Feb. 8, 1938. W. L. KEEFER 2,108,006

ABRADING APPARATUS

Original Filed July 25, 1935 2 Sheets-Sheet 1

Fig. 1

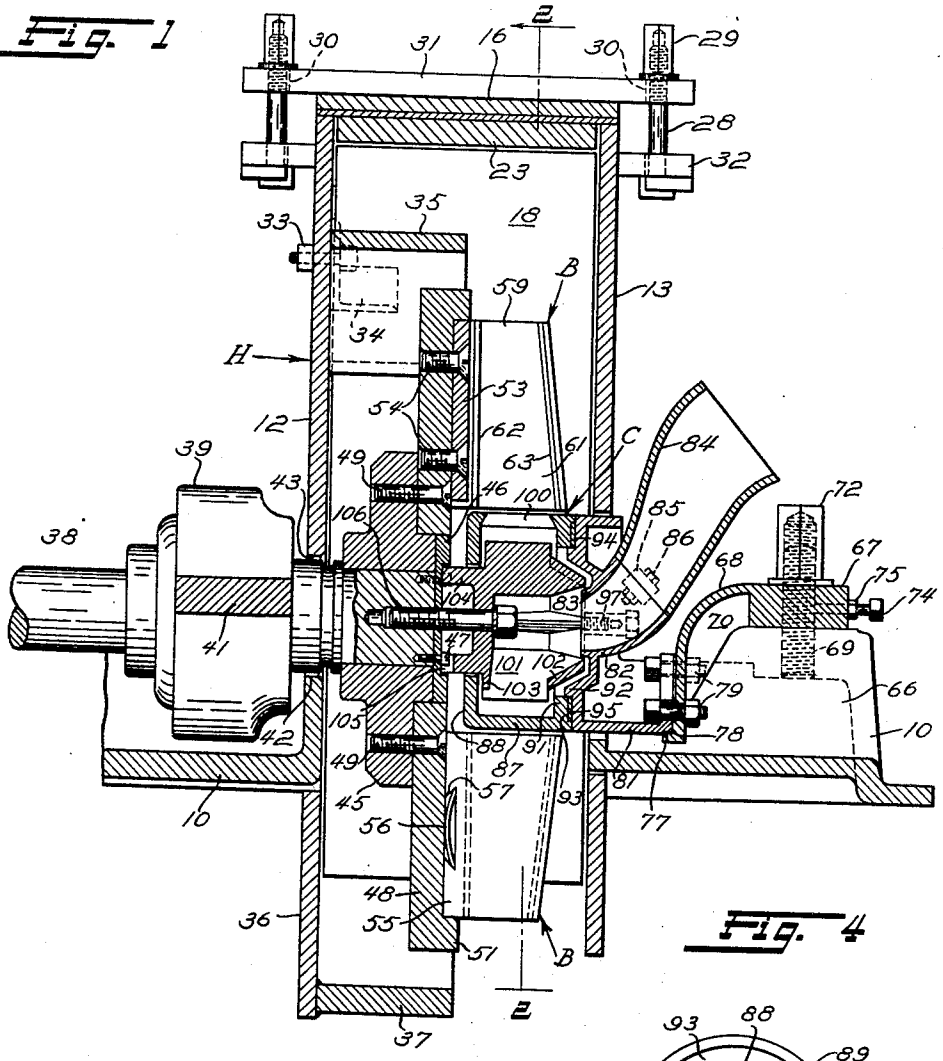
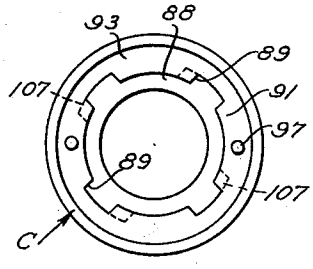


