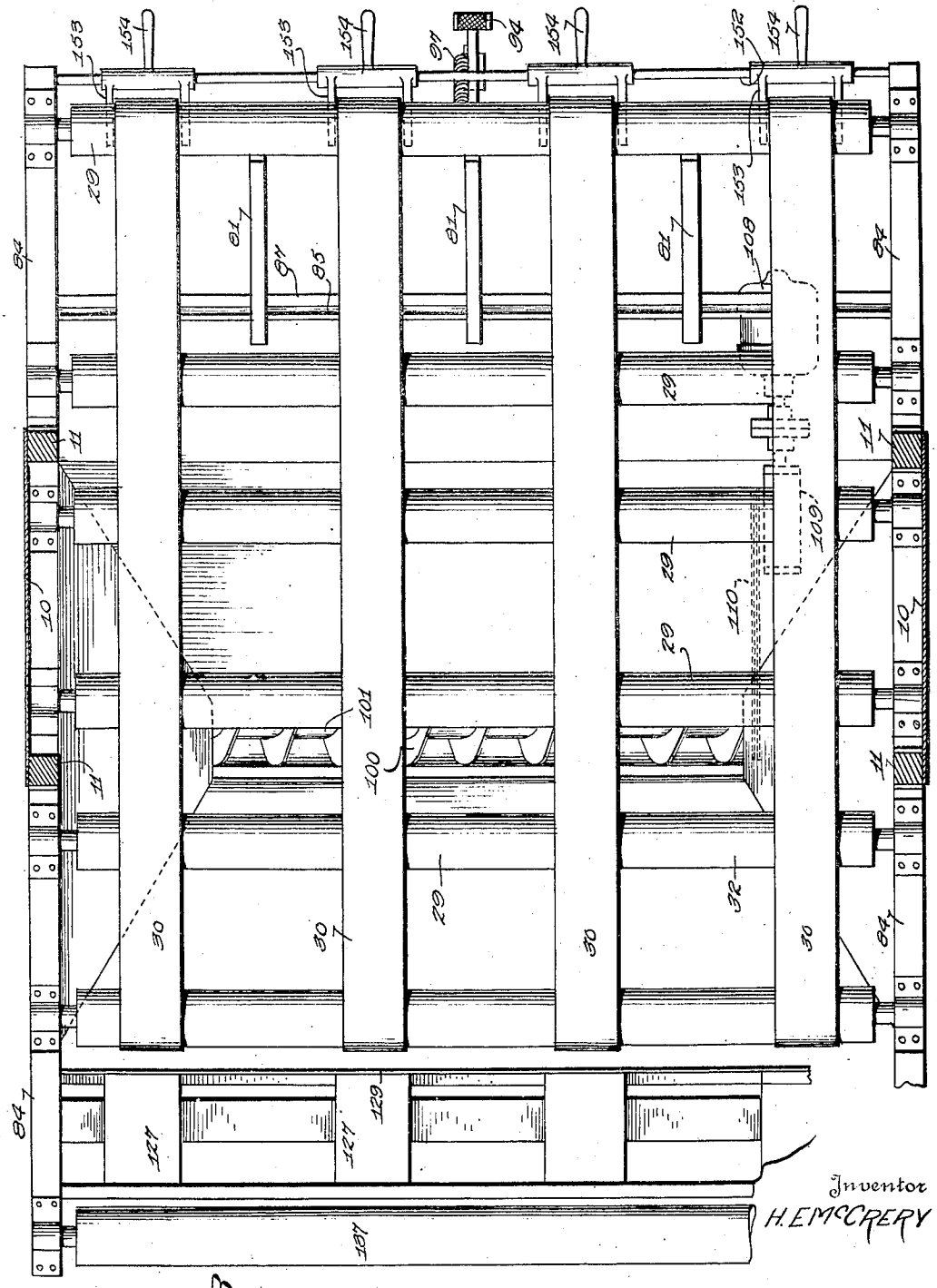


Fig. 3

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APPARATUS FOR TREATING METAL SHEETS

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Fig. 4.

