

April 14, 1936.

W. A. ROSENBERGER

2,037,047

BLAST CLEANING MACHINE

Original Filed June 28, 1932

3 Sheets-Sheet 1

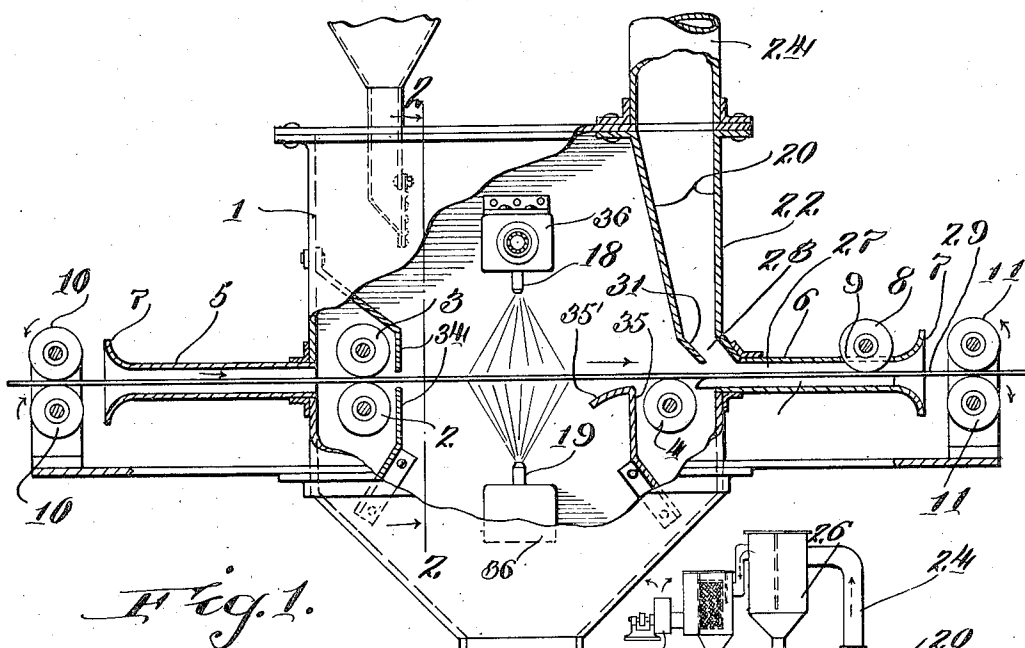


Fig. 1.

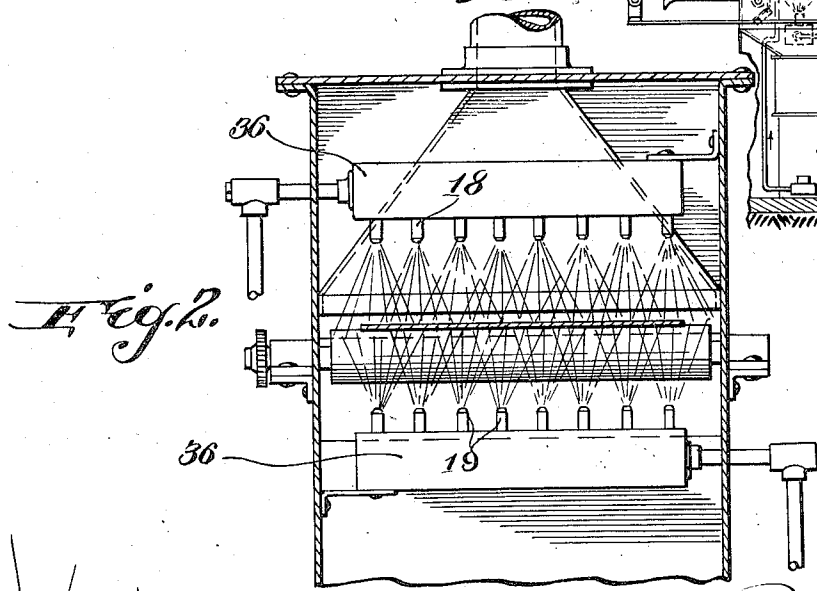
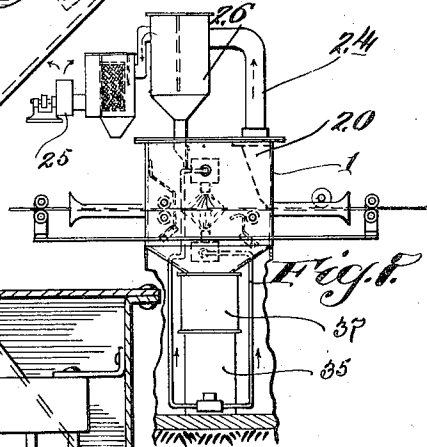


Fig. 2.