Fig. 4



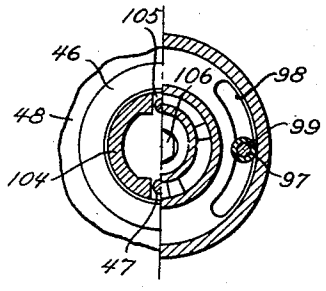


Fig. 3

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ABRADING APPARATUS

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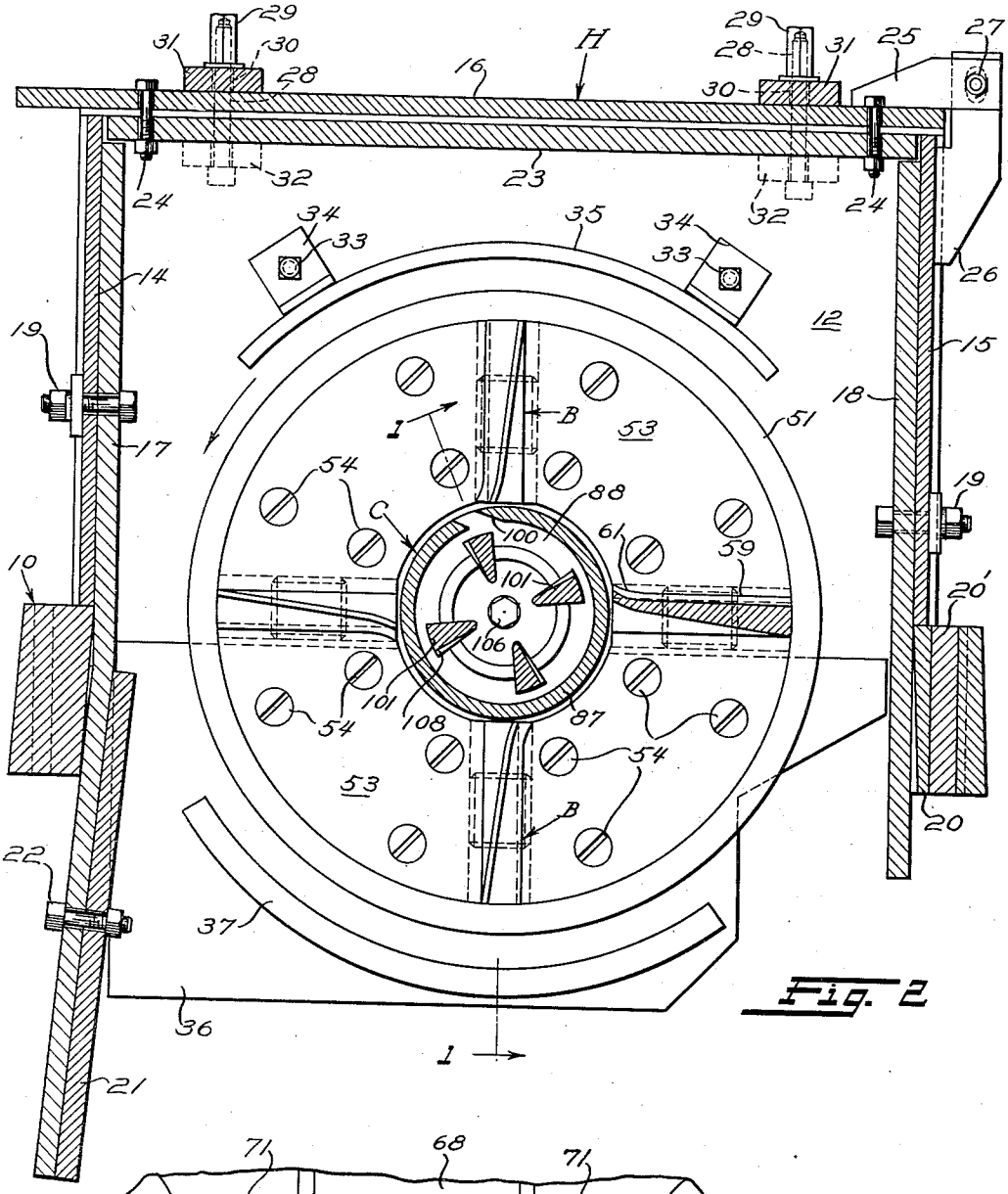


Fig. 2

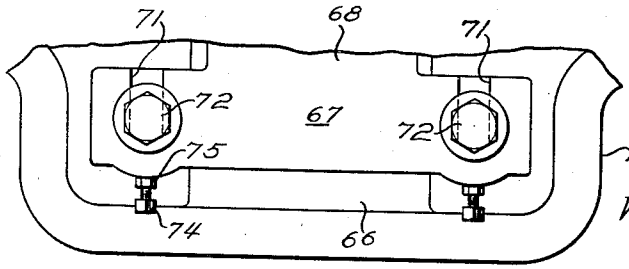


Fig. 5

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UNITED STATES PATENT OFFICE

2,108,006

ABRADING APPARATUS

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Original application July 25, 1935, Serial No. 33,185. Divided and this application June 26, 1937, Serial No. 150,648. Renewed November 9, 1937

15 Claims. (Cl. 51—9)

The present invention relates to abrading apparatus and it is more particularly concerned with mechanical abrasive projecting or propelling machines of the character wherein an abrasive is projected by centrifugal action against the work operated upon.

A primary object of the present invention is to provide a machine having all of the desirable characteristics of the successful abrading machine shown in copending application Serial No. 726,188 together with further highly desirable structural and operating features that improve the wearing qualities, life and efficiency of the mechanism materially. This application is a division of my application Serial No. 33,185, filed July 25, 1935.

It is a major object of my invention to provide a novel centrifugal abrading machine that will efficiently utilize all of the abrasive supplied thereto, and have a long useful life in service, which is so constructed as to provide ready disassembly for servicing, and yet which is low in cost.

It is a further object of my invention to provide a centrifugal abrading machine having impeller and propeller blades which are properly correlated to produce a uniform flow of abrasive to the propeller blades and to reduce the initial impact of the abrasive therewith and the abrasive wear thereon, while improving the abrasive curtain discharged therefrom by increasing its concentration and reducing the stray abrasive discharge.

