April 20, 1937. V. E. MINICH 2,077,636

ABRASIVE THROWING MACHINE

Original Filed May 26, 1934 2 Sheets-Sheet 1

Fig. 1

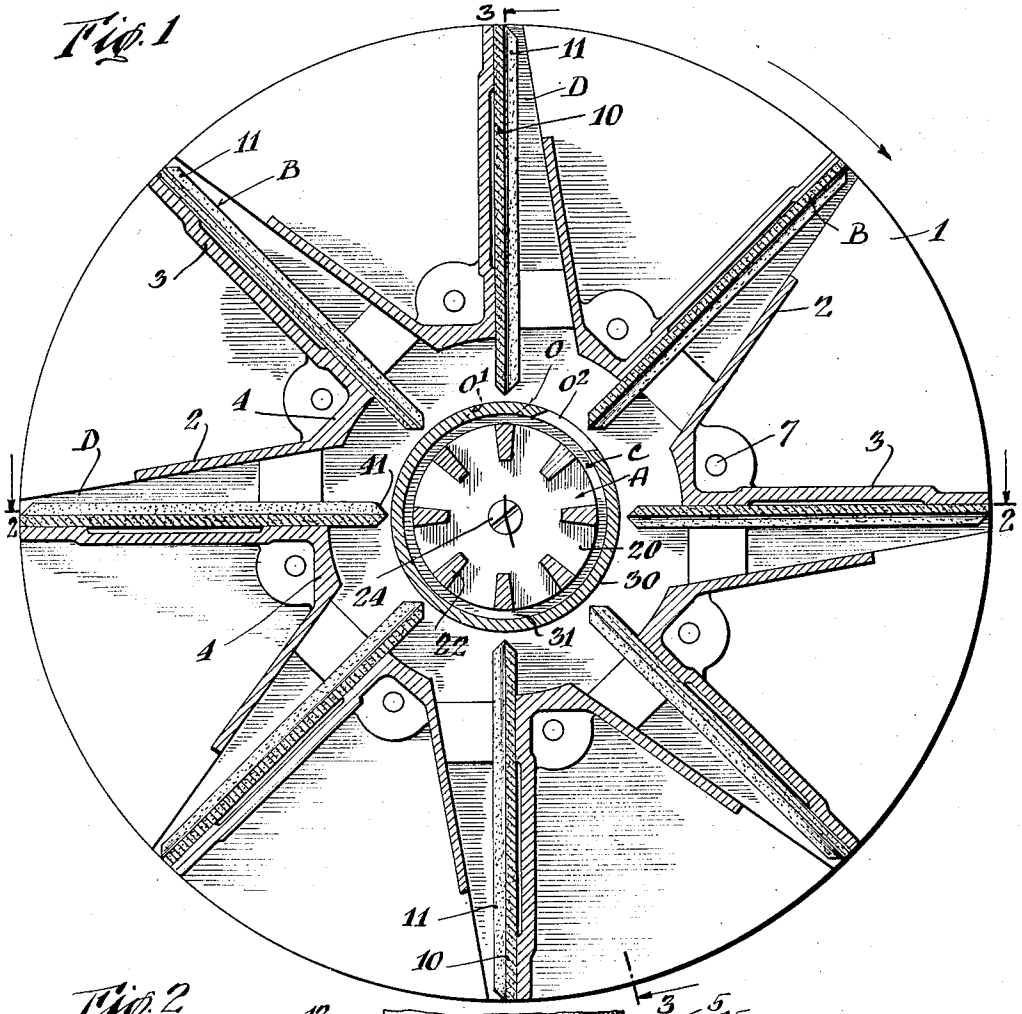
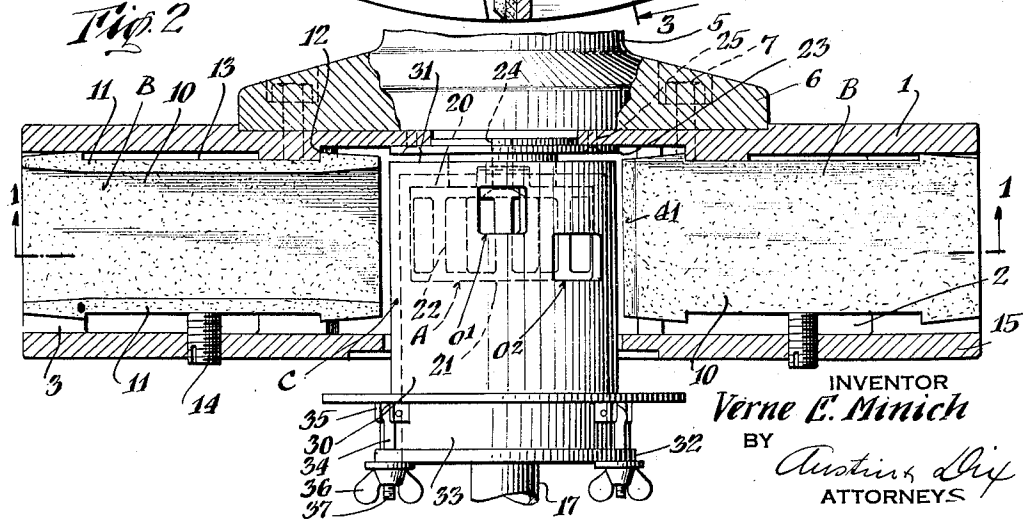


