A. ZISKA, JR.

APPARATUS FOR CLEANING METAL SHEETS AND PLATES.

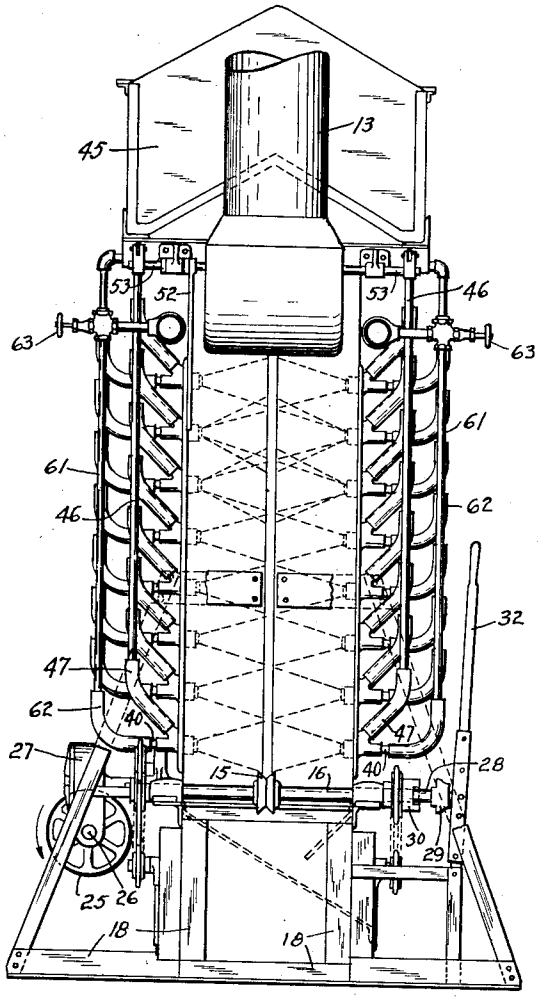
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1,386,547.

Patented Aug. 2, 1921.

3 SHEETS—SHEET 1.

Fig. 1.



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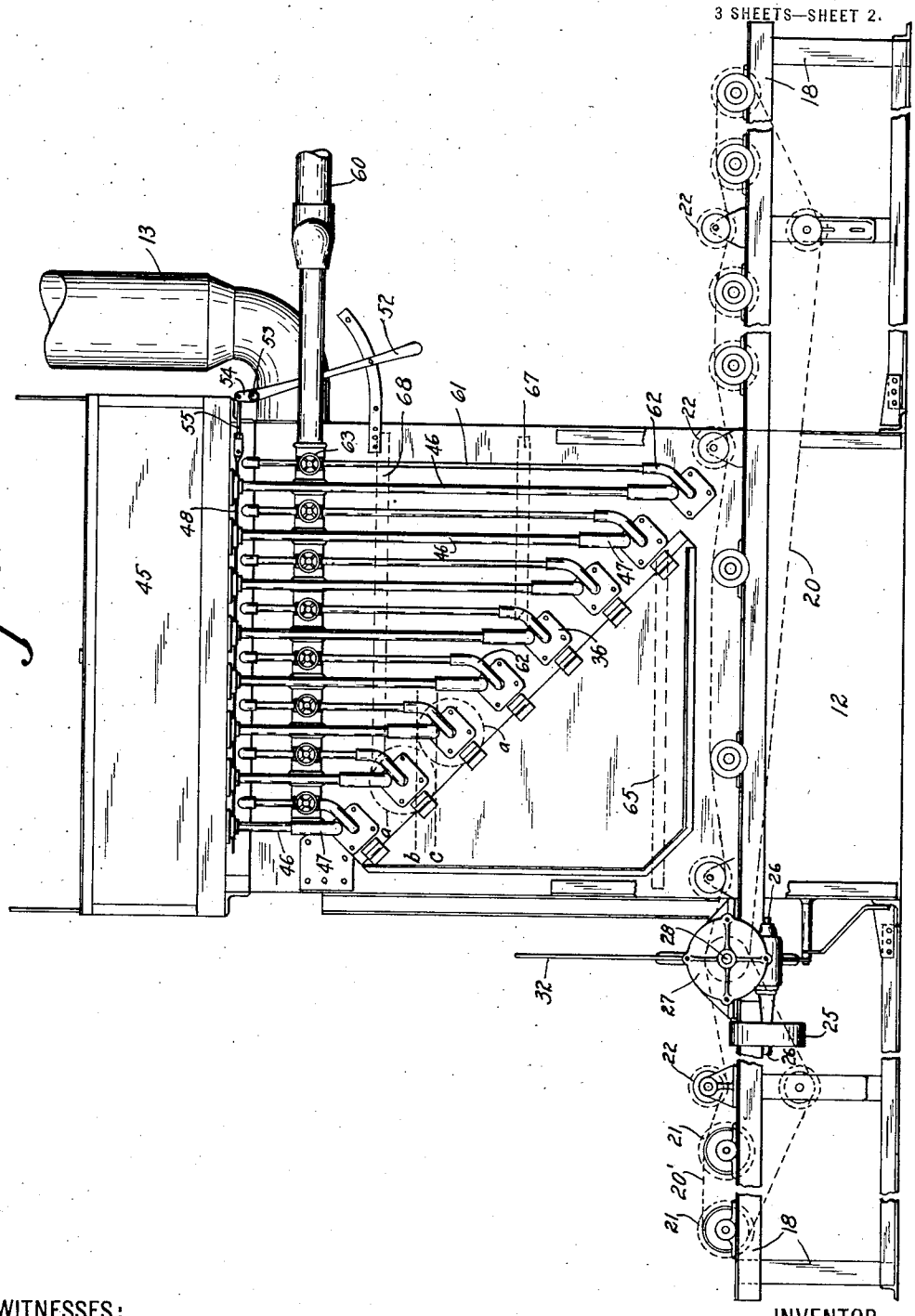
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