It is another object of this invention to provide a novel abrasive feeding assembly for centrifugal abrading machines in which the need for complicated and expensive air and abrasive seals is obviated.

A further object of this invention is to provide an abrasive feeding unit of novel design for abrading machines which may be readily removed from the machine as a unit without disturbing any of the parts thereof.

My invention also aims to provide centrifugal abrading machines with an improved abrasive impeller assembly and generally to refine and improve other features of such machines.

Further objects of the present invention will become apparent as the detailed description thereof proceeds in connection with the annexed drawings, and from the appended claims.

In the drawings:

Figure 1 is a longitudinal sectional view of a centrifugal abrading machine embodying my invention and it is taken approximately on the line 1—1 of Figure 2. In this view one of the propeller blade securing plates has been removed to show a part of the blade securing means.

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1, and it shows one of the propeller blades in section.

Figure 3 is a fragmental sectional view through the impeller and feed assembly and the section is taken so as to intersect the impeller hub on the left-hand side of the figure, and to intersect the peripheral flange of the holder on the other side of the figure.

Figure 4 is a right-hand end view (Figure 1) of the feeding cage with its associated parts removed therefrom.

Figure 5 is a fragmental top plan view of the bracket which holds the feeding assembly in position in the device shown in Figure 1.

With continued reference to the drawings, wherein like reference characters are employed to designate like parts throughout the several views thereof, the machine is supported upon a base designated generally at 10 and which provides an opening through which the blast wheel or runner assembly projects.

Mounted upon base 10 is a runner wheel housing designated generally at H and which comprises end walls 12 and 13, side walls 14 and 15, and a cover 16 which is hinged to the housing in a manner to be presently described. Abrasive guard plates 17 and 18 are secured to side walls 14 and 15 respectively, by means of nut and bolt assemblies 19. Base 10 is provided with a member 20 having an opening filled with lead 20' or any other renewable material. A further reinforcing guard plate 21 is secured to plate 17 by means of a nut and bolt assembly 22. An abrasive guard plate 23 is also secured to the lower side of lid 16 by means of nut and bolt assemblies 24.

Housing top or lid 16 is hingedly connected to the housing for ready access to the interior by means of a hinge comprising a pair of lugs 25 secured to the lid, a pair of lugs 26 secured to the casing and a pivot pin assembly 27. The lid is releasably held in place by a plurality of bolts 28 having special dust proof or blind-ended nuts 29 threaded thereon. Bolts 28 fit through slots 30 in a pair of cross pieces 31 secured to lid 16, and are received with considerable clearance in lugs 32 secured to housing H so that nuts 29 need merely to be loosened and bolts 29 rocked out of slots 30 in cross pieces 31 to permit the lid to be lifted into opened position.

Secured to side wall 12 of housing H by means of nut and bolt assemblies 33 and angle brackets 34, is an abrasive rebound guard 35 whose function will be pointed out hereinafter. A wear plate 36 is secured in place below the base in any suitable manner and carries an abrasive rebound guard 37.

All of the rotatable parts of the machine are carried upon a shaft 38, which may be mounted for rotation in any suitable manner, but which

is supported in the present instance by means of a pair of axially spaced bearings 39 which are provided with arms 41 for securing them to the base. As the shaft and bearing arrangement forms no part of the present invention, only one bearing assembly has been shown in order to simplify the disclosure.

Power may be applied to shaft 38 in any suitable manner and it extends into housing H through an opening defined by notches 42 and 43 formed respectively in base 10 and housing side wall 12. Supported on the shouldered end of shaft 38 is a heavy disc 45 and it is preferably keyed thereto in any suitable conventional manner. Disc 45 is restrained against axial displacement from shaft 38 by means of a plate 46 which bears against the end face of disc 45 and is secured to shaft 38 by two machine screws 47.

The abrasive propelling elements of my machine are carried by a rotatable runner head or rotor 48 which is secured to disc 45 by a plurality of counter-sunk screws 49. Runner 48 is provided with a peripheral flange 51 which operates to restrain the abrasive propelling blades against outward movement in response to centrifugal force. The abrasive propelling blades are preferably four in number and are designated generally at B. Blades B are secured in place in preferably symmetrical relationship on runner 48 in a manner similar to that employed in the aforesaid copending application, and with reference to Figures 1 and 2, four sector-shaped guide plates 53 are secured in place on head 48 by means of counter-sunk screws 54, and their edges are beveled so that adjacent sides of each pair of guide plates will form a dove-tail groove. The side edge of each blade B is provided with a correspondingly beveled face 55, so that when blades B are inserted in the center of the machine and slid outwardly into position between the guide plates they will be firmly held against movement. Annular flange 51 prevents the blades from moving outwardly in response to centrifugal force and a bowed leaf spring 56, fitting in a groove 57 provided in each blade, frictionally restrains each blade against inward movement. As the blade restraining means forms no part of the present invention it will not be further described.

