No. 699,838. Patented May 13, 1902.

M. E. EVANS.

SAND BLASTING APPARATUS.

(Application filed Sept. 5, 1899.)

(No Model.)

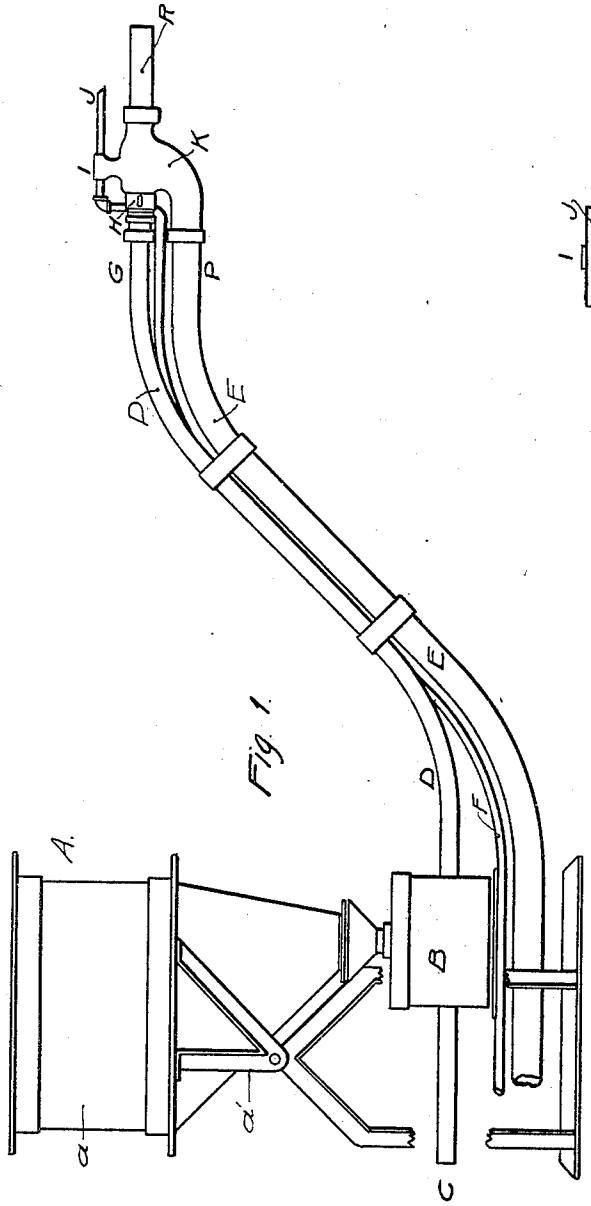

Fig. 1.

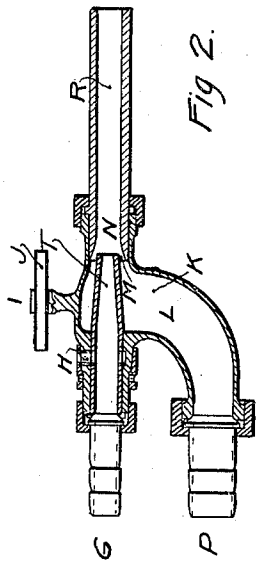

Fig. 2.

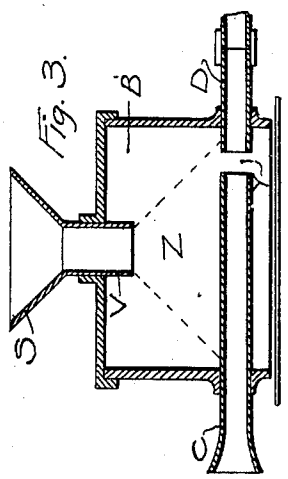

Fig. 3.

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SAND-BLASTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 699,838, dated May 13, 1902.

Application filed September 5, 1899. Serial No. 729,480. (No model.)

To all whom it may concern:

Be it known that I, MYRON E. EVANS, of the city, county, and State of New York, have invented new and useful Improvements in Sand-Blasting Apparatus, of which the following is a description.

The main objects of my invention are, first, to prevent the sand from becoming moist, and consequently clogging up parts of the apparatus; second, to prevent unnecessary abrasion of the apparatus; third, to allay the dust or clouds of fine abrasive and abraded material caused by the striking of the blast upon the object which is being treated.

My invention consists of devices for keeping the sand or other abrasive material under the prevailing atmospheric pressure or somewhat less than the said prevailing atmospheric pressure until the sand reaches the blast, in devices for delivering the sand or other abrasive material to the blast at a point beyond that at which the blast has been given its full momentum, in devices presenting an unobstructed path for the blast after it has received its charge of sand or other abrasive material, and in devices for throwing simultaneously upon the object to be treated the blast of sand or other abrasive material and an atomized or other spray of water or other suitable fluid adapted to allay dust. Many varieties of the said devices will suggest themselves to one skilled in the art. I will describe my preferred form of the same, which is illustrated in the accompanying drawings, and of which—

Figure 1 is a side view, and of which Fig. 2 shows the nozzle and other outward portions in a detailed view in section, and of which Fig. 3 shows my preferred form of a mixing-box.