Inventor

William A. Rosenberger

By Edwin Hamrick

Attorney

April 14, 1936.

W. A. ROSENBERGER

2,037,047

BLAST CLEANING MACHINE

Original Filed June 28, 1932

3 Sheets-Sheet 2

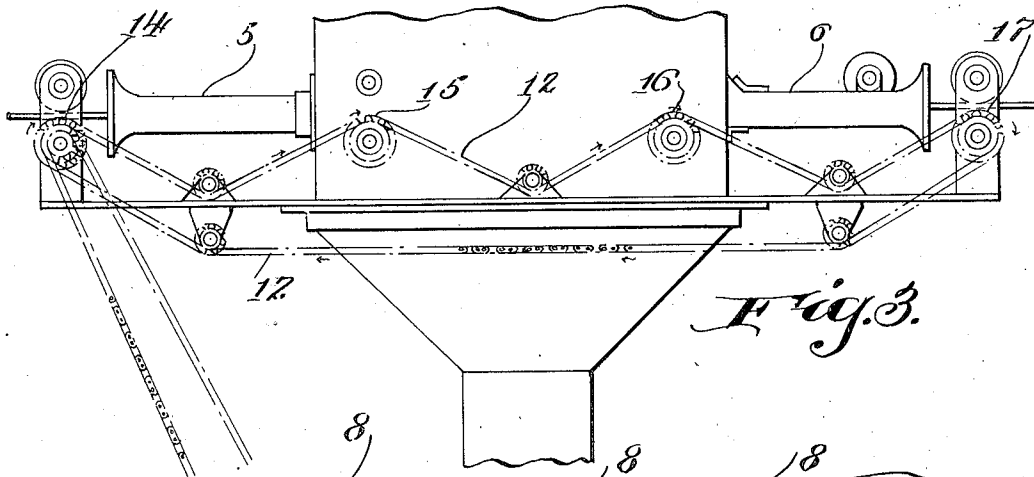


Fig. 3.

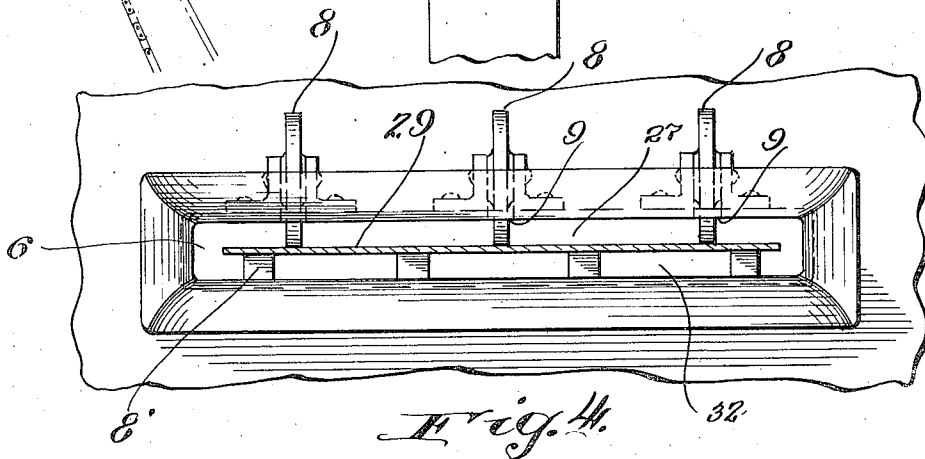


Fig. 4.