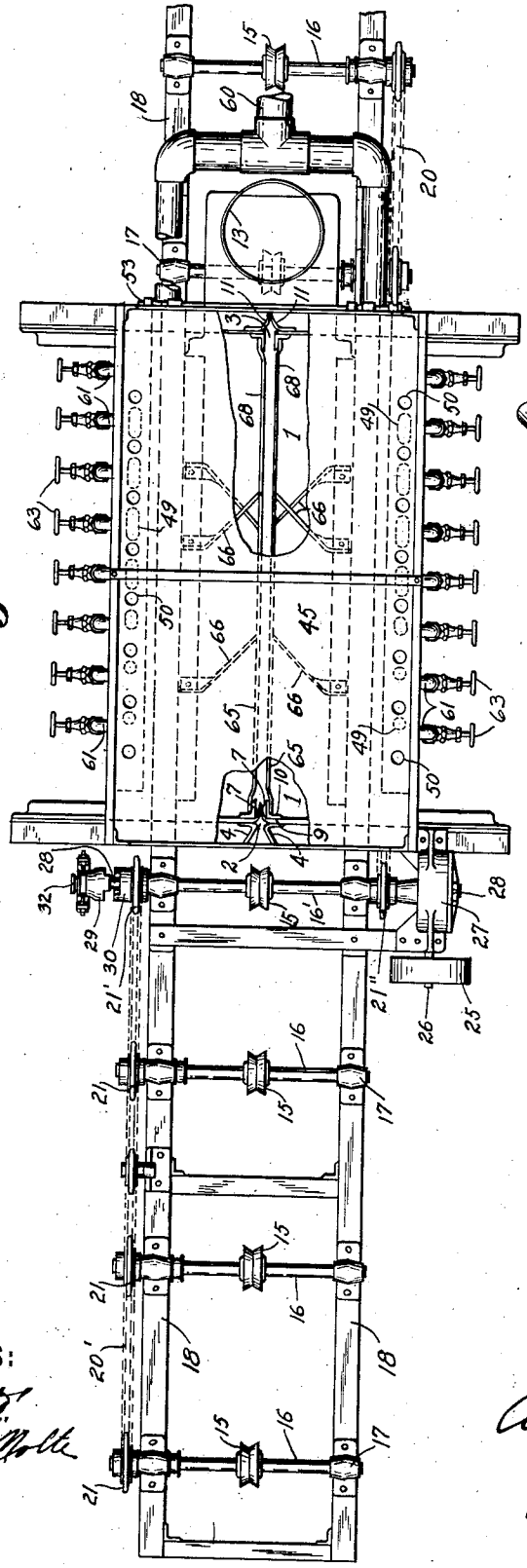


Fig. 4.