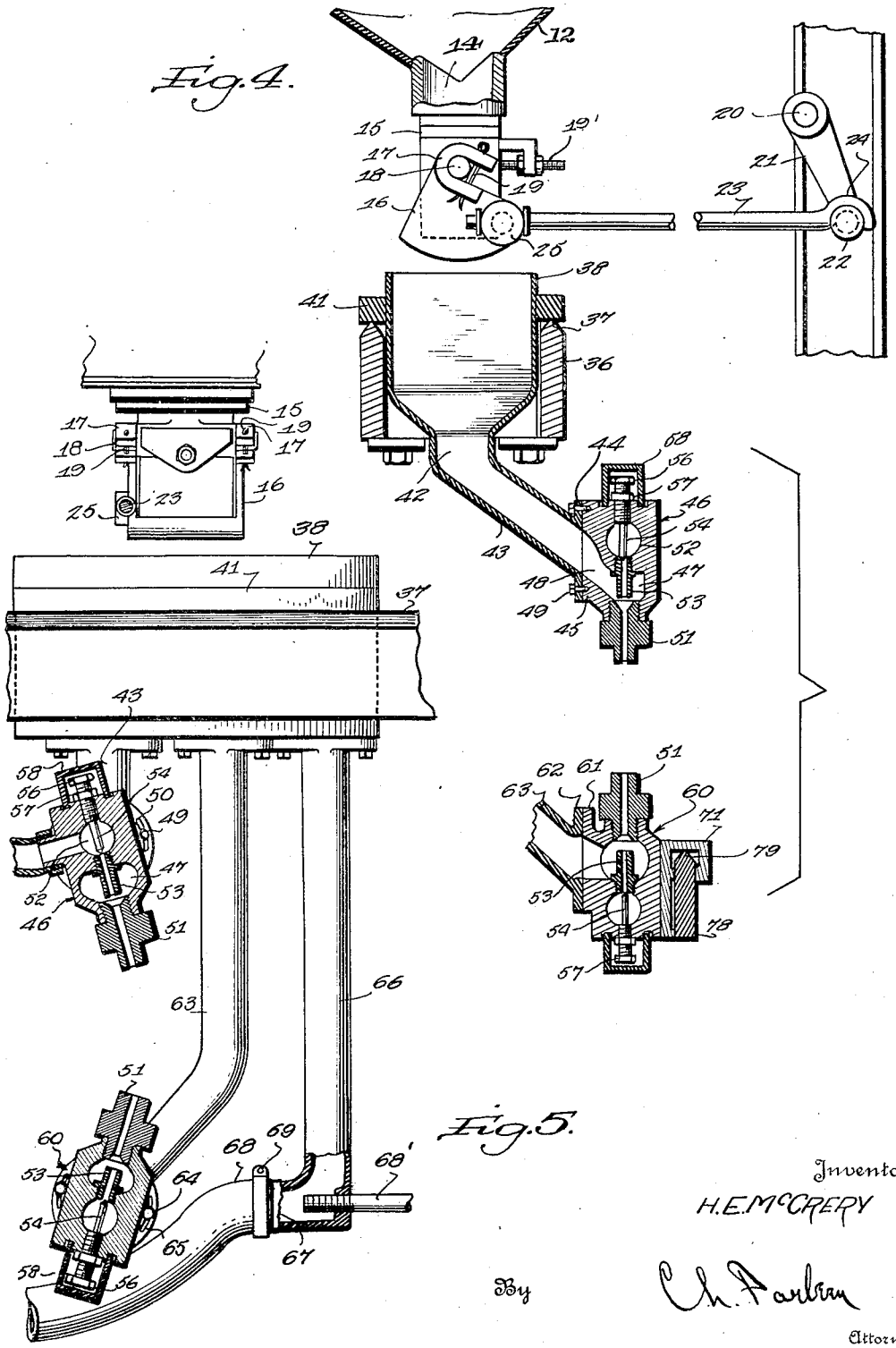


Fig. 5.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATING METAL SHEETS

Application filed August 2, 1927. Serial No. 210,181.