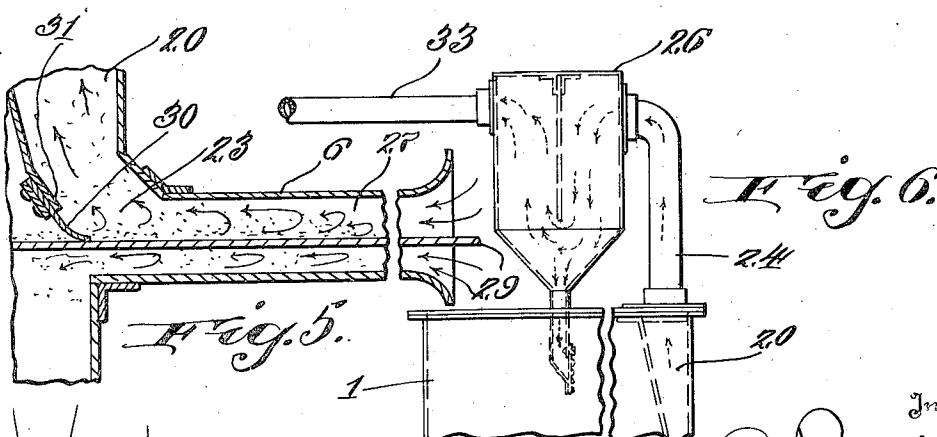


Fig. 5.

Fig. 6.

WITNESSES
For: W. A. Rosenberg

Inventor
William A. Rosenberg
Edwin C. Hamack

334

Attorney

April 14, 1936.

W. A. ROSENBERGER

2,037,047

BLAST CLEANING MACHINE

Original Filed June 28, 1932

3 Sheets-Sheet 3

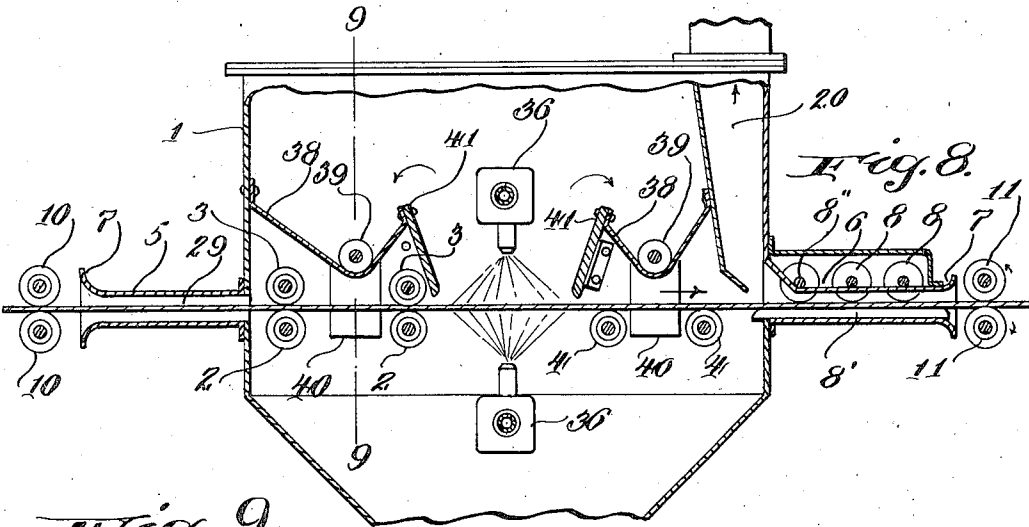


Fig. 9.

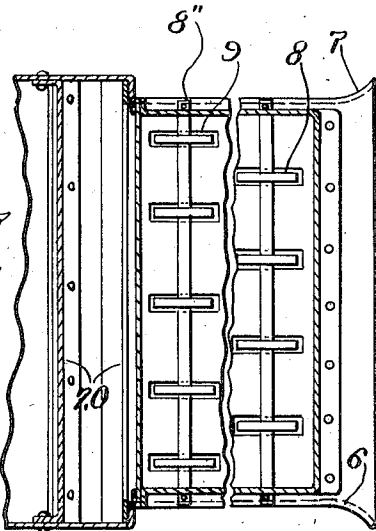
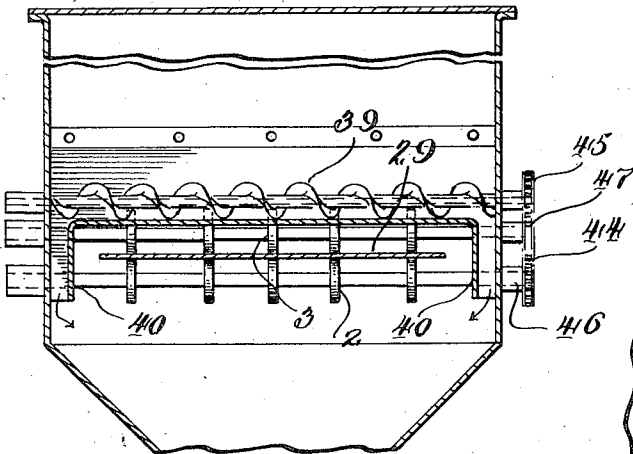