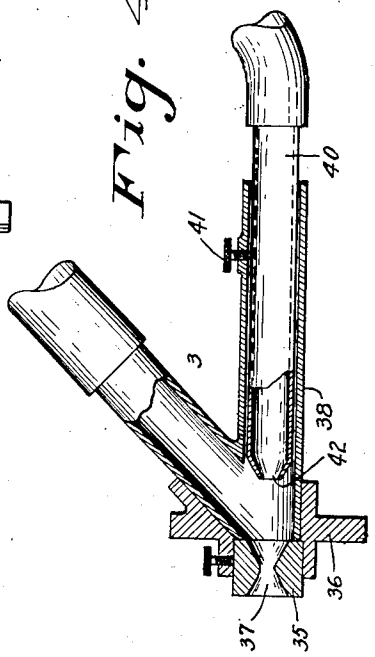
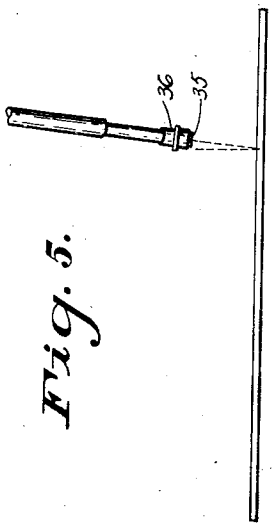


Fig. 5.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CLEANING METAL SHEETS AND PLATES.

1,386,547. Specification of Letters Patent. Patented Aug. 2, 1921.

Application filed February 15, 1917. Serial No. 148,893.

To all whom it may concern:

Be it known that I, ADAM ZISKA, Jr., citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Apparatus for Cleaning Metal Sheets and Plates, of which the following is a specification.

My invention relates to improvements in apparatus for cleaning metal sheets and plates, with particular reference to the removal of scale.

The object of my invention is to provide means whereby metal sheets or plates may be cleaned on both sides simultaneously through the medium of sand blasts directed against the respective sides of the plate in such a manner as to be effective over the entire area on both sides while the plate is traversing a suitable chamber or housing within which the sand blasting operation is performed.

My invention contemplates feeding the plates into the sand blasting chamber in an upright position and automatically moving the plates in or through the chamber while maintaining them in such upright position and subsequently delivering them from the opposite end or portion of the chamber from that where the plates are entered. Within the chamber, I propose to provide two series of sand blast nozzles, one series on each side of the path taken by the plate in passing through the chamber, and the nozzles in each series being disposed along an oblique line in a plane substantially parallel to the surface of a plate traversing the chamber but inclined with reference to the line of travel, whereby the effective range of one sand blast may overlap that of the adjacent sand blast without interference of one blast with another. Each successive sand blast nozzle is located in advance of the one preceding it with reference to the direction that the plate travels and also below, (or above), the next adjacent nozzle, whereby each sand blast nozzle may operate to clean a horizontal belt or zone along the surface of the plate and in its operation may overlap to some extent upon the belts or zones cleaned by the adjacent blasts. By having the work of the several blast nozzles overlap, I am enabled to effectively clean the surfaces along the horizontal lines or belts between the nozzles. The blast delivered from a nozzle expands conically and its force or effectiveness diminishes radially from the center in proportion to the lateral deflection, but by arranging the nozzles as above described, the areas in which the sand is least effective will be subjected to two cleaning operations by successive nozzles, and with proper spacing of the nozzles, it is therefore possible to clean these surfaces with approximately the same thoroughness as those which are substantially in the direct line of the blast.

By holding the plates in an upright position, I am enabled to utilize two sets or series of sand blast nozzles to simultaneously clean both sides of the plate and allow free clearance for the sand which has done its work, so that it will not interfere with the grains approaching the plate under the momentum of the blast.