Referring to the configuration of the blades, and with reference to Figures 1 and 2, each blade B is provided with a substantially flat abrasive propelling surface 59, which extends from the outer end of the blade to a region near the inner end thereof. The inner end of each blade is preferably provided with a curved abrasive pick-up surface 61 for a purpose that will presently appear. With reference to Figure 1, each blade (in this instance upper blade B) is provided with a pair of abrasive guiding flanges 62 and 63. Flange 62 is substantially parallel to runner head 48 whereas flange 63 inclines toward the runner head at its outer end. Flange 63 is inclined in view of the fact that the velocity of the abrasive increases as it approaches the outer end of the blades and accordingly narrows down to a thinner stream. Hence the blade is wider at its inner end in order to insure that the abrasive will not escape laterally from the blade as it is initially contacting therewith and is in a less contracted condition.

The mechanism I preferably employ for feeding abrasive into the space defined by the inner ends of the propelling blades will now be described.

Bridging a semi-circular recess 66 provided in base 10 is an arm or bracket 67 which is provided with a forwardly and downwardly curving portion 68. Portion 68 is reinforced by means of a plurality of webs 70 which join it to arm 67. Arm 67 may be secured to base 10 in any suitable manner, but I preferably employ a pair of studs 69 which are secured in base 10 and which extend through open-ended slots 71 in arm 67. Nuts 72 are employed to hold arm 67 in place on base 10, and as seen in Figure 1 they are preferably provided with closed ends to exclude dust from the threads. Slots 71 are disposed with their open ends facing toward the rotor, so that when nuts 72 are loosened, bracket 67 may be slid to the right and removed.

In order to insure that arm 67 will be positioned properly when put in place over studs 69, it is preferably provided with a pair of positioning set screws 74 for cooperation with studs 69, each having a locknut 75 turned thereon. To properly adjust positioning screws 74, arm or bracket 67 is put in place on base 10, nuts 72 are taken up lightly, and arm 67 is then by experiment or measurement brought into the proper position. Nuts 72 are then taken up tight. Positioning screws 74 are then screwed up to take up the lost motion between them and studs 69, and locknuts 75 are then screwed into place to maintain the positioning screws in the proper set position. If desired, however, positioning screws 74 may be manipulated while nuts 72 are partially loosened and arm 67 is being maneuvered into proper position.

The forward face of the curved portion 68 of arm 67 is provided with a circumscribing flange 77 having vertical and horizontal portions. Secured to the forward face of portion 68 by three nut and bolt assemblies 79 and having a rabbeted portion 78 conforming to the flange of portion 68, is a holder 81. Holder 81 provides a combined spout and cage or distributor support.

Holder 81 is accordingly stationarily but removably secured to base 10, and it is provided with a preferably integral spout portion 82 which has an overhanging lip 83 for cooperation with the impeller in a manner to be hereinafter pointed out. Spout portion 82 is provided with a funnel or spout extension 84, and although these parts may be integrally formed, I preferably form them in two pieces to facilitate casting of the parts. They are fastened together by pairs of lugs 85 formed on the respective members and nut and bolt assemblies 86.

Abrasive introduced into spout 84 is conveyed into a cage or receptacle which is carried by holder 81, and which is designated generally at C.

Cage C is provided with a generally cylindrical portion 87, a deep, preferably imperforate flange 88 and a shallower flange 91 in which four notches 89 are provided. Notches 89 correspond in number and spacing to the blades of the impeller, to be described hereinafter. Cage flange 91 is piloted or centered upon a cylindrical hub or flange 92 provided on holder 81. Cage C is also provided with a recessed face 93, and an element 94 covers slots 98 in holder 81. Cage C is preferably adjustably supported for angular rocking movement about the axis of the machine upon holder 81 in the following manner:

Preferably a pair of diametrically opposite studs 97 are secured in flange 91 of cage C and extend through apertures in slot cover 94. Studs 97 extend through arcuately-shaped slots 98 in holder 81, as shown in Figure 3, and a pair of nuts 99 are turned thereon to releasably clamp cage C to

holder 81. As seen in Figure 1, nuts 99 are of special form as their ends are closed to exclude dust and abrasive from the threads, and they provide "hex" manipulating heads which are disposed a considerable distance from cage C in order that the nuts may be readily loosened and manipulated during the cage adjusting operation. Nuts 99 also provide convenient operating handles which may be grasped for rocking cage C into proper angular adjusted position after they are loosened. Cage C is also provided with a discharge slot or opening 100, which inclines forwardly with respect to the direction of rotation of the runner, as seen in Figure 2.

I preferably employ an impeller or agitator within cage C which rotates synchronously with runner 48, for insuring a proper feeding of the abrasive to the propeller blades B. The impeller or agitator is preferably equipped with the same number of blades as are present on runner 48, and in the present case they are four in number. Impeller blades 101 are joined at one end by a cone-shaped cylindrical portion 102 providing a truncated cone-shaped internal abrasive feeding face, and into which lip 83 of spout 82 projects. Blades 101 are jointed at their other ends by a generally cup-shaped member preferably providing a circular abrasive baffling flange 103, and a deep cylindrical flange or hub 104 in which a pair of diametrically opposed slots 105 are formed.