This invention relates to apparatus for treating metal sheets and more particularly to an apparatus for cleaning the edge portions of metal sheets to be made into shipping drums or the like whereby such edge portions readily may be welded.

An important object of the invention is to provide an apparatus including conveying means for successive metal sheets, and means for cleaning portions of the sheets which are to form the edge portions of blanks from which metal shipping drums are to be made to facilitate the welding together of the edge portions.

A further object is to provide novel means for accomplishing the desired results by impacting blasts of abrasive material against the portions of the sheets to be cleaned.

A further object is to provide novel conveying means for the sheets whereby they are caused to move in a line past the abrasive blasting devices whereby the latter elements will clean and preferably slightly etch the edge portions of the sheets for the purposes referred to.

A further object is to provide novel means for adjusting the positions of discharge of the abrasive material against the sheets according to the widths thereof.

A further object is to provide a stationary hopper for the blasting material and to provide novel means for supplying the adjustable abrasive blasting devices with material from the hopper regardless of the positions of the blasting devices.

A further object is to provide novel means for facilitating the feeding of sheets to the apparatus.

A further object is to provide novel means for conveying the sheets past the abrasive blasting nozzles whereby the latter are permitted to be adjustable according to the sizes of the sheets to impact abrasive against opposite sides thereof without interference with the conveying means.

A further object is to provide conveying means for the sheets comprising a plurality of relatively narrow endless belts between which the abrasive impacting nozzles are adapted to operate, the belts being shiftable according to the positions of the nozzles to permit the latter to impact abrasive against opposite sides of the sheets without interference with the conveying belts.

A further object is to provide novel means for facilitating the discharging of the sheets from the apparatus after the cleaning operation has taken place.

A further object is to provide novel means for adjusting the angular relationship between the impacting nozzles and the surfaces of the sheets.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown one embodiment of the invention. In this showing,

Figure 1 is a central vertical longitudinal sectional view through the apparatus,

Figure 2 is a transverse section taken substantially on line 2—2 of Figure 1,

Figure 3 is a horizontal sectional view on line 3—3 of Figure 1,

Figure 4 is a detail vertical sectional view through a pair of the impact nozzles and associated elements, parts being shown in elevation, and,

Figure 5 is a similar view of another set of nozzles, parts also being shown in elevation.

Referring to the drawings the numeral 10 designates a casing as a whole supported upon posts or standards 11 as indicated in Figure 1. The casing is of substantial height and contains in its top portion a hopper 12 having inclined walls and adapted to contain any desired abrasive substance to be impacted against the sheets to be cleaned. The upper end of the forward wall is vertically arranged as at 13 and spaced from the adjacent wall of the casing 10, for a purpose to be described. The lower end of the hopper is provided with a plurality of outlet openings 14 leading to conduits 15 which are closed at their lower ends by gates 16. These gates are provided with substantially U-shaped hub portions 17 receiving pivot pins 18 carried by the pipes 15, and cotter pins 19 extend through the arms of the hub members to retain the gates in position. The structure described is employed merely to permit the ready removal of

the gates. A shaft 20 extends transversely through the casing and is provided with cranks 21 having circumferentially grooved pins 22 at their ends. A rod 23 is associated with each of the cranks and is provided at its end with a semi-circular portion 24 adapted to be received in the groove of one of the pins 22. The opposite end of each rod 23 extends through a swivel 25 carried by one of the gates 16. It will be apparent that rotation of the shaft 20 is adapted to simultaneously control movement of all of the gates 16 to which the rods 23 are connected. The semi-circular portions 24 of the rod are employed to permit the latter elements to be disconnected from their associated cranks when the gates to which they are connected are not to be operated, under conditions to be described. Openings 26 are provided in opposite sides of the casing and these openings are normally closed by doors 27. The doors permit access to the gates 16 and the operating means therefor.

