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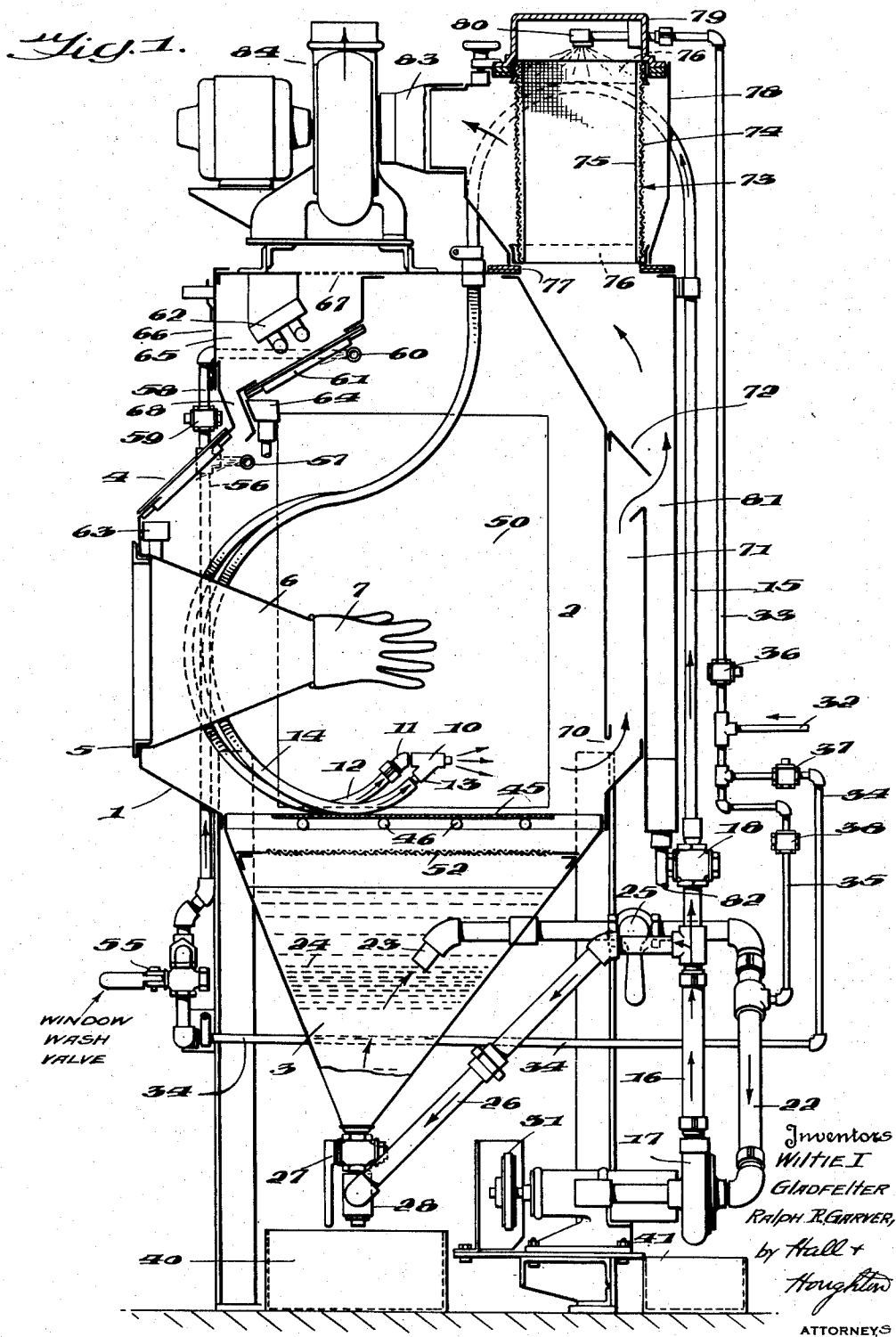
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WET BLASTING MACHINE