Fig. 11.

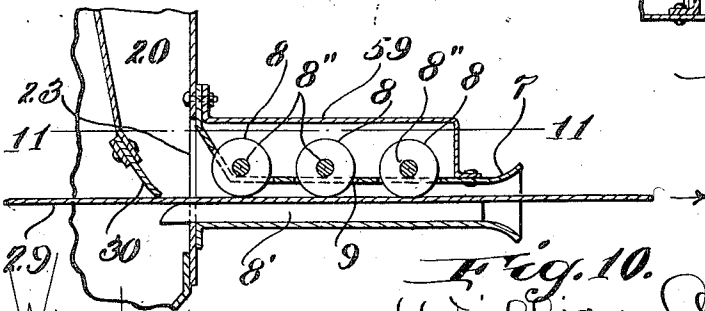


Fig. 10.

WITNESSES
R. H. A. Smith

William A. Rosenberg

Inventor

By Edwin Hammett

Attorney

UNITED STATES PATENT OFFICE

2,037,047

BLAST CLEANING MACHINE

William A. Rosenberger, Hagerstown, Md., assignor to Pangborn Corporation, Hagerstown, Md., a corporation of Maryland

Application June 28, 1932, Serial No. 619,647

Renewed June 26, 1935

12 Claims. (Cl. 51—8)

The invention relates to the cleaning by means of a stream or streams of abrasive material of flat and other surfaces which are ordinarily the surfaces of metal sheets, the cleaning taking place as the sheets or other pieces of work are passed through an enclosure, the purpose of which is to confine the abrasive and dust to a limited area and prevent its escape into the room. The work particularly when in the form of metal sheets, is most conveniently carried with its top surface in a horizontal or substantially horizontal position and in the development of this branch of the art it has been found difficult if not impossible to prevent the abrasive and dust which accumulates mainly on top of the work, but to a greater or less extent on other surfaces, from being carried out of the blasting chamber.

In some instances, as shown in McCreary Patent No. 1,842,619, the work has been passed through a separate vacuum chamber or vestibule for the purpose of removing the abrasive and dust, but this is not practical as there is no provision for passing an air draft along the surface of the material which would be sufficient to move the abrasive, and in other instances rotary brushes, flaps or wipers of rubber, leather or felt or the like have been used to wipe the accumulated abrasive and dust from the top or other surface where it is found necessary, i. e., wherever it accumulates.

These mechanical wipers are, however, extremely short lived due to the action of the abrasive in cutting and wearing them away and when the surface of the work is irregular, i. e., varied from the flat, they do not clean the depressed portions of the surface and even when the surface is flat the wipers pass over a considerable portion of the abrasive. In every instance, more or less, abrasive is carried outside.

The invention provides for this purpose a completely effective sweeping device which is adapted to remove the abrasive and dust from all portions of the upper surface of the work whether it be a uniform surface or varied by depressions and protuberances, and it is also effective to remove such dust and grit as may adhere to the other surface or surfaces. The new apparatus has the further advantages that it does not scratch the work, no moving parts are necessary and its efficiency is not reduced by wear, being maintained at the maximum throughout an extended period.

In the accompanying drawings I have illustrated a sand blast apparatus for cleaning sheet

material and other substantially flat work though the invention may be applied to the cleaning of other articles. The drawings show a sand blast chamber or enclosure through which the work is passed and in which it is treated. The drawings show the improvements of the invention in what is at present regarded as the preferred form, the drawings being more or less diagrammatic in their nature for convenience of illustration.