The impeller is preferably secured to the runner assembly by means of a long cap screw 106 which passes through an aperture in the central part of the impeller and plate 46; and is threaded into shaft 38. Cap screw 106 pulls the impeller with its flange 104 into tight engagement with plate 46 and with its slots 105 embracing the heads of machine screws 47. By reason of slots 105 in the impeller flange fitting over screws 47, it is impossible to improperly assemble the impeller with the runner assembly, as these parts must be in alignment before cap screw 106 may be brought into its final tightened position. With reference to Figure 1, flange 103 of the impeller extends outwardly beyond flange 88 of cage C, with the result that they are radially overlapped and abrasive leakage is minimized, because the abrasive in cage C would have to take a tortuous path in order to escape therefrom. In order to minimize abrasive leakage over flange 91, one wall 107 of each of slots 89 formed therein are beveled, and as seen in Figure 4 they are beveled in a direction to assist in maintaining the abrasive in cage C.

Although I have termed blades B "propeller" blades, and blades 101 "impeller" blades, their action upon the abrasive is somewhat similar because in each instance the abrasive is picked up by the inner end of the blades and is impelled or propelled outwardly over the blade and is smoothly and continuously accelerated without abrupt changes in a substantially radial direction until it reaches the tips of the blades. Blades 101 are also distributor blades as they serve to break up the abrasive stream entering cage C into a readily distributable form, and to impart an initial velocity to the abrasive prior to its being picked up by the propeller blades, and the latter function to impart the final abrading velocity to the abrasive, I have employed this terminology to differentiate these functions of the two sets of blades.

The impeller is assembled with the runner assembly in a predetermined relationship to establish a highly important cooperation between the impeller blades and the propeller blades for feeding and propelling the abrasive in a novel manner. Referring to Figure 2, the direction of rotation of the runner is counter-clockwise and it is seen that each impeller blade 101 is disposed at a predetermined angle of advance in the direction of rotation of the runner with respect to its propelling blade B. This relationship is established between the impeller and propeller blades so that the abrasive which is "churned" around in cage C will be discharged through slot 100 a predetermined angle in advance of each blade B. This synchronized or coordinated action of the impeller and propeller blades insures that the abrasive will be positively thrown out into the path of the propeller blades, and by reason of the angular velocity component of the abrasive, and the rearward inclination of the inner ends of the blades, the abrasive is picked up with a minimum impact. This also results in a more restricted or contracted discharge from the wheel. Impeller blades 101 are also provided with concave faces 108 which face forwardly with respect to the direction of rotation of the runner assembly so that the abrasive impelled thereby will be confined to the width of the blades, and will accordingly be discharged through slot 100 onto blades B in a more contracted form. By confining outward flow of the abrasive over blades B to a narrower lateral area, less power is required to drive the wheel, and the discharge from the runner is of a more concentrated character.

Operation

The work is placed under the machine opposite the discharge opening and it is to be understood that the work may assume various forms and may be moved in various ways while it is treated. For instance, the work may be located in a tumbling device or may be mounted on a truck to be moved about under the machine to expose various parts to the blast. Moreover, the work may be passed through a cabinet, and the machine mounted for oscillation about different axes in order to subject the work to the blast at various angles. Also, the work may be passed through a suitable cabinet or housing in strip or sheet form and subjected to the action of one or more of my machines. If desired, however, the machine may be mounted in inverted relationship in a cabinet to be directed against the lower side of the work passed therethrough or it may be mounted to discharge horizontally or at an oblique angle. The following discussion of the operation of the machine is therefore intended to apply to my machine irrespective of the manner in which the work is exposed to the blast stream.

Shaft 38 may be rotated at any suitable speed, but with a machine constructed as shown in the drawings, I find that a speed of approximately 2500 R. P. M. in the direction indicated in Figure 4 is suitable for satisfactory operation of the machine. Cage C is mounted on holder 81 in the position shown in the drawings at the factory, and it has been found that with the proportions of the various parts as shown, and with the discharge opening 100 located as shown in Figure 2, the discharge from the machine will be properly located when the machine is rotated at the proper speed.

However, if it is found upon operating the machine that the discharge is not directed as desired, nuts 99 may be loosened and manipulated to rock cage C and thereby change the angular relationship of abrasive discharge slot 100. As

the point at which the abrasive stream leaves the wheel is determined by the point at which the abrasive is admitted to the inner ends of the propeller blades, and as the time it takes for an abrasive particle to traverse the blade depends upon the length of the blade and to some extent upon the nature of the abrasive, it is apparent that by rocking cage C so as to vary the angular position of slot **100**, the angular range over which the discharge from the machine will occur may be correspondingly varied.