Filed Sept. 9, 1949

2 SHEETS—SHEET 1



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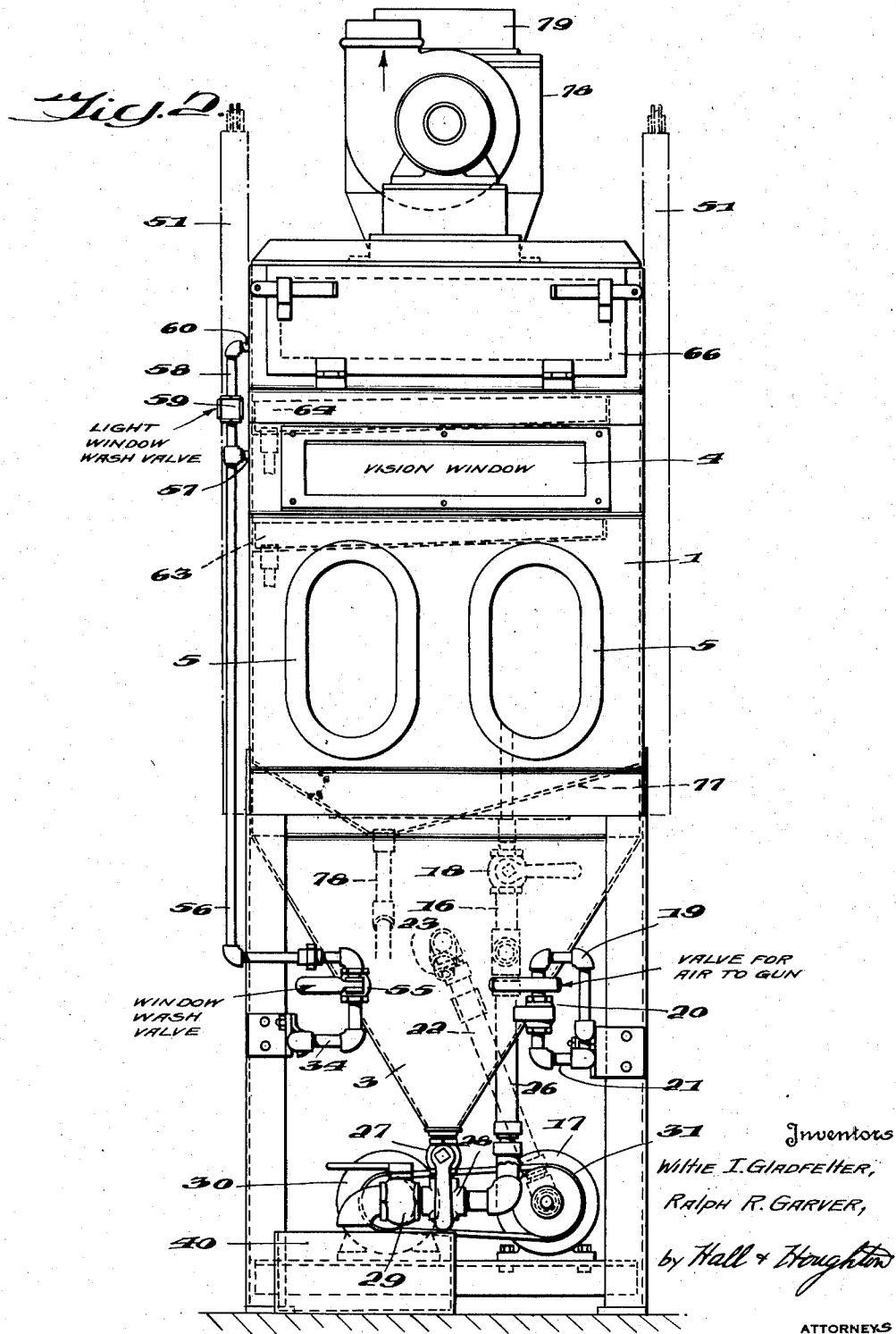
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2 SHEETS—SHEET 2



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WET BLASTING MACHINE

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15 Claims. (Cl. 51—8)

1 This invention relates to blasting machines and aims to provide a wet blasting machine of high efficiency and simple and compact construction.