In the drawings:

Figure 1 is an elevation partly in section on a vertical plane parallel to the direction of motion of the work as it passes through the chamber.

Figure 2 is a section on the line 2, 2, in Figure 1, looking to the right in said figure.

Figure 3 is an elevation looking at the apparatus as in Figure 1 and including means for driving the rollers which carry the work through the sand blast area or chamber.

Figure 4 is an elevation looking from the right in Figure 1 showing the exit or work discharge duct with the work issuing therefrom.

Figure 5 is a longitudinal section on a somewhat enlarged scale taken through the discharge duct and including a portion of the abrasive trap or suction duct.

Figure 6 is an elevation showing an abrasive reclaimer or separator for returning the abrasive from the suction duct or uptake to the blasting chamber.

Figure 7 is a diagrammatic assembly of the apparatus.

Figure 8 is a section corresponding to Figure 1 showing a modified form of the apparatus.

Figure 9 is a section on the line 9, 9 in Figure 8.

Figure 10 is a section through the exit duct in the plane of Figure 1, showing a plurality of sets of top guide rollers or disk rollers instead of a single set. These are particularly adapted for use with very thin work.

Figure 11 is a horizontal section on the line 11, 11 in Figure 10.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the apparatus as shown comprises a sand blast compartment or enclosure 1 having rollers 2, 3, 4 of the disk type or any suitable conveyor for moving the work through the compartment. These rollers may to advantage be provided with guard plates or shields 34, 35. These guard plates reduce the quantity of abrasive, coming in contact with these rollers and hence protects them from un-

due wear. The lip 35' on the guard 35 guides the front edges of the sheets on to the roller 4.

Aligned with these rollers on one side is an entrance or admission duct 5 and opposite this on the right is an exit or discharge duct 6. These ducts are of sufficient extent in a vertical direction to permit the free passage of the work which is ordinarily in the form of substantially flat sheets, also providing a sufficient space or clearance for the passage of air along the surface or surfaces to be cleaned. Both ducts are of a lateral dimension sufficient to provide for the width of the sheets or other work to be fed to the apparatus, and they are elongated, particularly as to the exit duct, in the direction of motion of the work to hold the sweeping air draft in contact with the work for a sufficient period to remove the abrasive.

As shown, these ducts, particularly the exit duct, are bell mouthed at 7 to provide for free admission of the air, and secured at their inner ends to the corresponding wall of the enclosure or compartment 1 where they register with suitable openings. The exit duct 6 may be provided with disklike guide rollers or equivalent means 8 to engage the work as it passes out, to assure a sufficient clearance as hereinafter described. The guide rollers are seated in slots 9 and they are preferably in the form of relatively narrow disks. They are not, however, regarded as essential to the useful operativeness of the device, it being understood that various details shown and described may be varied or omitted without departure from the spirit of the invention. The apparatus also includes feed rollers 10 for presenting the material to the entrance or intake duct 5, the same being preferably aligned with the feed rollers 2, 3 and the supporting roller 4, and the drawings, Figure 1, shows discharge rollers 11, 11 just beyond the exit or discharge duct 6 and also in line with the rollers 2, 3, 4, etc.

Figure 3 shows a suitable device in the form of chain gearing which need not be specifically described for driving the rollers, the chain being indicated by reference character 12, the shafts on which the bottom rollers or disks are mounted are provided with sprockets 14, 15, 16, 17, it being understood that all of the rollers, preferably consist each of a number of disks spaced apart.

The apparatus as shown includes two batteries of sand blast nozzles 18 and 19 in the compartment or enclosure. These nozzles are arranged at suitable intervals and spaced transversely to the direction of feed, each series or battery extending substantially across the compartment, and each set of nozzles as shown is connected to a suitable manifold 36 or other source of supply of air under pressure, mixed with abrasive, in accordance with the regular practice in this art.