Assuming that the machine is properly adjusted, and the rotor has been brought up to speed, an abrasive of any suitable form, (preferably metal grit) is preferably allowed to drop by gravity into spout **84**, and it is preferably metered as by means of a screw or other conveyor operating at a predetermined constant speed. Rotation of runner head **48** causes blades B and impeller blades **101** to establish a partial vacuum in the axially extending passage defined by the inner ends of the impeller blades and in the lower end of spout **84**, so that the abrasive entering the spout is picked up by a rapidly moving air stream and enters the impeller with a predetermined degree of initial velocity. The abrasive is then impelled outwardly over concave portions of the impeller blades, and when it reaches the blade tips it is "churned" around or agitated within cage C. A dispersion of air and abrasive which rotates forwardly with respect to the direction of rotation of the runner assembly is thereby established, and also a stationary or slowly moving film of abrasive lodges on the interior of cylindrical portion **87** of cage C, and thereby protects it from excessive wear. Cage flanges **88** and **91** serve to confine the abrasive within the cage as it is being agitated.

The forwardly rotating dispersion of sand and air is of fairly uniform intensity but it is naturally of somewhat more concentrated character immediately in front of the leading face **108** of each impeller blade. By reason of the angular advance of each impeller blade with respect to its corresponding propeller blade, the concentrated streams of abrasive on the leading faces of the impeller blades are thrown outwardly through slot **100** in such manner, and at such a time that the inner curved end **61** of blade B will properly pick them up with a minimum of impact and "splash". As the abrasive is exhausted through slot **100**, it possesses angular as well as radial velocity in view of the impelling action of blades **101**. This feature, when taken in connection with the fact that the inner ends of blades B are curved, operates to minimize any abrading action that may take place as blades B initially pick up the abrasive. The abrasive accordingly travels outwardly and angularly, and as the tangential component of the velocity of an individual particle of abrasive is not greatly lower than the velocity of the inner ends of blades B, wear of the latter is minimized.

As the abrasive is forwardly rotated in cage C under the influence of impeller blades **101** it is confined by flanges **88** and **91** and it will be seen that if any stray abrasive should leak between cage C and holder **81** and the sides of spacer member **94**, the abrasive so escaping can do no harm as it is located within housing H and hence will merely gravitate or be impelled out of the discharge opening thereof. Moreover, as these parts merely function as a funnel or chute for introducing the abrasive into the impeller, there is no tendency for an air or abrasive leak to develop due to the arrangement and location of the parts. It is accordingly unnecessary to provide an air or abrasive tight joint between the cage and the holder.

In view of the fact that disc **45** and runner head **48** are permanent parts, as distinguished from certain other parts of the device, which are frequently replaced and hence are replacement parts, it is desired to completely protect these permanent parts against abrasion. The end of disc **45** is protected by wear plate **46**, which may be replaced in a manner to be hereinafter described when it has become worn excessively by stray abrasive. The impeller and cage and blades B may likewise be replaced and in connection with blades B, it should be observed that as the abrasive travels outwardly over surfaces **59** of each blade, it is prevented from laterally escaping from the free edge of the blade by flange **63**, and it is prevented from abrading runner head **48** or guide plates **53** by flange **62**, which keeps the abrasive spaced a considerable distance from these parts.

The abrasive is therefore supplied to the inner ends of blades B in a predetermined limited angular region, and as it travels outwardly, each particle defines a spiral path and is directed against the work over a definite region. Therefore, none of the abrasive, properly discharged from the opening **100**, strikes any of the stationary parts of the device. However, a minute amount of "stray" abrasive is sometimes admitted to the blades in a region other than that adjacent discharge slot **100**, and this abrasive, as it is discharged from blades B (Figure 2), strikes either guard plate **17**, **21**, **18** or **23**. As the amount of this stray abrasive is comparatively small, the wear plates accordingly have a long life before they must be renewed. When it does, however, become necessary to renew any of the housing guards or rebound guards they may be readily replaced by detaching their securing bolts.

Moreover, because of the large space provided between the tips of blades B and the upper part of the cabinet, particularly the corners of housing H, the abrasive is given a chance to expand and is not confined adjacent the rotor. Therefore wear of the rotor and the wear plates is minimized. Rebound guard **35** is provided in order to prevent stray abrasive from being discharged upwardly and striking guard plate **23** and then rebounding back into contact with and abrading runner head **48**, which, as previously mentioned, is a permanent part of the machine. Lower rebound plate **37** is provided to prevent abrasive from rebounding from the work and striking runner head **48**. If it is desired to inspect the runner blades or other parts of the device located in the upper portion of housing H, nuts **29** may be loosened and lid **16** lifted to expose the interior of the cabinet.