Fig. 2



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Fig. 3

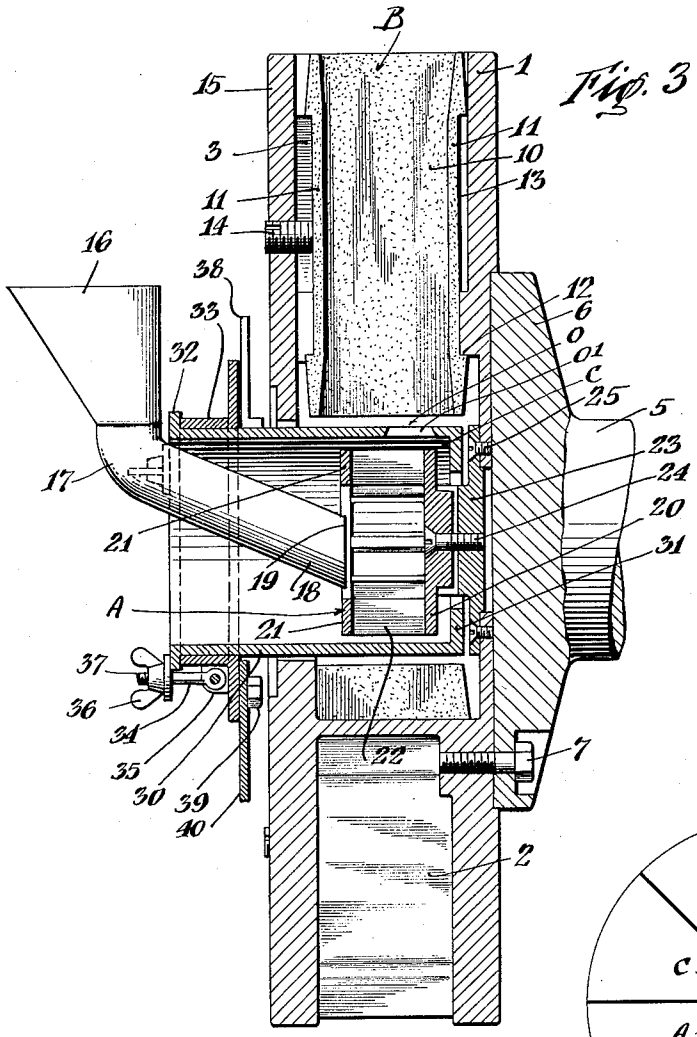


Fig. 5

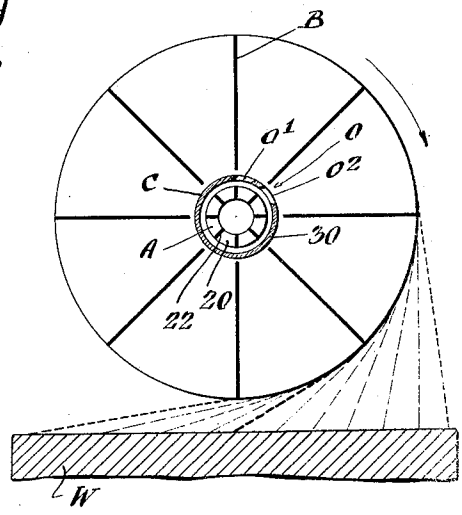
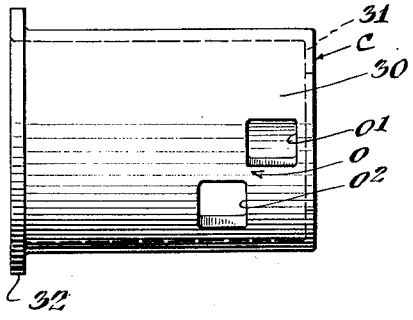