An important feature of the invention consists in the provision in connection with the enclosure having the exit duct 6 of the abrasive take up passage 20. This, in the form of the invention shown, is arranged with its intake end 23 immediately adjacent the point where the exit duct 6 joins the compartment. In accordance with the preferred arrangement the lower or intake end 23 of the passage 20 is continuous with the inner end of the duct 6. This passage 20 extends upwardly from or otherwise away from the entrance of the exit duct 6, the intake and/or nozzle 23 being of a width at the bottom substantially equal to the width of the exit duct and being most conveniently of reducing downward taper so that its upper end may be connected to a pipe 24 which, in turn, may be connected to any suitable suction

device, or a strong upward take-up air current may be maintained in and through the abrasive passage 20 in any suitable manner, the said current resulting in or being otherwise continuous with a current of air which is passed through the duct 6, the object being to sweep the surface of the work and to convey the abrasive and dust to and through the take up passage 20 to a suitable point of discharge or separation.

In the preferred construction shown, see particularly Figure 5, the lower end of the passage 20 is of reduced width measured in the direction of the motion of the work and is preferably inclined upwardly and backwardly opposite to the motion of the work as shown at 23, it being helpful though not necessary to substantially close the air passage 27 which is formed between the top of the exit duct 6 and the work 29 by means of a flap 30, Figure 5, which extends downwardly from the lip 31 which forms the lower portion of the inner wall of the passage 20, into contact with the work.

In this way the abrasive passage 20 is practically closed off and separated from the inside of the compartment 1 and connected to the passage 27 which is the clearance between the top wall of the passage 6 and the work 29, whereby a continuous current of air is passed at high speed over the top of the work as it leaves the apparatus by way of the exit 6 removing the dust and abrasive which is lodged on top of the work and carrying it upwardly into the passage 20, as more fully hereinafter described.

The work is raised off of the bottom of the duct 6 by the rollers or by rails 8'. This provides a space 32 beneath the work in which a draft is maintained which removes any abrasive which may be on the bottom of the work. This prevents the discharge into the outside air of any abrasive and/or dust which may be dropped from the side edges of the work as it passes out through the exit duct 6. This also establishes an inward current beneath the work and otherwise prevents the further escape of abrasive and dust from the compartment into the outside air.

It is of particular importance that instead of being restricted or reduced the passage 27 is preferably open sufficiently to permit free passage of air at high velocity, the outer end of the duct being preferably expanded or bell mouthed as shown at 7. In this way, with the proper amount of suction applied by way of the pipe 24, a high velocity current of air is provided in a direction opposite to that of the work travel. This serves to lift the abrasive from the sheets so that the particles become suspended in the air as illustrated in Figure 5, so that they are carried into the passage 20 without difficulty. In Figure 5 the motion of the abrasive is indicated by the arrows, the particles of abrasive material are also indicated.

The abrasive is thus carried for a considerable distance in a plane parallel to the plane of the work in the direction of motion of the work and in the face of a strong air current to a point where the counterflow air raises the particles in a manner similar to the takeoff of an air plane. The air current thus serves to carry the particles backwardly in a direction opposite to the travel of the work when they are deflected into the abrasive and dust passage 20 from which they are removed in any suitable manner as by the current through the pipe 24 which may be passed through a reclaiming 25 or otherwise treated, or, if desired, direct to a suitable dust collector.

The desired air current may be supplied most

conveniently by means of a suction device, as exhaust fan 25, which is connected through an abrasive reclaimer 26 to the pipe 24 at the top of the abrasive takeup 20, the speed of the suction device being preferably such that the air in the duct 6 passing over the surface of the work has a speed of from 5,000 to 10,000 feet per minute or any speed sufficient to remove the accumulated abrasive and dust on the work and carry it into the trap 26 so that it can be disposed of in any convenient manner.

Figure 6 shows the reclaimer 26 in its operative relation to the apparatus for returning the abrasive thus trapped to compartment 1.

Figure 7 shows an assembly of the apparatus including pressure blast machine 35, which receives the abrasive from an abrasive separator 37 connected to the bottom of the chamber 1 which is preferably funnel shaped. The spent abrasive drops by gravity into the abrasive separator 37.

In Figures 8 and 9, I have shown a modified construction particularly adapted to use where a large number of nozzles are used and therefore a large quantity of abrasive is discharged. Above the work 29 on each side of the nozzle manifold 36, I have provided heavy wear plates 41 which are preferably inclined upwardly and away from the nozzles. On the opposite side of each wear plate from the nozzles is a trough or hopper 38 extending across the chamber 1 transversely to the direction of motion of the work. These troughs are inclined downwardly from the top of the wear plates to which they are most conveniently connected. On the bottom of each trough I have shown screw conveyors 39 for which any suitable conveying means to move the abrasive collected in this trough may be substituted. The conveyors 39 deliver the abrasive collected in the trough to discharge chutes 40 at each end of the troughs which lead downwardly into the discharge of the chamber which may be connected to a separator 37 and pressure tank 35, as indicated in Figure 7.