When it becomes necessary to replace blades B it is merely necessary to loosen nuts **72**, remove nuts **99**, so as to detach cage C from the holder, and pull the entire feeding assembly (with the exception of cage C) axially to the right, and remove it from the machine. It is then possible to reach into the comparatively large opening and remove the single cap screw **106** which holds the impeller in place and remove the impeller and cage C as a unit from the machine. After the impeller and cage have been removed from the machine they may be disassembled by aligning impeller blades **101** with notches **89** of flange **91**.

After cage C and the impeller have been removed in the manner just described, blades B may then be individually slid inwardly to the large central space and then withdrawn and replaced by new blades. At this time, wear plate 46 may also be renewed, if necessary, by removing machine screws 47. After the new blades are in place and plate 46 is secured to shaft 38, the impeller (or a new one if it requires replacement) is then put in place with cage C and the impeller and aligned with screws 47 as previously described. Although as illustrated I preferably employ the wear plate 46 which is separately formed from the impeller because these parts wear at different rates of speed, they may if desired be made integral without departing from the spirit of the present invention. In the event that plate 46 and the impeller are integrally formed, screws 47 are dispensed with and dowel pins or the like employed to cooperate with openings in member 45 for properly positioning the impeller in the device, and also notches 89 will be formed in flange 88 instead of flange 91, in order to facilitate assembly of the impeller with the parts. Moreover, in the two part construction shown, notches 89 may be provided in flange 88 instead of flange 91, and in such case the entire feeding assembly, including cage C may be removed by merely loosening nuts 72 and aligning the impeller with notches 89.

After the parts just described have been put in place, the remaining parts of the feed assembly may be slid to the left toward the opening in the machine. The cage is then secured to the holder by nuts 99 and the holder assembly is slid over studs 69 until it is arrested by contact of positioning screws 74 with the studs. Nuts 72 are then tightened and the machine is ready for operation. In this connection it should be observed that the horizontal contacting bearing faces provided on bracket 67 and base 10 are of considerable area, which forms an adequate support for the feed assembly.

Although I have illustrated and prefer to employ a runner assembly embodying four impeller blades and four propeller blades, it is to be understood that if desired the number of blades in each set may be one or more blades, depending upon the size of the wheel and the abrading characteristics desired. In any event, however, an equal number of blades is employed in each set, in order that the impeller may discharge the abrasive through slot 100 a predetermined angular degree in advance of the inner ends of the propeller blades and bring about the beneficial results previously discussed. It is to be understood, however, that insofar as the other novel features of my machine are concerned, an unequal number of impeller and propeller blades may be used without sacrificing the advantages of those features.

Although I have illustrated cage C as being adjustably mounted upon spout holder 81, and I prefer to employ this arrangement as it makes it possible to maintain the spout in a fixed position irrespective of the adjusted position of the cage, it is to be understood that if desired these parts may be permanently connected or integrally formed, and arcuately-shaped slots provided in holder 81 or arm 68 in the region where bolt and nut assemblies 79 cooperate with them, so as to mount the holder as well as the cage for angular adjustment upon arm 68.

Although I have illustrated an impeller assembly that is disposed in a predetermined fixed position by machine screws 47, and I prefer to use this construction, because I have experimented and determined the proper angle of advance of the impeller blades with respect to the propeller blades, and which remains fixed throughout the life of the machine, it is to be understood that if it is desired to operate the machine in a manner that requires it, slots 105 in impeller flange 104 may be elongated so as to provide a predetermined range of adjustability of the impeller with respect to the runner, and the appended claims are intended to embrace my machine when it assumes this form. Moreover, I prefer to use the positioning means shown as it is of simple form and does not entail the use of additional parts, but I may if desired, especially if an adjustable impeller is used, employ a dowel pin on one of the parts which may be selectively engaged with one, or with one of a plurality of holes located in another of the parts for positively or selectively adjusting the impeller respectively, without departing from the spirit of the present invention.

The terms "runner" and "rotor" employed in the appended claims are intended to embrace the blade carrying member irrespective of whether it is made in one piece or is as a matter of fact integrally formed with shaft 38, or is made up of two members 45 and 48 and secured to shaft 38 as shown in the drawings. Moreover, I prefer to support the propelling blades at one edge only, but it is to be understood that the invention embraces runner assemblies having an apertured side plate secured to the other edges of the blades or other similar constructions.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:—

1. In an abrading machine, at least one disc-like member mounted for rotation, a plurality of abrasive propelling blades mounted on said member, means for feeding abrasive to said blades, means for rotating said member for propelling said abrasive at abrading velocities, and a stationarily supported rebound abrasive guard mounted to one side of said member, one edge of said guard terminating in a plane normal to the axis of rotation of said member and passing through a region adjacent the junction of said member and said blades, said guard extending in an axial direction away from said blades.

2. The abrading apparatus described in claim 1, wherein said guard is of generally cylindrical configuration and is disposed closely adjacent and conforms to the outer periphery of said member.

3. In an abrading machine, a shaft member mounted for rotation, a runner mounted on said shaft and carrying a plurality of abrasive propelling blades which terminate short of the axis to define an abrasive admitting space, a wear plate secured to said shaft and operable to protect a part of said runner and the end of said shaft against abrasive wear, said plate also be-

ing operable to preclude endwise displacement of said runner from said shaft.