The casing is provided in its front and rear walls with openings 28 through which the sheets to be treated are adapted to pass. A plurality of rollers 29 are arranged with their top portions in alinement with the openings 28, and a plurality of relatively narrow belts 30 pass across these rollers as shown in Figures 1 and 3. The outermost rollers 29 are arranged a substantial distance from the casing and from these rollers the belts 30 pass downwardly around lower rollers 31 and 32. A tensioning roller 33 is arranged between the rollers 31 and 32 and the belts pass over this roller. Springs 34 are employed for properly tensioning the belts 30, as will become apparent. The roller 31 is mounted in guides 34 and screws 35 are adapted to move the roller 31 inwardly or outwardly to take up slack in the belts 30.

A pair of parallel rails 36 extend transversely of the casing and are preferably provided with relatively sharp upper edges 37, as shown in Figure 4. These rails are adapted to support a plurality of auxiliary hoppers 38, 39 and 40 which receive abrasive material from the hopper 12 when the gates 16 are opened. Each auxiliary hopper is provided with outstanding horizontal runners 41 which slide upon the upper edges of the rails 36. This construction permits the auxiliary hoppers to be arranged in any desired position under conditions to be referred to later. The auxiliary hopper 38 is provided with an outlet opening 42 communicating with an angular discharge pipe 43. This pipe is provided with a preferably internal flange 44 to which is secured a similar flange 45 formed integral with an impacting device 46. The nozzle is provided with an abrasive receiving chamber 47 which communicates with the pipe 43 through an opening 48. The adjacent ends of the openings 43 and 48 are arranged concentrically of the flanges 44 and the latter are made adjustable with respect to each other by securing bolts 49 which extend through the flanges 44 and 45, the latter element being provided with circumferential slots 50. The impacting device 46 is provided with an outlet nozzle 51 through which the abrasive is adapted to be forced. An air chamber 52 is arranged in the upper part of the device 46 and communicates with the abrasive chamber through a jet 53. This jet is controlled by a valve 54 operable by a nut 56 at its upper end, a lock nut 57 surrounding the upper end of the valve and engaging the upper face of the impacting device to prevent movement of the valve. The cap 58 covers the upper end of the valve, as shown in Figure 4. Compressed air is supplied to the chamber 52 through a suitable flexible hose 59 connected to any convenient source of air pressure. A similar impacting device 60 is arranged beneath the device 46 and inverted with respect thereto, as shown in Figure 4. The elements of the lower impacting device are similar to those of the impacting device 46 and need not be referred to in detail. The impacting device 60 also is provided with a circular flange 61 which coacts with a flange 62 carried by a pipe 63, the upper end of the latter device communicating with the auxiliary hopper 38, as shown in Figure 2. The flanges 61 and 62 also are provided with bolts 64 similar to the bolts 49, the flange 61 being provided with circumferential slots 65 through which the bolts 64 extend. A third outlet pipe 66 communicates with the auxiliary hopper 38 and its lower end is turned inwardly substantially horizontally as at 67. The end 67 of the pipe 66 is connected to a flexible hose 68 by a clamp 69, this hose leading to a central impacting device 70, as shown in Figure 2. An air pipe 68′ extends into the lower end of the pipe 66 in alinement with the end 67 thereof. This pipe is adapted to act as an injector to assist the flow of abrasive material through the hose 68. The impacting device 70 is identical with the device 60 except that the swinging adjustment is carried by an overhanging bracket 71 which will be referred to later. The auxiliary hopper 39 is connected to an upper impacting device 72 which is identical with the previously described impacting device 46 and need not be referred to in detail.