The abrasive in rebounding from the work and from the wear plates 41 accumulates in the troughs 38 to be delivered by the conveyors 39 and discharged through chutes 40 to such an extent, depending on the width of the hoppers 38 as compared to the width of the compartment 1, that from fifty to seventy per cent. will be thus collected and removed, thus relieving to a corresponding extent the duct 6 and the takeup 20 which is, under such circumstances, required to take care of only fifty to thirty per cent. of the abrasive which ordinarily settles on top of the work. The conveyors 39 may be driven in any suitable manner from any convenient sort of power. This may be accomplished by means of sprockets 44 and 45, the sprocket 44 being mounted on the shaft 46, carrying the rollers 2, the sprockets being connected by a chain 47.

Figures 10 and 11 show the delivery duct 6 provided with three sets of delivery rollers 8 mounted on shafts 8', one in front of the other, so as to increase the area of contact of the rollers with the work. This arrangement is particularly adapted for use in the treatment of very light, i. e., thin sheets. The very strong suction which is applied tends to lift the sheets as soon as the front edge has passed the inlet 23 to the passage 20 so that in the treatment of the very light, thin work referred to, this or some equivalent arrangement is necessary. To prevent excessive leakage around the rollers or disks 8 through the slots 9

a cover 59 is provided which encloses the rollers from above substantially as shown, so that all the air which goes through the abrasive takeup passage 20 enters the duct at 7 and applies its sweeping action to the work throughout the length of the duct.

I have thus described specifically and in detail a blast cleaning machine embodying the features of my invention in the preferred form in order that the manner of constructing, applying, operating and using the invention may be fully understood, however, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a blast cleaning machine, an enclosure, means for passing the work through the enclosure, the enclosure being provided with an exit duct in the form of an elongated passage and means for passing air at a high speed through the duct oppositely to the direction of motion of the work, said means comprising a nozzle immediately adjacent the entrance to said duct and means for guiding the work and spacing it away from the walls of the duct leaving a free passage for the incoming air, the duct serving to hold the air current in close contact with the work whereby the air current serves to remove from the work the abrasive and dust which would otherwise be carried with it out of the compartment.

2. In a blast cleaning machine, an enclosure, means for passing the work through the enclosure, the enclosure being provided with an elongated exit duct and means for passing air at a high speed through the duct oppositely to the direction of motion of the work, said means comprising a suction device and an air intake immediately adjacent the inner end of the duct, the duct serving to hold the air current in close contact with the work whereby the air current serves to remove from the work the abrasive and dust which would otherwise be carried with it out of the compartment, the duct being arranged to conform to the shape of the work allowing sufficient clearance above the work for the free admission of the air current at a high speed and to avoid clogging of the passage with abrasive.

3. In a blast cleaning machine a compartment containing abrasive projecting devices with means for supplying abrasive thereto, means for moving the work through the compartment and through the blasting area therein leading it into and out of the compartment, the compartment having an elongated exit duct conforming in cross section to the cross section of the work allowing a considerable clearance on all sides for the admission of an air current at high speed, and means for passing a current of air through the exit duct in a direction opposite to the motion of the work in contact with the surface of the work at high speed, the duct serving to hold the air current in close contact with the work whereby the air current serves to remove the abrasive and dust from the surface of the work, the apparatus including an abrasive trap immediately adjacent the inner end of the exit duct with means for deflecting the air as it leaves the exit duct into the trap.

4. In a blast cleaning machine a compartment containing abrasive projecting devices with means for supplying abrasive thereto, means for

moving the work through the compartment and through the blasting area therein leading it into and out of the compartment, the compartment having an exit duct conforming in cross section to the cross section of the work allowing a considerable clearance for the admission of an air current at high speed, and means comprising an air passage and means for propelling air there-through at a high speed to draw a current of air through the exit duct in a direction opposite to the motion of the work in contact with the surface of the work to remove the abrasive and dust from the surface of the work, the apparatus including an abrasive takeup at the end of said air passage and immediately adjacent the inner end of the duct, said takeup comprising means for deflecting the air as it leaves the exit duct into the uptake.