My invention also contemplates an inclination of sand blast nozzles whereby the sand will be delivered toward the plate along lines which are oblique to the surface of the plate instead of along lines which are at right angles to such surface. I have found that where the nozzle is given a slight pitch downwardly or upwardly or toward the front or rear, (preferably toward the front, *i. e.*, the point at which the plate enters the chamber), the sand will pass under the scale and remove it more effectively, and the particles of sand striking the plate will escape from the area covered by the blast more readily than in cases where the axis of the nozzle is at right angles to the surface of the plate.

In the drawings,

Figure 1 is a rear elevation of a sand blasting apparatus embodying my invention.

Fig. 2 is a side elevation of the same.

Fig. 3 is a plan view with portions of the hopper and inclosing walls broken away to show the inlet and outlet gates and plate supporting members.

Fig. 4 is a detail view, partly in section, of one of the sand blast nozzles.

Fig. 5 is a detail plan view showing the pitch of the nozzle with reference to the plate.

Like parts are identified by the same reference characters throughout the several views.

The cleaning chamber and plate conveyer.

The plate cleaning or sand blasting operation is performed within a chamber 1, the front and rear walls of which are provided with vertical slots 2 and 3, respectively, through which the plates may be fed into and delivered from the chamber. Guides 4 are mounted on the front wall at the respective sides of the slot and extend divergently therefrom. These receive the edge of the plate between them and direct it to the slot. The inner face of the wall is provided with inwardly projecting flexible portions 7 which swing into contact with each other to close the opening formed by the slot, when not forced apart by the plate itself. Where the wall is of flexible material, it may be formed in sections, clamped between rigid upright bars 9 and 10, with integral marginal portions turned inwardly to form the closure flaps or wings 7, substantially as illustrated. The rear wall is provided with similar outwardly turned flaps or closure wings 11. The function of these flaps or wings 7 and 11 is to prevent the escape of sand and dust from the chamber, except at the bottom, which is open to a receiver 12 into which the sand and scale may drop, and near the top where the dust laden air may escape from chamber 1 through a duct 13 to any suitable point of delivery. If desired, however, the walls of the receiver may be composed of a dust collecting fabric through which the air may pass to the exterior.

The plates or sheets to be cleaned are fed into and conveyed through the chamber 1 by a conveyer of any suitable type. In the drawings, I have illustrated a series of grooved rollers 15 each mounted upon a supporting shaft 16 having bearings 17 in a supporting frame 18. The grooved pulleys 15 are arranged in line with the slot 2. The plates are placed in an upright position with their lower margins resting on these pulleys 15 which are rotated in unison to carry the plates rearwardly through the slots 2 into and through the chamber. The pulleys are driven by a sprocket chain or belt, or a set of sprocket chains or belts, indicated at 20 20′ as passing over sprocket wheels or pulleys 21, each mounted on one end of a shaft 16. Idler sprocket wheels 22, located above the chains, are adapted to hold the chains in operative relation to the sprocket wheels.

The conveyer is driven from any suitable source of power applied to pulley 25, the motion of which is transmitted to the chains 20 and 20′ through a worm shaft 26, a worm gear inclosed in housing 27, shaft 28 inclosed in tubular shaft 16′, clutch members 29 and 30, the latter being rigidly connected with tubular shaft 16′ and also provided with driving sprocket wheels, 21′—21″. A shifting lever 32 is employed to operate clutch member 29 in a well-known manner, whereby shaft 16′ with its driving sprockets may be engaged or disengaged with the source of power.

The sand blast nozzles and their arrangement.

Each sand blast nozzle comprises a nozzle member 35 mounted in a supporting member 36 and having a nozzle aperture 37 contracted in its central portion and expanded at both ends, thereby forming a *vena-contracta*. A Y-shaped fitting having converging ducts 38 and 39 is connected with the supporting member 36, with duct 38 lineally alined with the nozzle passage 37. This duct receives an adjustable air blast tube 40 which may be held in any desired position of longitudinal adjustment by a set screw 41. The sand is fed into the path of the air blast through the duct 39 and is driven by the air through the nozzle passage 37, the form of which causes the blast to expand conically as it escapes from the nozzle. It will be observed that the walls of the air blast tube 40 converge at the discharge end as shown at 42, whereby the air is delivered from the tube at substantially full pressure in the form of a concentrated jet having approximately the same diameter as the central portion of the nozzle passage.