Since only one pipe is necessary for connection with the bottom of the auxiliary hopper 39, the walls of this hopper may be made angular as indicated at 73. The auxiliary hopper 40 also is provided with an upper impacting device 74 which is identical with the impacting device 46. The devices 72 and 74 may be supplied with compressed air through pipes 75 connected to the source referred to. A second pipe 76 extends downwardly from

the auxiliary hopper 40 to receive abrasive material therefrom and to deliver it to a third lower impacting device 77 similar to those previously described. The lower impacting devices all may be supplied with air under pressure through pipes 77. A rail 78 extends through the casing adjacent the lower impacting devices and is provided with a relatively sharp upper edge 79. Each of the lower impacting devices is provided with one of the brackets 71 previously described, and these brackets are adapted to slide upon the rail 78. Each lower impacting device is preferably arranged beneath one of the upper impacting devices, and all of these elements are adapted to slide upon their supporting rails according to the width of the sheets being treated, as will become apparent.

Sheets being fed to the apparatus are adapted to be placed upon supporting members 80, the sheets being indicated by the numeral 81. These supporting members have upper normally horizontal edges arranged slightly above the upper surfaces of the belts 30 and are pivotally connected to a shaft 82. A stop plate 83 is arranged adjacent the inner ends of the supporting members 80 to prevent movement of the sheets inwardly into the machine until such action is desired, and to square the sheets with respect to the apparatus so that they will travel therethrough in proper position.

A plurality of rails or supports 84 are arranged beneath the supporting members 80, and a transverse bar 85 is adapted to rest upon the rails 84. This bar is secured to the upper ends of rods 86 which extend downwardly through guides 87 carried by plates 88 secured against the lower faces of the rails 84. The lower ends of the rods 86 are pivotally connected as at 89 to cranks 90 secured to a shaft 91. To one side of the apparatus, an operating lever 92 is secured to the shaft 91 and is provided at its end with a laterally extending angular member 93. An operating pedal 94 is pivotally mounted upon a shaft 95 and is provided with an overhanging member 96 adapted to depress the lever 92 by contacting with the angular member 93. A spring 97 normally holds the outer end of the pedal upwardly, thus depressing the lever 92 and supporting the rods 86 and bar 85. The latter elements obviously hold the supports 80 in upper position whereupon a sheet may be supported in position thereon.

Abrasive material impacted against the sheets as they travel through the apparatus is adapted to fall downwardly into a hopper 98 in the lower portion of which is arranged a conveyor trough 99 having a spiral conveyor 100 therein mounted upon a shaft 101. The conveyor trough is arranged between walls 102 which support the posts 11 of the casing 10. Preferably integral supports 103 extend downwardly from the conveyor trough and rest upon plates 104, as shown in Figure 2. These plates in turn rest upon rails 105 which extend longitudinally with respect to the direction of movement of the sheets, and the rails 105 are supported upon relatively heavy transverse rails 106 mounted on concrete or similar foundations 107.

A motor 108 furnishes the power for driving the conveyor 100 and another conveyor to be described later. This motor transmits power to a shaft 109 which drives a chain 110 passing around a pulley 111 mounted on the end of the shaft 101. An idler sprocket 112 may be provided for properly tensioning the chain 110. The conveyor referred to is adapted to move the abrasive material toward one end of the trough 99 from whence it is delivered into a depending pipe 113 having an angular lower portion 114 which delivers the abrasive into a vertical conveyor 115. The upper end of this conveyor is provided with a discharge spout 116 for returning the abrasive to the upper hopper 12. The conveyor 115 is of any desired type and is driven by an upper shaft 117 having a gear 118 mounted at one end thereof and meshing with a pinion 119 carried by a shaft 120. The opposite end of the latter shaft is provided with a gear 121 meshing with a pinion 122 carried by the shaft of the motor 123.