Similar letters of reference refer to corresponding parts in said drawings.

The preferred form of my apparatus consists in what I may term a "nozzle-body" K, which is composed of two main parts—the air-chamber L and the inner nozzle T—so constructed as to permit of the attachment of an additional or outer or discharging nozzle R when the same is desired. These parts are also so constructed with relation to each other that when the nozzle R is attached the adjacent surfaces of the said nozzles T and R will form an annular aperture or reducer at M, or if the nozzle R is detached the adjacent surfaces of the nozzle T and the body K will form a similar annular aperture at the same point M. Through the said chamber L runs the inner nozzle T, which is cut off at a point coincident with or beyond (or nearer the discharge than) the annular opening M.

G is a connection between the pipe D and the nozzle T.

Connected with the inner and lower end of the chamber L by a suitable connection P is a compressed-air conduit E, which in turn is connected at its other extremity with a compressor or other air-forcing apparatus.

J is a nozzle adapted to throw an atomized or other jet of water or other fluid and is suitably held by an arm or other connection I, suitably placed, and is connected to a pipe which connects in turn with a pump or other fluid-supply.

The operation of this form of my apparatus is as follows: A current of air is forced into the pipe E by any suitable means, through the same, through the connection P, and through the chamber L at a comparatively low velocity and then discharged through the annular opening M. As is clearly seen, the velocity of the said current will be determined by the area of the said annular opening or reducer M, which area may be regulated by any suitable means. In this way the current of air which passed through E, P, and L at a comparatively low velocity escapes through the annular opening M at a high velocity without increasing the pressure from the forcing apparatus. This rush of air will create a partial vacuum at N, which in turn will produce an induced current of air or other fluid through the pipe G D and nozzle. This induced current coming from the pipe G and nozzle T carries with it a charge of sand or other abrasive material which has been mixed with the said induced current by any suitable means and carries the said sand or other abrasive material directly into the said blast of air, which has come through the annular opening M and is rushing out. The said blast commingling with the said induced current and its charge of sand discharges itself with the sand upon the object which is being treated.

Various ways of regulating the area of the reducer M may be employed. I prefer that shown in Fig. 2, however, where the inner nozzle T is in form that of a section of a cone and narrower at its outer or discharge end than at its inner end and adapted to be moved backward and forward, or, in other words, inward and outward. As is clearly shown, the farther forward or outward this nozzle T is shoved or moved the narrower will be the annular opening M, and vice versa. In other words, the area of the reducer M will vary according to the position of the inner nozzle T relative to the nozzle-body K and the nozzle R. This nozzle T may be held in its various proper positions in any well-known way, as by clamps or by a heavy thumb-screw or by using various thicknesses of washers fitting between the inner end of said nozzle and the casing of the nozzle-body, into which it slides and fits.

A great variety of devices for mixing sand or other abrasive material with the current induced through the pipe G D may readily be supplied. One form is that shown in Fig. 3 and consists of a mixing-box B, wherein S is a funnel or other device for receiving sand delivered to the box; V, a connection between the said funnel and the interior of said box; C, a pipe entering said box and capable of being moved horizontally in and out, so as to project into the said box a variable distance, and D a pipe in the same horizontal plane as the said pipe C and fixed in and projecting from the side of the box opposite to the said pipe C. It is preferred that the said pipe D should project only a slight distance into the said box, so that one edge of the sand cone which will form at the lower extremity of the connection V and rest upon the said pipe C D as its base will be substantially over the inner extremity of the said pipe D. The operation of this mixer is as follows: The pipe C is slid into the box as far as may be desired, so as to leave an opening Y of sufficient width to deliver the desired amount of sand to the current which is being induced through the pipes C and D. Sand or other abrasive material is then delivered to the funnel S, runs down through the connection V, and forms in an approximately cone-shaped heap resting upon the upper surfaces of the pipes C and D as its base. A portion of this sand heap constantly flows through the opening Y and is carried into suspension by the current induced through the pipes C and D. The situation of the opening Y at substantially one edge of the said sand heap Z tends to prevent the "arching" of the sand or its packing into a cone and leaving an arch hollowed out near its base. The opening Y may be of any desired form. The fittings around the pipe C and other joints in the box need not be air-tight, and, if desired, the bottom and sides may be hinged, so as to open. Sand is supplied to this mixer B from a reservoir A or other suitable supply and may be regulated as desired by the operator. The said reservoir A may be of any form; but I prefer that form shown in Fig. 1, in which a is the reservoir proper and a' is a support in the form of trunnions, which will permit of the part a being swung over and emptied of its contents and refilled without interrupting the continuous action of the apparatus.