Fig. 4



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ABRASIVE THROWING MACHINE

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Original application May 26, 1934, Serial No. 727,665. Divided and this application November 11, 1935, Serial No. 49,983

6 Claims. (Cl. 51—9)

This invention relates to abrasive throwing machines and more particularly to an apparatus for throwing abrasive at a blasting velocity so as to effectively clean metal sheets, castings, forgings and the like.

This application is a division of my copending application, Serial No. 727,665, filed May 26, 1934.

According to this invention the machine comprises an abrasive throwing wheel so arranged and constructed as to throw the abrasive fed into the machine at a blasting velocity under directional control. The machine generally comprises a plurality of throwing blades extending from the periphery of the wheel inwardly short of the axis of rotation of the wheel. The blades may be rotatably supported upon either one or a pair of spaced rotatably mounted side wall discs fixed to a rotatable shaft. The blades are preferably channel shaped to contain the moving abrasive and protect the permanent parts of the machine from the wearing effects of the moving abrasive. The abrasive is fed into the path of the rotating blades through a discharge outlet provided in a tubular control member which extends into the central space or chamber and is independently preferably adjustably mounted to direct the abrasive thrown from the wheel in the desired direction. Suitable means for forcing the abrasive out through the discharge outlet is provided, as for example, an impeller positioned within the control chamber and preferably attached to the rotor for rotation therewith. The impeller throws the abrasive through the discharge outlet in the control member and into the path of the rotating vanes of the rotor. The impeller generally comprises a plurality of radially arranged vanes or blades carried by the rotatable disc of the rotor. The abrasive is fed through a suitable feed pipe into the impeller and the vanes of the impeller pick up the abrasive and carry the abrasive to the discharge outlet in the control member through which it is progressively thrown in substantially uniform increments into the path of the rotating blades.

The abrasive can be fed into the path of the rotating blades at any desired point by adjusting the position of the discharge outlet in the control member. Directional control is thus accomplished. The circumferential length of the discharge outlet determines the length of the path swept by the thrown abrasive. The discharge outlet is preferably of such shape and form that the abrasive is discharged uniformly through the entire area of the discharge outlet. A discharge outlet in the control member comprising a plurality of spaced adjacent openings have proven to be practical and efficient. Substantially uniform distribution of the thrown abrasive over the area to be treated may thus be obtained. The control member is preferably constructed and mounted so that it can be easily removed and replaced if desired by a control member having an opening or openings of different size or shape. The same machine can thus be used for a variety of different operating conditions.

An object of this invention is to provide an abrasive throwing machine provided with adjustable means by which abrasive thrown from the machine may be directionally controlled and substantially uniform impingement intensity attained.

Another object of this invention is to provide a machine for throwing abrasive at a blasting velocity having means for controlling the direction of flight and the distribution of the thrown abrasive over the area treated.

Another object of this invention is to provide an abrasive throwing machine having associated parts by means of which substantial uniformity of distribution of the thrown abrasive over the area to be covered may be achieved.

Another object of this invention is to provide an abrasive throwing machine which is simple in construction, inexpensive to manufacture and produce, which has a low power consumption for the work done, which imparts to the abrasive particles a highly effective abrading velocity, which causes a minimum disintegration of the abrasive particles, which is durable and lasting in construction, which is not subjected to excessive wear from the abrasive when thrown by the machine, which is provided with means for controlling the directional flight, the impingement concentration and the area covered by the thrown abrasive, and which is highly adaptable for the cleaning of metal sheets, billets, shapes, forgings, castings, metal parts and other articles.

Other objects of this invention will become apparent as the disclosure proceeds.

In order that a clearer understanding of my invention may be had, attention is hereby directed to the accompanying drawings forming a part of this application and illustrating certain possible embodiments of my invention.