Among the objects of the invention, severally and interdependently, are the following: To provide in such a machine novel means for maintaining in agitated condition the liquid suspension or slurry of abrasive material. To provide therein novel means for ventilating the cabinet. To provide therein simple and effective means for clearing the slurry from the slurry pump and blast gun. To provide therein a novel and easily cleaned means for intercepting dust laden droplets drawn off in the ventilating of the blast chamber. To provide in such a machine an improved air admission arrangement. To provide improved combinations, sub-combinations and elements contributing to the aforesaid objects.

Further objects and advantages of the invention will be apparent from the following description of an exemplary embodiment thereof.

The invention comprises the novel features and combinations hereinafter disclosed and claimed.

In the accompanying drawings forming a part of the specification:

Fig. 1 is a more or less diagrammatic side elevation partly in section of an exemplary embodiment of the invention.

Fig. 2 is a front elevation thereof.

As shown in Figs. 1 and 2, a machine of the class described comprises a cabinet or housing 1 enclosing a blasting chamber 2 and a slurry hopper 3. The housing 1 in the form shown is provided in one of its walls with a vision window 4 and armholes 5 with which are associated flexible sleeves 6 terminating in gloves 7, so that the operator may hold and manipulate the work, or the blast gun, or both, within the machine.

The blast gun in the form shown comprises a gun body 10 of any conventional or other form, having an inlet 11 for compressed air or other propelling fluid, supplied through a flexible hose 12, and an inlet 13 for the abrasive slurry supplied through the flexible line 14. The hoses 13 and 14 pass through the top or roof of the blasting chamber 2, in the form shown, or through any other wall of the blasting chamber 2, and the slurry hose 14 is connected to the branch line 15 which receives slurry from the delivery pipe 16 on the discharge side of slurry pump 17, through valve 18. The compressed air line 12 is connected through suitable piping 19 (Fig. 2) to a knee-controlled valve 20 to which compressed air is supplied from a suitable source through the pipe connection 21.

2 As is best shown in Fig. 1, the slurry pump 17 draws slurry from a suction pipe 22 having its inlet 23 not at the bottom of the slurry storage body in hopper 3, but at an elevated position therein, proximate to and preferably above the dividing line 24 between the sediment and the supernatant liquid when the slurry is allowed to settle. The suction line 22 is provided as shown, with a stop valve 25.

10 The discharge line 16 from the pump 17 is further provided with a return line 26 which discharges upwardly into the bottom of the hopper 3 through the valve 27. The return or branch line 26 in the form shown is provided below the valve 27 with a fitting 28, which also has connected thereto a drain cock 29.

The pump 17, when of the centrifugal impeller type shown, is driven in any suitable manner, exemplified by electric motor 30 and belt drive 31.

20 As is further shown in Fig. 1, the installed machine is also provided with water piping comprising a water supply connection 32 from which extend branch lines 33, 34 and 35, provided respectively with stop valves 36, 37 and 38. The branch lines 33 and 34 connect, respectively, with the filter-wash and window-wash lines, hereinafter described. The branch line 35 connects in the form shown to the suction side of pump 17.

With the slurry circuit, above described, the machine being charged with slurry, and valves 25 and 27 being open, operation of the pump 17 effects a continuous circulation of slurry in the slurry circuit 23, 25, 22, 16, 26, 28, 27 and upwardly through the slurry body in hopper 3, thus thoroughly agitating the slurry body in the hopper and maintaining adequate uniformity of suspension of the slurry at all times. With valves 18, 25 and 27 closed and with valve 38 and drain cock 29 (Fig. 2) open, clear water may be passed through the pump and out the drain cock to flush the pump clear of abrasive, with the pump operating, or not operating, as desired. By closing drain cock 29 and opening valve 27, clear water may be passed through the pump 17 and into the bottom of the hopper 3 for filling or replenishing the same. With valves 25, 27 and 29 closed, and valves 38 and 18 open, clear water may be admitted to the pump inlet and may be supplied therefrom through line 15 to clear abrasive from this line and from the gun 10, when desired. With valves 27 and 29 open the contents of the hopper 3 may be discharged.

Suitable provisions may be made for disposal of material issuing from the drain cock 29 or other drain outlets hereinafter described, as ex-

emplified herein by the provision of refuse cans 40 and 41.