In case it is desired to stop the blast of sand temporarily or to use the blast of air alone the suction in the nozzle T may be relieved by the use of a relief H, thus preventing the carrying of sand or other abrasive material. In case it be desirable to vary the character of the blast the outer surface of the inner nozzle T or the inner surface of the discharging-nozzle R or when R is not attached the inner surface of the body K may be rifled.

I make no claim herein for the method of sand-blasting, which I have also invented and which this apparatus herein claimed is specially well adapted to carry out, nor do I intend in any way to include the said method as a part of this application, as I have made an application for United States Letters Patent on said method of sand-blasting, which Letters Patent were filed on September 5, 1899, and given the Serial No. 729,479.

What I claim is—

1. In a sand-blast apparatus a nozzle-body, consisting of an air-chamber, an inner nozzle, and a detachable outer nozzle, the adjacent surfaces of said air-chamber and said inner nozzle forming an annular opening when said outer nozzle is detached, and the adjacent surfaces of said inner and outer nozzles forming an annular opening when said outer nozzle is attached.

2. The combination in a sand-blast apparatus of a reservoir, a mixing device, means for delivering sand from the said reservoir to the said mixing device, a nozzle-body consisting of an inner nozzle and an air-chamber and having an annular opening formed by the adjacent surfaces of the said inner nozzle and the said air-chamber, means for conveying sand from the said mixing device to the said inner nozzle, an air-forcing apparatus, means for connecting the said air-forcing apparatus and the said air-chamber.

3. In a sand-blast apparatus a nozzle-body consisting of an air-chamber and an inner nozzle, the adjacent surfaces of the said inner nozzle and the said air-chamber forming an adjustable annular opening.

4. In a sand-blast apparatus a nozzle-body consisting of an air-chamber, an inner nozzle, and a detachable outer nozzle, the adjacent surfaces of said air-chamber and said inner nozzle forming an adjustable annular opening when said outer nozzle is detached, and the adjacent surfaces of said inner and outer nozzles forming an adjustable annular opening when said outer nozzle is attached.

5. In a sand-blasting apparatus a nozzle-body, consisting of an air-chamber, an inner nozzle, and a detachable discharging-nozzle,

the adjacent surfaces of the said inner nozzle and the said discharging-nozzle forming an annular opening.

6. The combination in a sand-blasting apparatus of a discharging-nozzle, an air-forcing apparatus, means for connecting the said air-forcing apparatus and the said discharging-nozzle, an inner nozzle projecting into the said discharging-nozzle, a mixing device, means for connecting the said inner nozzle and the said mixing device, and an adjustable reducer situated between the said inner nozzle and the said discharging-nozzle.

7. The combination in a sand-blasting apparatus of a mixing device, a nozzle, means for connecting the said mixing device and the said nozzle, means for conveying a blast of air past the end of said nozzle and inducing a current of air through the said nozzle and the said mixing device.

8. In a sand-blast apparatus a nozzle-body consisting of an air-chamber and an inner nozzle, the adjacent surfaces of the said inner nozzle and the said air-chamber forming an annular opening, and means for regulating the area of said annular opening.

9. In a sand-blast apparatus a nozzle-body consisting of an air-chamber and an inner nozzle adapted to be moved backward and forward and held in various positions, the outer surfaces of said nozzle-body being cone-shaped, and forming with the adjacent inner surface of said air-chamber an annular opening whose area varies according to the relative position in which said inner nozzle is held.

10. The combination in a sand-blast apparatus of a mixing-box having pipes entering said box at opposite sides, but in substantially the same vertical and horizontal planes, but leaving a space between the interior adjacent extremities of said pipes; a nozzle; means for connecting said nozzle to one of said pipes; and means for discharging a blast of air past the end of said nozzle and inducing a current of air through the said nozzle and the said pipes.

11. The combination in a sand-blast apparatus of a nozzle-body, consisting of a nozzle and an air-chamber, and having an annular opening formed by the adjacent surfaces of said nozzle and air-chamber; an air-forcing apparatus; means for connecting said air-forcing apparatus and said air-chamber; a mixing-box having pipes entering said box at opposite sides, but in substantially the same vertical and horizontal planes, and leaving a space between the interior adjacent extremities of said pipes; and means for connecting said nozzle to one of said pipes.

12. In a sand-blast apparatus a mixing device, consisting of a mixing-box having an opening for the admission of sand, and two conduits entering said box at opposite sides, but in substantially the same horizontal and vertical planes, and adapted to leave an adjustable space between their inner adjacent extremities.

13. In a sand-blast apparatus the combination of a nozzle and mixing device, means for connecting said nozzle and said mixing device, means for conveying a blast of air past the end of said nozzle and inducing a current of air through said nozzle and said mixing device, and a reservoir adapted to supply said mixing device with sand, and also to be emptied at will without stopping the operation of the apparatus.

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Witnesses:
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