Referring to the drawings:

Fig. 1 is a longitudinal cross sectional view taken through the abrasive machine showing the interior construction thereof, this view being taken on line 1—1 of Fig. 2;

Fig. 2 is a transverse cross sectional view

through the abrasive machine, this view being taken on line 2—2 of Fig. 1;

Fig. 3 is a transverse cross sectional view through the abrasive machine showing more particularly the construction of the control member and impeller, this view being taken on line 3—3 of Fig. 1;

Fig. 4 is a side view of a tubular control chamber having a discharge outlet comprising circumferentially spaced discharge openings;

Fig. 5 is a diagrammatic view illustrating the direction of movement of the abrasive thrown from the machine when the discharge opening in the adjustable control member is positioned as shown.

Similar reference characters refer to similar parts throughout the several views of the drawings and specification.

One of the big difficulties heretofore encountered in the operation of abrasive throwing wheels results from lack of control over the abrasive thrown therefrom. When the wheel or rotor is operated at a speed of 1800 revolutions per minute and upward, the rotor has a tendency to carry a portion of the abrasive around with it and throw the abrasive off into space where it fails to impinge the work if the abrasive is not brought under proper control before it is thrown. A heavy loss in efficiency thus results, and even more important, particles thrown at random soon destroy and abrade away operating parts of the machine or any protective guard placed around the machine. This invention contemplates provision of means for placing the thrown abrasive under control so that all abrasive particles may be directed and controlled so as to directly and substantially uniformly impinge the work.

According to this invention abrasive particles, such as sand, steel, filings or shot are fed into an impeller A positioned within a control member C centrally mounted within a wheel or rotor. The rotor is mounted upon a rotatable shaft 5 having a hub 6 connected by means of the bolts 7 to a side wall member or disc 1. Abrasive throwing blades B are provided which are radially arranged in spaced relationship and extend from the periphery of the wheel inwardly short of the axis of rotation of the wheel so as to provide a central opening. The blades may be suitably supported from the side wall member or disc 1 or if desired the blades may be suspended between a pair of spaced side wall members 1 and 15. When a pair of side wall discs 1 and 15 are provided they may be held in fixed spaced relationship by means of suitable connecting vanes 2 which may also provide a support for the blades B. A guard vane 3 following the connecting vane 2 may be provided, both vanes being joined together by an apex portion 4.

Directional control of the abrasive may be accomplished through the provision of a tubular control member C which is positioned centrally of the rotor and is independently and adjustably mounted with respect to the blades B. The control member C comprises generally a tubular wall 30 provided with an inturned flange 31 at the inner end thereof. The outer end of the tubular side wall 30 extends outside of the rotor and is provided with an out-turned flange 32. A supporting collar 33 surrounds the outer end of the tubular side wall 30 and is so shaped and arranged as to permit rotation of the member with respect thereto. The supporting collar 33 may be angle shaped in cross section, as shown, or any other suitable shape. The collar member 33 is connected by means of bolts 39 to a supporting plate 40 extending from the framework which supports the machine. A pair of handles 38, suitably connected to the tubular side wall 30 of the control member, may be provided for adjusting the control member with respect to the rotor.

Suitable means are provided for locking the control member in any desired adjusted position. A plurality of key bolts 34 may be provided which are hinged to lugs 35 extending from the supporting collar 33. Threaded wing nuts 36 which screw over threaded end portions 37 of the key bolts 34 seat over the out-turned flange 32 of the control member. By manipulating the wing nuts 36 the control member may be locked in any desired position. The control member C may be adjusted in position by simply loosening the wing nuts 36 and rotating the control member into the desired adjusted position. The control member is provided with a discharge outlet O through which the abrasive fed into the machine is discharged into the path of the moving blades B. The shape and arrangement of the discharge opening O will be discussed more fully hereinafter in connection with the operation of the machine.

Means are provided for propelling the abrasive fed into the control member into the path of the moving blades through the discharge outlet O. An impeller A positioned within the control member C rotates with the rotor. As shown more particularly in Figs. 1 and 3, the impeller comprises spaced plates 20 and 21 connected by the radially arranged throwing vanes and blades 22. The impeller positioned within the control member C is operatively connected to the rotor of the machine by means of a screw bolt 24 which extends through the plate 21 and screws into a plate 23 fixed to the disc 1 of the rotor by means of screws 25. It is understood, however, that the impeller can be connected to the rotor by other convenient means or it may be driven independently. The impeller should be so connected, however, as to permit removal of the control member when desired. Removal of the control member may be effected in the assembly herein shown by removing the screw bolt 24 which permits removal of the impeller A along with the control member C.