5. In a blast cleaning machine a compartment containing abrasive projecting devices with means for supplying abrasive thereto, means for moving the work through the compartment and through the blasting area therein leading it into and out of the compartment, the compartment having an elongated exit duct conforming in cross section to the cross section of the work allowing a considerable clearance for the admission of an air current at high speed, and means for passing a current of air through the exit duct in a direction opposite to the motion of the work in contact with the surface of the work to remove the abrasive and dust from the surface of the work, the apparatus including an abrasive takeup with means for deflecting the air as it leaves the exit duct into the takeup, said deflecting means including a lip in close proximity to the work, the same being inclined upwardly and backwardly in a direction opposite to the motion of the work.

6. In a blast cleaning machine a compartment containing abrasive projecting devices with means for supplying abrasive thereto, means for moving the work through the compartment and through the blasting area therein leading it into and out of the compartment, the compartment having an exit duct conforming in cross section to the cross section of the work allowing a considerable clearance above the work for the admission of an air current at high speed, and means for passing a current of air through the exit duct in a direction opposite to the motion of the work, in contact with the surface of the work at high speed to remove the abrasive and dust from the surface of the work, the apparatus including an abrasive takeup with means for deflecting the air as it leaves the exit duct into the takeup, and means for separating the abrasive from the cleaning air after it is passed through the exit duct as aforesaid.

7. The combination in a blast cleaning machine having an enclosure with means for moving the work through the enclosure and through the blasting area of a transversely arranged trough at the side of the blasting area and above the work to catch the abrasive which rebounds from the work and would otherwise be redeposited thereon, with means for conducting the abrasive along the trough and discharging it therefrom.

8. The combination in a blast cleaning machine of an enclosure, a battery of abrasive projecting devices therein and means for carrying the work through the blast area, a transversely disposed wear plate at the side of the blasting area and a transversely disposed trough immediately beyond the wear plate on the side opposite to the blast area, means for moving the abrasive along the trough and discharging it from the machine.

9. In a blast cleaning machine a blasting enclosure having a battery of abrasive projecting devices and means for moving the work through the enclosure and through the blasting area, of a transversely disposed wear plate on each side of the blasting area and a trough immediately beyond the wear plate on the side opposite to the blasting area to catch the abrasive which rebounds from the work and to prevent it from becoming deposited thereon and, means for discharging the abrasive from the trough.

10. In a blast cleaning machine a blasting enclosure having a battery of abrasive projecting devices and means for moving the work through the enclosure and through the blasting area of a wear plate on each side of the blasting area and a trough immediately beyond each wear plate on the side opposite to the blasting area, means for discharging the abrasive from the troughs, the machine also being equipped with an elongated exit duct through which the work is passed out of the enclosure, and an abrasive takeup passage having its intake end continuous with the duct on the top side of the work at the inner end of the duct and means for creating a draft through the duct in the direction opposite to the motion of the work and through the abrasive takeup duct in a direction away from the work.

11. The combination in a blast cleaning machine having a blasting enclosure with means for moving the work through the enclosure and through the blasting area, the machine being equipped with an elongated exit duct through which the work is passed out of the enclosure, and an abrasive takeup passage having its intake end continuous with the duct on the top side of the work at the inner end of the duct and means for creating a draft through the abrasive takeup in a direction away from the work and through the duct in the direction opposite to the motion of the work, said drafts being continuous, the duct being arranged to provide a free passage for air between the work and the wall of the passage.

12. In a blast cleaning machine a compartment containing abrasive projecting devices having means for supplying abrasive thereto, means for moving the work through the compartment and through the blasting area therein, the compartment having an exit duct conforming in cross section to the cross section of the work and allowing a considerable clearance above the work for the admission of an air current at high speed, the duct being provided with a plurality of guiding means engaging the work from above and spaced laterally and longitudinally to prevent lifting of the work when subjected to the air current and consequent closing of the air passages.

WILLIAM A. ROSENBERGER.