A discharge pipe 124 is arranged outwardly of the casing 10 and is provided with an upper forwardly inclined portion 125 communicating with the hopper 12. A pivoted plate 126 is adapted to be swung to the position indicated in Figure 1 whereby material being emptied into the hopper from the spout 116 will be deflected outwardly into the pipe 125 whereby the upper hopper 12 gradually may be emptied. It will be apparent that the plate 126 is normally vertically arranged to permit the abrasive material to be returned to the hopper 12.

After the sheets have passed through the apparatus they fall downwardly upon bars 127 having flanges 128 and 129 at their ends. When a sheet 81 falls downwardly to the solid line position indicated in Figure 1, the lower edge of the sheet will strike the bars 127 thus dislodging any loose scale or abrasive material thereon. The loosened scale and abrasive falls downwardly upon an inclined shelf 130 from whence it slides downwardly into a trough 131 in which is arranged a conveyor 132 carried by a shaft 133. The shaft is adapted to be driven by a chain 134 connected to the shaft 101 of the other spiral conveyor 100. From the end of the trough 131 material therein is delivered to a depending outlet pipe 135 from whence it falls downwardly into an angularly arranged pipe 136 which delivers the material to the pipe 114. As previously described, the pipe 114 delivers material to the bottom

of the conveyor 115. After assuming the solid line position previously referred to, each sheet 81 will be contacted with by the next succeeding sheet and will be tilted over to the position indicated in Figure 1, whereupon the sheet will rest upon a roller 137. The sheets may be removed by pulling them across the roller 137, as will be apparent.

In order to effect the removal of a considerable part of the foreign matter from the scale after it has been impacted against the sheets, a blower 138 is mounted above the casing 10. This blower communicates with the interior of the apparatus through the space between the walls 10 and 13. The scale removed from the sheets is materially lighter than the abrasive and the blower 138 is intended to pick up this lighter material and thus separate it from the abrasive. The blower also tends to maintain a partial vacuum in the apparatus thus preventing the impacting material and scale removed thereby from being forced out of the casing through the openings 28. The blower is driven by a motor 139 mounted on the top of the casing 10, as will be apparent. Referring to Figure 2 the numeral 140 designates a motor which is adapted to drive a shaft 141 by a belt 142. Any suitable form of change speed drive 143 is arranged between the shaft 141 and a drive shaft 144. This shaft carries a sprocket 145 about which a chain 146 passes, the lower end of the chain also passing around a sprocket 147 mounted upon a shaft 148. A chain 149 passes around a sprocket 150 carried by the shaft 148 and around a second sprocket 151 carried by the roller 32. Thus it will be seen that the motor 140 is adapted to drive the roller 32 and thus the belts 30, and a change speed drive is preferably employed whereby the linear speed of the sheets passing through the apparatus may be varied. As previously stated, the impacting devices are adapted to be adjusted transversely of the apparatus according to the width of the sheets passing therethrough, and it is desirable that the belts 30 be movable so as not to interfere with the impacting of the abrasive material against the sheets. Accordingly a shaft 152 is mounted at the inlet side of the apparatus and is provided with a plurality of pairs of forks 153 each of which extends on opposite sides of one of the belts 30. An operating handle 154 is carried by each pair of forks and this handle is adapted to be moved to slide the corresponding forks longitudinally upon the shaft 152 to shift one of the belts 30.

The operation of the apparatus is as follows:

The sheets to be treated are successively placed upon the supports 80 with the latter elements arranged in the position shown in Figure 1. The sheets to be treated may be in the form of single blanks or larger sheets from which blanks for two or more drums may be cut. In the present instance, the apparatus has been illustrated as being adapted to treat sheets from which two blanks are to be cut in which case the edges and centers of the sheets are cleaned by the impacting nozzles. Each sheet is placed on the supports 80 with its length arranged transversely of the apparatus, the forward edge of the sheet being arranged against the stop 83. The latter element serves to "square" the sheet with respect to the apparatus so that it will travel therethrough in the proper position. After a sheet has been placed in the position described, the pedal 94 may be depressed by the operator to lift the projection 96, and thus the angle 93 and lever 92 may move upwardly. The weights of the sheet, supports 80, bar 85 and rods 86 are sufficient to overcome the weight of the free end of the lever 92 to permit the action referred to to take place. The sheet thus will be lowered to contact with the belts 30 and these elements will cause the sheet to travel through the apparatus and between the sets of impacting nozzles. The belts are adapted to be driven by the motor 140, change speed device 143 and chains 146 and 149. The rate of travel of the sheets through the apparatus readily may be varied by properly operating the change speed device. The impacting nozzles are placed with respect to the sheet, as shown in Figure 2, to direct the abrasive material under pressure against the edge and center portions of the sheet, and as the latter travels through the apparatus the impacted abrasive will clean the scale from the portions of the sheet referred to and will slightly etch the metal to permit the latter more readily to be welded in a manner to be referred to. Since it is desirable to permit the apparatus to treat sheets of different sizes, the impacting devices are mounted to slide upon the rails 36 and 78 in the manner previously described. The hoppers of the upper impacting devices 38, 39 and 40 are relatively long and regardless of the positions of these elements each hopper referred to will be arranged beneath at least one of the gates 16 whereupon this element may be opened to supply abrasive thereto. If any of the gates are not arranged over one of the impacting devices, its operating rod 23 may be swung upwardly out of engagement with the corresponding pin 22, whereupon rotation of the shaft 20 will only open the gates which are in position to effect the discharge of material into the upper impacting devices. The gates 16 may be positioned to regulate the flow of abrasive material from the hopper 12, or if desired, the gates may be swung to entirely open positions and the flow of abrasive governed by a suitable gate arranged in the pipe 15 and controlled by a threaded rod 19′ indicated in Figure 4.

From the foregoing it will be apparent that the portions of the sheets referred to will be both cleaned and etched whereby the finished sheet may be rolled into the form of a drum and the edges of the sheet suitably welded. Where a two-blank sheet is employed, the finished sheet is cut through the center to form two separate drum blanks. Thus it will be apparent that the apparatus is readily adaptable for use in treating sheets from which a plurality of blanks may be formed, thus permitting economy in operation by treating a large number of sheets in a relatively short time. While the apparatus has been described in connection with the treating of blanks for making steel shipping drums, it will be apparent that it may be used for etching narrow portions of metal sheets for various purposes.

The various impacting nozzles operate in the same manner and a description of the operation of one set will suffice. Referring to Figure 4 it will be obvious that abrasive material will be fed to the nozzle 51 through the pipe 43 and passage 48, and this abrasive will be forced through the nozzle under pressure by air from the jet 53. This jet is supplied with air from the chamber 52 and the air feed may be adjusted by the valve 54. The upper impacting nozzles receive abrasive material directly from the spouts 15 while the outermost lower nozzles will be supplied with abrasive through the pipes 63 and 76. The central lower nozzle will be supplied with abrasive through the pipe 66 and hose 68, and the feeding of the abrasive material will be assisted by air supplied through the pipe 68′ as shown in Figure 5. The various air hoses, and the hose 68 are made of flexible material to permit the nozzles to be adjusted according to the width of the sheets being treated. The effect of the abrasive material on the sheets may be varied by changing the angular positions of the impacting nozzles, and adjustment of these nozzles is accomplished by loosening the nuts 49 and 50 and rotating the associated flanges with respect to each other.