The abrasive is fed into a hopper or funnel 16 from which it passes into a suitable feed pipe 17. Plate 20 of the impeller is provided with a large opening 26 through which the feed pipe 17 extends.

In operating the machine a supply of abrasive is fed into the hopper or funnel 16 from which it is fed in controlled amounts through the feed pipe 17. The abrasive is emitted from the discharge opening 19 of the feed pipe and is immediately picked up and carried by the throwing vanes 22 of the impeller until the discharge outlet O is reached. The abrasive then escapes through the outlet O.

The shape as well as the length of the discharge outlet O determines to a large extent the length of the path swept by the abrasive discharged from the machine as well as the uniformity of the discharge. There is shown in Fig. 4 a control member having a plurality of separated discharge openings O_1 and O_2 extending peripherally around the control member. These openings are preferably rectangular in shape but may be given a triangular or other shape. Where two discharge openings are used, the width of each discharge opening may be approximately half the axial width of the impel-

ler. Considering the impeller as rotating clockwise, the abrasive is first discharged through one of openings O_1 and then through the succeeding opening O_2. The openings are preferably arranged so that there is no break in the uniformity of discharge. A path of considerable length can be cleaned by the provision of two or more discharge openings, each of which may cover a part of the actual width of the impeller, the openings being thus offset with respect to one another. The abrasive flowing from each opening spreads fanwise over the area to be cleaned and a sufficient interval or space should be allowed between openings so that the fans will not overlap or overlap sufficiently only to produce substantial uniformity of the abrasive discharge. The offset arrangement of the openings as here shown has produced very advantageous results with respect to the uniformity of discharge and a long path across the work is swept by the abrasive.

The abrasive discharged through the openings O_1 and O_2 is impelled into the path of the moving throwing blades B. The throwing blades B, as shown in Figs. 1, 2 and 3, are made of heavy wear resisting material and are suitably supported and held in spaced radial arrangement. Each blade may extend over and rest upon a supporting vane 2. The blades B are positioned between the discs 1 and 15 and extend from the periphery of the control member C to the outer periphery of the rotor. Each blade B is in the form of a chute comprising a bottom portion 10 which covers the vane 2, and side wall portions 11 which confines the abrasive moving outwardly toward the wheel periphery within the blade area and thus protects the discs 1 and 15 from the abrading action of the flying abrasive. Any convenient means for removably securing the blades B in position may be provided. For purposes of illustration, one form of blade securing means is shown which comprises a shoulder 12 projecting from the disc 1 and seated within a groove 13 cut in the side wall 11 of the blade B. A set screw 14 extends through the disc member 15 and engages the side portion 11 to lock the blade in position. Other well known means for removably securing the blades in position, however, may be provided within the scope of this invention. The inner end of each blade is positioned adjacent to the tubular side wall 30 of the control member. The inner end portion 41 of the side wall portions 11 are beveled and the underside of the bottom portion 10 is also beveled, as shown in Fig. 1, to reduce the end of the blade to substantially a fine edge which cleaves the abrasive ejected from the discharge outlet and directs the same across the blades and prevents rebound and scattering of the abrasive. The inner end of the blade is preferably flared outwardly so as to more readily catch the abrasive emitted from the discharge outlet O.

In all cases the axial width of each discharge opening or the combined axial width of the discharge openings taken together should be sufficient to extend completely over the side walls of 20 and 21 of the impeller. By making the discharge opening equal to or larger than the width of the impeller A the circumferential side margins of the opening are spared the wear which otherwise results when the abrasive thrown by the impeller is thwarted in its exit by the overhanging portions along the circumferential sides of the opening. The axial width of the opening should, however, be not more, and preferably less, than the width of the blades B so that all the abrasive is guided directly into the path of the blades B and out of contact with the permanent parts 1 and 15 of the machine.

It is understood that a variety of different shaped discharge openings may be used within the contemplation of this invention depending upon the effects to be produced. The circumferential length of the opening generally determines the length of the path swept by the abrasive and the width of the slot determines the intensity and uniformity of the abrasive thrown from the machine.