It will be observed (Fig. 2) that the nozzles are secured by supporting members 36 to the side walls of the chamber 1, each set or series of nozzles comprising a diagonal row, the first of which is located in the upper portion of the side wall near the front wall and the last of which is located in the lower portion of the side wall near the rear wall. Each successive nozzle beyond the first nozzle is therefore located below and to the rear of the preceding one, whereby the circular area or portion of the plate against which sand strikes from any given blast nozzle may include a portion of the area covered by the blast from the preceding nozzle. For example, in Fig. 2, the degree of conical expansion of the blasts from the respective nozzles is indicated by the circular dotted line *a* and the degree to which the blasts overlap upon the surface of the plate is equal to the distance between the horizontal dotted lines *b* and *c*. The degree of overlap may be increased or diminished by either increasing or diminishing the number of nozzles and their proximity to each other, or by varying the inclination of the line along which the nozzles are secured to the wall of the chamber.

It will be observed, in Fig. 5, that each

nozzle has its axis inclined toward the front of the chamber, whereby the blast is directed to some extent in opposition to the progressive movement of the plate through the chamber. This not only facilitates clearing the sand away from the plate after it has once struck the surface thereof, but it also facilitates driving the sand behind the scale and facilitates the removal of the latter. The grains of sand also tend to move with a slight sliding effect on the surface of the plate before rebounding therefrom, thus increasing the abrasive action.

Sand and air feeding and controlling mechanism.

The sand is fed from a hopper 45 downwardly to the nozzles through tubes 46, the lower ends of which are preferably flexibly connected with the nozzles by sections of rubber tubing 47. The latter facilitate cleaning the tubes 46 and the nozzles in case they should become clogged. A slide valve 48 controls the delivery of sand from the hopper to the respective tubes. This valve preferably comprises a sliding plate provided with holes 49 adapted, when the plate is longitudinally adjusted, to move into and out of registry with holes 50 in the bottom of the hopper 45. The valve plates 48 (one on each side of chamber 1) are actuated from a lever 52 connected with a rock shaft 53, said shaft having arms 54, each of which is linked to one of the plates 48 by a link rod 55.

Air under pressure is supplied to the nozzles from a main 60 coupled to vertically disposed feed pipes 61, the lower ends of which are connected with blast tubes 40, preferably by sections of rubber tubing 62. Manually adjustable valves at 63 control the delivery of air to each of the vertical tubes 61 separately, whereby when narrow plates are to be cleaned, the air may be cut off from the initial nozzles, thereby enabling me to use only those nozzles which are located below the upper margin of the plate. It will also be observed that, by providing the sand valve plates 48 with apertures 49 which are progressively elongated from front to rear, I am enabled to open a number of the rear nozzles first and then progressively open those nearer the front portion of the chamber.

Plate supporting devices.

The plates may be manually supported until their margins are engaged between the walls of the slot 2. Thereafter, the plate thus engaged will be held in an upright position by these walls and by a set of horizontal guide bars 65, extending rearwardly along the lower portions of the chamber and terminating in advance of the nozzles with which they are substantially alined. At their rear ends, these bars are supported from the side walls of the chamber by bracket arms 66.

Similarly, pairs of guide bars 67 and 68, respectively, extend forwardly from the rear wall of the chamber, the length of these bars being determined by the distance from the rear wall to the nozzles. Each of the guide bars terminates at a sufficient distance from the nozzles which it approaches to avoid interfering with the sand blasts therefrom. It will, of course, be understood that the plates pass between the guide bars of each set, said guide bars and the walls of the slots forming an open channeled way traversed by the plates. The guide bars of the respective sets are near enough together to hold the plate from tilting materially toward one side or the other and the friction of the plates upon the bars will therefore be very light and insufficient to prevent the plates from being advanced by the positively actuated grooved rollers upon which their lower margins are supported.