In the illustrative embodiment shown in the drawings, the cabinet is provided with a suitable work supporting means, shown as a work platform comprising a perforated plate 45 carried on supporting rods 46, and with side doors 5 operable to place work in or remove it from the machine. These doors may be of any desired form, and for compactness may comprise vertically slidable door panels carried in suitable guideways (not shown). In large machines these doors may be counterbalanced as by cable supported weights running in weight-guide tubes 51 as indicated by broken lines in Fig. 2.

Below the work platform 45, the slurry hopper 3 is preferably provided with a removable screen element 52, for straining the slurry returning to the hopper from the blasting chamber.

The valved water line 34, previously mentioned, in the form shown leads through a knee-controlled valve 55 and thence through conduit 56 to a window wash spray pipe 57, placed close to and above the inner side of vision window 4. A branch line 58 with control valve 59 connects to a similar spray pipe 60 similarly related to the glass illuminating panel 61 which is interposed between the lighting fixtures 62 (shown as of the fluorescent tube type) and the blasting chamber 2. Suitable drip troughs 63 and 64 are provided to receive the used wash water, and in the form shown are piped to deliver it to a suitable disposal point as one of the refuse cans 40 or 41.

The light compartment 65 in the form shown, is closed by a front access door 66, and is provided with air inlet means, shown as a grilled opening 67 in the top of the chamber 65. In the illustrated embodiment the light chamber 65 is also provided with an air discharge duct 68 (Fig. 1) which extends slotwise above the vision window 4, and the ventilating air is drawn into the blasting chamber 2 through the light compartment and through this duct. With this arrangement the air entering through duct 68 is directed sheetwise across the vision window 4. Deposit of slurry splatter on the window 4 is thus retarded.

The fog of slurry droplets produced in the chamber 2 by the blasting operation is drawn away from the vision window in the form of device shown in the drawings, and into a ventilating outlet 70 near the lower rear of the chamber 2. The ventilating air and fog are drawn thence through a duct 71 and under a wash water deflecting baffle 72 to the inner side of a cylindrical filter screen 73, arranged with its axis vertical in the form shown. The filter screen 73 preferably consists of a generally cylindrical self-supporting screen member 74 of wire mesh or the like, and a cloth sleeve 75 within said screen and secured to its ends. In the form shown the sleeve 75 is somewhat longer than the screen 74 and has its ends turned back over the ends of the screen 74 and suitably clamped thereto. Such clamping may be effected by retaining rings slipped over the ends of the assembly at 76, or by abutment with the housing shoulders as shown. There is thus provided a reinforced filter cloth body capable of allowing the air to pass therethrough while retaining the dust laden fog on its inner surface. The screen 73 is received on a flange or shoulder 77 in the inlet duct, and held in place in the exhaust housing 78 by a removable cover 79. A spray head 80 is arranged axially at one end of the screen for spraying wash water on its inner surface to wash down the ac-

cumulated material from time to time (the exhauster hereinafter described being stopped as a general rule during this wash down operation). The wash water baffle 72 deflects the washings from the ventilating duct 71 into a channel 81 provided with a drain pipe 82, thereby avoiding dilution of the slurry. A duct 83 connects the exhaust housing 78 to a suitable exhauster, shown as a motor driven fan 84, which draws the ventilating air through the ventilating circuit and discharges it from the machine.

From the foregoing description it will be apparent that the present invention provides an improved machine of the type employing an abrasive suspended in a liquid which is delivered to the blasting nozzle by means of a pump, and in which velocity is imparted to the suspension as it flows through the blast projector or nozzle 10, as by the injection of compressed air or the like. For normal nozzle work an air pressure of about 90 pounds per square inch is satisfactory.

In use of the machine, any suitable circulatory medium may be employed, for example, a medium comprising 300 mesh silica mixed into a thin watery mud or slurry in a water carrier, with or without added anti-caking ingredients well known to the art, such as calcium hydroxide for example, which may be employed for reducing caking of the solids precipitating out in the sump when the machine is at rest.