The abrasive ejected from the discharge openings O_1 and O_2 or modifications thereof is thrown or projected by the throwing blades B. As diagrammatically illustrated in Fig. 5, the abrasive which is first ejected from the discharge opening is carried by the throwing blades B a distance of approximately 120 to 180° before leaving the outer ends of the blades to impinge the work W. The abrasive which is last to leave the discharge opening O likewise leaves the ends of the blades B at a point approximately 120 to 180° removed from the extreme edge of the discharge opening. The range of discharge, of course, depends to a considerable degree upon the length of the discharge passage through which the abrasive has to move after being emitted from the discharge opening in the control member. The direction of discharge may also vary with the length of the discharge passage D, as well as the diameter of the control member and blade tip diameter of the wheel. A wheel or rotor having a diameter of approximately 19½ inches and a control member of approximately 5 inches will throw the abrasive approximately as shown in Fig. 5 when rotated at approximately 2250 R. P. M. Different operating effects may be obtained by changing either the shape or size of the discharge opening in the control chamber. Change in shape and size of the discharge opening can be effected by either providing adjustable shutters for the opening or by the provision of a removable and replaceable control member having the desired type of discharge opening.

With a machine as above constructed substantially all of the abrasive can be thrown in the direction desired so as to directly impinge the desired work area and perform effective work. The removable and replaceable wear blades and the discharge opening in the control member are so arranged and constructed that substantially none of the abrasive emitted from the discharge opening is permitted to contact the discs 1 and 15 or other permanent parts of the machine. The throwing blades B are made of wear resisting material and will withstand great abuse. When furrowed or otherwise worn by the moving abrasive they may be easily and quickly removed and replaced with new blades.

The machine is adapted for a variety of different uses, such as the cleaning of metal sheets, billets, castings, forgings and other articles. The machine may be mounted upon any suitable standard or may be associated with other apparatus, such as a tumbling mill. The machine is made of few parts, and may be inexpensively manufactured and assembled. Adjustable means are provided which may be easily and quickly manipulated to directionally control the thrown abrasive as well as to limit or expand the path

swept by the abrasive and the intensity of the impingement against the work. The machine is furthermore strong and durable in construction, substantially foolproof in operation, requires little floor space and is highly efficient.

While certain novel features of the invention have been disclosed and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. A machine for throwing abrasive at blasting velocities including, a tubular control member having a plurality of discharge openings diagonally offset with respect to one another, and throwing blades radially arranged around said member operative to throw the abrasive emitted from said openings.

2. A machine for throwing abrasive at blasting velocities including, a tubular control member having a plurality of discharge openings diagonally offset with respect to one another, and throwing blades radially arranged around said member operative to throw the abrasive emitted from said openings, the combined axial width of said discharge openings being not more than the width of said throwing blades.

3. A machine for throwing abrasive including in combination, a tubular control member having a plurality of rectangular shaped discharge openings diagonally offset with respect to one another, and throwing blades radially arranged around said member operative to throw the abrasive emitted from said openings.

4. A machine for throwing abrasive at blasting velocities including, a rotatably mounted disc, throwing blades mounted on said disc a control member of tubular form adjustably mounted independently of said disc, and an impeller comprising rotatably mounted radially arranged vanes positioned within said member, and a plurality of discharge openings in the side wall of said tubular member through which the abrasive is thrown from the member by said impeller and into the path of said blades, said discharge openings being diagonally offset with respect to one another and having a combined axial width less than the width of said throwing blades.

5. A rotor for throwing abrasive at blasting velocities including in combination, rotatably mounted throwing blades extending inwardly short of the axis of rotation of said wheel to provide a central space, a tubular control member within said central space having a diagonally offset discharge outlet in the side wall thereof, a rotatable impeller for forcing abrasive out through said discharge outlet on to the inner ends of the blades longitudinally of the blades and into the path of rotation thereof, said diagonally offset discharge outlet including a plurality of closely spaced discharge openings each of limited peripheral length for producing substantially even distribution of a directed stream of abrasive thrown by said blades.

6. A rotor for throwing abrasive at blasting velocities including in combination, rotatably mounted channel shaped throwing blades extending inwardly short of the axis of rotation of said wheel to provide a central abrasive receiving space, a tubular control member positioned within said central space having a discharge outlet in the side wall thereof, means for forcing abrasive out through said discharge outlet on to the inner ends of the blades longitudinally of the blades and into the path of rotation thereof, said discharge outlet including a plurality of spaced diagonally offset discharge openings each of limited peripheral length for producing substantially even distribution of the abrasive thrown by the rotating blades.

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