I have found that plates can be more effectively cleaned by sand blast apparatus of the character above described than by employing pickling vats in accordance with the practice heretofore followed. The object of cleaning the surfaces is to avoid injury to dies and punches employed in shaping and perforating the plates and also to prepare the surface for painting or plating operations, and I have discovered that surfaces cleaned in this manner not only remain bright and free from rust for longer periods than plates cleaned by the pickling process, but also that the surfaces are better prepared to receive paint or plating material inasmuch as the pores are left open and the surface of the metal is slightly scratched and indented by the impact of the particles of sand, thereby affording better anchorage for any coating that may be applied.

I claim—

1. Sand blast apparatus for cleaning metal sheets, including the combination of a casing provided with vertical openings in its front and rear walls, with a plurality of fixed sand blast nozzles supported by the vertical side walls of the casing and adapted to discharge opposing blasts into the the interior thereof, means for feeding metal sheets through the casing from one opening to the other and between the opposed sand blasts, and means for holding said sheets in vertical position while traversing the casing, each fixed nozzle being offset from the adjacent nozzles in a line diagonal to the direction of movement of the sheets, whereby the separate nozzles act simultaneously to clean both sides of the sheets in fields or zones extending along the path of travel of the sheets.

2. Sand blast apparatus for cleaning metal sheets, including the combination of

a casing provided with vertical openings in its front and rear walls, with a plurality of fixed sand blast nozzles supported by the vertical side walls of the casing and adapted to discharge opposing blasts into the interior thereof, means for feeding metal sheets through the casing from one opening to the other and between the opposed sand blasts, and means for holding said sheets in vertical position while traversing the casing, the fixed nozzles on the respective sides of the casing being offset from the adjacent nozzles in a line diagonal to the direction of movement of the sheets, whereby the separate nozzles act simultaneously to clean both sides of the sheets in fields or zones extending along the path of travel of the sheets, the said diagonally arranged nozzles being in such proximity upon each side of the casing that the field or zone of action of one nozzle will partially overlap that of the nozzle or nozzles adjacent thereto.

3. Apparatus for cleaning metal sheets, comprising means for supporting and advancing the sheets in vertical position, in combination with a plurality of sand blast nozzles supported in fixed relation to each other on opposite sides of the path of movement of the sheets, the said nozzles being arranged to simultaneously direct sand blasts upon both sides of the sheets in lines diagonal to the path of movement of the sheets, whereby the sides of the sheets are cleaned in fields or zones extending along the path of travel of the sheets.

4. Apparatus for cleaning metal sheets, comprising means for supporting and advancing the sheets in an upright position, a plurality of sand blast nozzles arranged in fixed positions on opposite sides of the path of movement of the sheets and diagonally with relation thereto, the said fixed nozzles having their axes inclined with reference to the sides of the sheets, so as to direct the sand blasts obliquely against said sheets to simultaneously clean both sides thereof.

5. Apparatus for cleaning metal sheets, comprising means for supporting and advancing the sheets in vertical position, sets of fixed sand blast nozzles, one set upon each side of the path of movement of the sheets, and each set comprising a plurality of nozzles progressively offset from each other downwardly and rearwardly, whereby the successive nozzles of each set will clean the sheets in fields or zones extending longitudinally of the sides thereof.

6. Apparatus for sanding metal sheets, comprising a casing, means for supporting and advancing the sheets through said casing in an upright position, fixed sets of sand blast nozzles, each set embracing a plurality of nozzles offset diagonally from each other on each side of the path of movement of the sheets through the casing, and guides for the sheets within the casing, the said guides being arranged on both sides of the diagonal line of nozzles at each side of the sheets and supporting the sheets against lateral movement by bearing at points outside of the area of action of the sand blast nozzles.

7. Apparatus for cleaning metal sheets, embodying means for supporting and advancing the sheets in a vertical position, in combination with sets of sand blast nozzles, such sets comprising a plurality of nozzles supported in a fixed and offset diagonal relation to each other at opposite sides of the path of movement of the metal sheet, whereby the sides of the vertically positioned sheet are cleaned in fields or zones extending along the path of travel thereof.

In testimony whereof I affix my signature in the presence of two witnesses.

ADAM ZISKA, JR.

Witnesses:
O. C. WEBER,
FREDERICK W. NOLTE.