With the present arrangement it is not necessary to employ manual tools to dig into and stir up the settled abrasive after a period of idleness of the machine. The suction side of the pump is connected to the liquid area above the sediment and the pressure side is connected to the underside of the sediment. Thus, on starting up there is no blocking of the pump intake by any substantial depth of densely compacted abrasive, and the pump may almost immediately develop full discharge pressure. The discharged liquid is thus positively forced through the center of the settled abrasive mass and quickly opens a passage for the commencement of the resuspending agitation. The employment of the non-compressible liquid slurry as the agitating medium, and its introduction at the bottom of the hopper, also affords a highly economical, as well as a very positive and complete agitation, continuously during the operation of the machine. The arrangement of parts is simple and compact, and a single spray head is able to effect washing of the entire surface of screen 73 due to its vertical cylindrical arrangement. The admission of the ventilating air through the lighting chamber and across the inner surface of the vision window increases the economy of the machine, especially since it enables operation for a greater time without stopping to clean the window, and also affords an improved view of the work.

The organization described is thus particularly effective in minimizing the proportion of an operator's time required to be spent in non-production operations. For the reasons above noted in detail, a very short period of preliminary circulation provides an adequately stirred-up liquid mud or slurry, and the continued upward agitation of the sump contents automatically maintains the slurry in working condition.

In the arrangement shown, operation of the blast gun may be controlled by the knee valve 20 controlling the supply of compressed air to the gun, and the gun may be operated or not, at the will of the operator, without stopping the operation of the pump 17.

During the operation of the gun, the ventilating arrangements tend to draw the fog produced by blasting out of the operator's line of sight and the illuminating, window cleaning, and filter-washing arrangements cooperate to minimize the amount of time required for these operations to thus increase the proportion of time applicable to productive work. Similarly, the improved arrangements for flushing, draining, and washing-out of the various slurry-containing portions of the machine, all aid in reducing the amount of time required for these purposes and thus in maintaining the machine in work-producing condition for as large a proportion of the worker's time as possible.

We claim:

1. In a wet blasting machine, and in combination, a circuit including a slurry storage body for a slurry of abrasive particles, pump mechanism having an outlet and an inlet, said outlet being connected to the bottom of the storage body and the said inlet being connected to a slurry-receiving intake located in the storage body above the outlet a distance sufficient to receive a working amount of abrasive particles, for circulating slurry through said circuit and upwardly through said body for maintaining uniformity of suspension therein, a blast projector, and means for delivering slurry from the discharge side of said pump circuit to said projector.

2. In a wet blasting machine, and in combination, a circuit including a slurry storage body for a slurry of abrasive particles, pump mechanism having an outlet and an inlet, said outlet being connected to the bottom of the storage body and the said inlet being connected to a slurry-receiving intake located in the storage body above the outlet a distance sufficient to receive a working amount of abrasive particles, for circulating slurry through said circuit and upwardly through said body for maintaining uniformity of suspension therein, a blast gun, means for delivering slurry from the discharge side of said pump circuit to said blast gun, and means for delivering compressed air to said gun for projecting the slurry therefrom at blasting velocity.

3. In a wet blasting machine, and in combination, a slurry circuit including a slurry storage body, said slurry circuit including circulating pump mechanism having an inlet connected to draw slurry from the upper portion of said body, an outlet connected to discharge slurry into the lower portion of said body to prevent settling of the suspended particles in said body, a blast projector, a conduit connected to supply slurry from said body to said blast projector, and a valve structure for isolating said slurry body from the pump outlet.

4. In a wet blasting machine, and in combination, a slurry circuit including a slurry storage body, pumping means therein for circulating slurry through said circuit and body for maintaining uniformity of suspension therein, a blast projector, a connection from the discharge side of said pumping circuit to said projector, valve means for isolating said slurry body from said circuit, and means for admitting clear water to the circuit in advance of said pumping means to pass therethrough.

5. In a wet blasting machine, and in combination, a blasting chamber, a slurry hopper below said blasting chamber, a valved bottom connection to said hopper and a valved suction connection communicating with the upper portion of said hopper, a pump having its suction side con-

nected to said suction connection and its delivering side connected to said bottom connection, a discharge valve connected to said bottom connection, a blast gun in said blasting chamber, and a valved connection from the delivery side of said pump to said blast gun.