The blower 138 tends to maintain a partial vacuum in the casing 10, as previously described, thus minimizing the flow of abrasive from the casing through the openings 28, and also serves to carry off the lighter particles of scale removed from the sheets. The depression within the casing 10, however, is not sufficient to permit the blower to carry off the abrasive material. The abrasive material falls into the hopper 99 and is conveyed therethrough to the pipe 113 to be discharged into the vertical conveyor 115, and thus returned to the upper hopper 12 through the spout 116. After a sheet has been treated it is fed from the outlet side of the apparatus and falls downwardly against the bars 127 as indicated in Figure 1. This action tends to dump any remaining abrasive from the upper face of the sheet, and this abrasive flows downwardly into the trough 131 to be conveyed through pipes 135 and 136 to the angular portion 114 of the pipe 113. Thus this abrasive material also will be returned to the hopper 12. As the next successive sheet is discharged from the apparatus the forward edge thereof will contact with the preceding sheet 81 and swing it outwardly to the position indicated in dotted lines in Figure 1 whereupon it may be grasped by an operator and removed by drawing it over the roller 137. It will be apparent that the conveyors 100 and 132 will be driven by the motor 108 through chains 110 and 134, and their associated driving sprockets.

When it is desired to empty the hopper 12 to renew or change the abrasive material the gate 126 may be swung to the position shown in Figure 1 to intercept the abrasive material from the spout 116 and cause it to be fed into the pipes 125 and 124 from the bottom of which it may be collected in any suitable receptacle. Abrasive is fed into the apparatus by supplying it to the conveyor 15 through the door 115′ indicated in Figure 2. Access may be had to the impacting devices and associated elements through the doors 27.

The belt shifting devices 153 are provided to permit the belts to be shifted out of the path of travel of abrasive from the impacting nozzles as these elements are adjusted for sheets of different widths.

It is the present practice to prepare sheets for welding by subjecting them to a pickling acid which is relatively expensive and consumes considerable time, the entire sheet surfaces being cleaned by this method. The present apparatus is continuous in operation and cleans only those portions of the sheet which are to be welded together, and thus the operation may be carried out economically.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. Apparatus of the character described comprising upper and lower abrasive impacting devices, a plurality of spaced conveyor belts having their upper runs passing between said impacting devices and adapted to convey a sheet of material therebetween, means for adjusting said impacting devices transversely of the direction of travel of the sheet, and means for shifting said belts transversely of their direction of travel.

2. Apparatus of the character described comprising a plurality of spaced conveyor

belts having their upper runs substantially horizontally arranged and spaced from the remaining portions of the belts, an impacting device arranged above the upper runs of said belts, an impacting device arranged in the space beneath the upper runs of said belts, said nozzles being adapted to impact abrasive material against opposite faces of a sheet moving on the upper runs of said conveyor belts and being vertically offset from said belts, means for adjusting said impacting devices transversely of the direction of travel of the sheet, and means for shifting said belts transversely of their direction of travel.

3. Apparatus of the character described comprising upper and lower abrasive impacting devices, a plurality of spaced conveyor belts having their upper runs passing between the planes of said impacting devices and offset vertically therefrom and adapted to convey a sheet of material therebetween, means for shifting said belts transversely of the direction of travel thereof, means for positioning the sheet on the upper runs of said belts with its side edges parallel thereto, and means for adjusting said impacting devices transversely of the direction of travel of the sheet.

4. Apparatus of the character described comprising upper and lower abrasive impacting devices, a plurality of spaced belts having their upper runs passing between the planes of said impacting devices and offset vertically therefrom and adapted to convey a sheet of material therebetween, a shaft arranged adjacent said belts, a slidable belt shifting device mounted upon said shaft and associated with each of said belts, means for positioning the sheet on the upper runs of said belts with its side edges parallel thereto, and means for adjusting said impacting devices transversely of the direction of travel of the sheet.

5. Apparatus of the character described comprising upper and lower abrasive impacting devices, a plurality of spaced conveyor belts having their upper runs substantially horizontally arranged and passing between the planes of said impacting devices and offset vertically therefrom, the upper runs of said belts being adapted to convey a sheet of material between said impacting devices and being spaced a substantial distance above the lower runs of the belts, means for shifting said belts transversely of their direction of travel, means for adjusting said impacting devices transversely of the direction of travel of the sheet, and an abrasive collecting hopper arranged between the upper and lower runs of said belts.

In testimony whereof I affix my signature.

HAROLD E. McCRERY.