6. In a wet blasting machine, and in combination, a blasting chamber, means for projecting a slurry blast therein, a vision window in a wall of said blasting chamber, means for applying wash water to the inner side of said window, a lighting compartment adjacent said vision window for illuminating said chamber, a ventilating suction duct leading from said chamber and means for admitting ventilating air to said chamber through said lighting compartment, said air admitting means directing the admitted air across said vision window.

7. In a blasting machine, and in combination, a blasting chamber, a vision window in a wall of said blasting chamber, means for applying wash water to the inner side of said window to clean the same, a ventilating suction duct leading from said chamber, and means for admitting ventilating air to said chamber, said last named means formed to direct the admitted air across said vision window.

8. In a wet blasting machine, and in combination, a blasting chamber, means for projecting a slurry blast therein, a ventilation outlet near the lower part of said chamber, a ventilating duct leading therefrom to an exhauster, a vertical cylindrical cloth screen filter interposed in said duct, a spray head for discharging wash water against at least the upper portions of the inlet surface of said filter, and means for deflecting the wash water from said ventilating duct.

9. In a wet blasting machine, and in combination, a slurry blasting chamber, a ventilating duct leading therefrom and having a rising portion, a vertical generally cylindrical cloth screen filter forming an upper portion of said duct, a removable cap closing the end of said duct therebeyond, an exhaust box surrounding said filter, means for connecting said exhaust box to an exhauster, a sprayer arranged axially of said filter for discharging wash water thereagainst, and a deflector arranged above said rising portion for deflecting the wash water therefrom.

10. In a wet blasting machine, a ventilating duct, a vertical generally cylindrical cloth screen filter forming an upper portion of said duct, said filter comprising a generally cylindrical screen and a cloth sleeve within said screen and secured to the ends of said screen, a suction box about said cloth screen filter, and a spray head for delivering wash water against the inside of said cloth sleeve.

11. As a sub-combination in a slurry blasting machine or the like, a cloth screen filter comprising a cylindrical self-supporting screen, a cloth sleeve within said screen and secured to the ends of said screen, an inlet duct having a shoulder for supporting one end of said screen, a cap for supporting and closing the outer end of the screen, an exhaust housing about the screen, means for spraying wash liquid on the inner surfaces of said sleeve, and means for diverting the wash water from said inlet duct.

12. In a wet blasting machine, and in combination, a slurry circuit including a slurry storage body, said slurry circuit including circulating pump mechanism having an inlet and outlet, said inlet being connected to draw slurry from the upper portion of the said body, and said outlet

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being connected for discharging slurry into the lower portion of said body to prevent settling of the suspended particles in said body, a blast projector, a conduit connected for delivering slurry from the storage body to said blast projector, a valve structure connected for isolating said slurry body from said pump outlet, and a drain cock connected to said outlet.

13. In a slurry blasting machine, an air circulation system for withdrawing air laden with blasting dust from the machine, an air filter having a cloth filter element positioned in said system, said element having a porous surface exposed to the circulating air for stopping particles carried along by the air and passing the air without the trapped particles, a spray mechanism connected for spraying wash liquid over said surface to periodically wash off the trapped particles and rejuvenate the filter element.

14. In a compact slurry blasting machine a blasting chamber, a slurry holder below said blasting chamber, an air circulation system for removal of dust laden air from said blasting chamber, said system including an air filter having a cloth filter element positioned above the blasting chamber, and vertically extending air ducts connecting the filter with the blasting chamber, said filter element having a porous surface exposed to the air entering from the blasting chamber, for trapping and retaining particles carried along by the air, and passing the air substantially free of said particles, a spray mechanism connected to periodically wash off the trapped particles and rejuvenate the filter element, and diverting structure cooperating with the ducts to keep the washings from running down into and diluting the slurry.

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15. In a slurry blasting machine: walls defining a blasting chamber; a slurry storage body; a blast projector, said blast projector being located within the blasting chamber; a slurry conduit connected between the blast projector and said slurry storage body; a vision window in a wall of said blasting chamber to view the work being blasted within the blasting chamber, said blast chamber walls including an opening, a flexible sleeve having one end secured in dust-tight relation around said opening, a flexible glove sealed to the other end of the sleeve to provide for the insertion and manipulation of an operator's hand within the blasting chamber without the escape of slurry and dust from the machine.

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