4. The abrading machine described in claim 3, together with an impeller disposed in said abrasive admitting space and secured to said runner for synchronous rotation therewith, said impeller bearing against said wear plate.

5. In an abrading apparatus an abrasive propelling head mounted for rotation and having a hollow abrasive admitting space adjacent its axis of rotation, an abrasive feeding device having a discharge end located in proximity to said abrasive admitting space for feeding abrasive thereto, a support providing a clamping face, holding means for releasably maintaining said feeding device in frictional engagement with said clamping face, and abutment means for adjustably limiting movement of said feeding device with respect to said rotor when said holding means is released, so as to properly locate said feeding device with respect to said abrasive admitting space.

6. The abrading apparatus described in claim 5, wherein said holding means comprises at least one threaded element associated with said feeding device and support, and said abutment means comprises at least one threaded member mounted on said feeding device and operable to bear against said threaded element.

7. In an abrading apparatus, a shaft mounted for rotation, a rotor mounted on said shaft and carrying a plurality of abrasive propelling blades which terminate short of the axis to define an abrasive admitting space, a wear plate covering the end of said shaft adjacent said rotor and secured to said shaft by at least two headed elements, an impeller disposed in said abrasive admitting space and abutting said wear plate, said impeller having a pair of recesses in which said headed elements nest, whereby said impeller is locked in a predetermined angular position on said wear plate, and means for clamping and maintaining said impeller in place against said wear plate.

8. The abrading apparatus described in claim 7, wherein said wear plate is provided with a generally circular recess and said impeller is provided with a generally circular base which seats in said recess and is piloted by the wall of said recess.

9. The abrading apparatus described in claim 7, wherein said impeller is provided with an axially directed flange which abuts against said wear plate and said recesses are formed in said flange.

10. The abrading apparatus described in claim 7, wherein said rotor is made in two parts which are detachably secured together, one of said parts surrounding said shaft and abutting the rear face of said wear plate, the other of said parts surrounding the periphery of said wear plate and being provided with a surface disposed substantially flush with the front face of said wear plate.

11. The abrading apparatus set forth in claim 3, together with an impeller disposed in said abrasive admitting space and bearing against said wear plate for synchronous rotation therewith, said impeller and said wear plate having aligned central apertures, and a bolt extending through said apertures and being secured in the end of said shaft and having the head thereof bearing against said impeller and holding it in clamping engagement with said wear plate.

12. In an abrading apparatus, a shaft mounted for rotation; a head having an axially extending opening therein, said head being concentrically mounted on said shaft with said shaft extending into said opening; a plurality of outwardly extending abrasive propelling blades mounted on said head and terminating short of the axis of rotation to define a central abrasive admitting space; a stationarily supported abrasive feeding device disposed within said abrasive admitting space and operable to feed abrasive over the inner ends of said blades; a centrally located wear plate closing said opening and protecting said shaft against abrasion; an impeller disposed in said abrasive feeding device and having a clamping face disposed in surface engagement with said wear plate; and means for releasably holding said impeller with said clamping face in engagement with said wear plate.

13. In an abrading apparatus, a hub having a central opening; a shaft tightly fitting within said opening; a rotor comprising a disc mounted on said hub and having a central opening; a plurality of outwardly extending abrasive propelling blades terminating short of the axis of rotation to define a central abrasive admitting space; a stationarily supported abrasive feeding device disposed within said abrasive admitting space and operable to feed abrasive over the inner ends of said blade; a centrally located wear plate mounted on said disc and closing the opening therein to protect said shaft against abrasion; an impeller disposed in said abrasive feeding device and having a clamping face disposed in surface engagement with said wear plate; and means for releasably holding said impeller with said clamping face in engagement with said wear plate.

14. In an abrading apparatus, a rotor member of disc-like form having a plurality of outwardly extending grooves defining guideways for a plurality of abrasive propelling blades, said member being provided with a central aperture and having means mounting it for rotation; a wear plate mounted on said member and closing said opening and disposed within the inner ends of said grooves, said blades terminating short of the axis of rotation to define a central abrasive admitting space; a hollow abrasive feeding device disposed in said space; and an impeller disposed in said feeding device and secured to said wear plate.

15. In an abrading apparatus, a hub member having an axially extending opening provided therethrough, a shaft tightly fitting within said opening, a rotor comprising a disc element having a central opening, means for securing said disc element to said hub member, said rotor having a plurality of outwardly extending abrasive propelling blades terminating short of the axis of rotation to define a central abrasive admitting space, a stationarily supported abrasive feeding device disposed within said abrasive admitting space and operable to feed abrasive over the inner ends of said blades, a centrally located wear plate closing the opening in said disc element so as to protect said shaft against abrasion, said wear plate being recessed into said disc element so as to dispose it substantially flush with said disc element, means for releasably securing said wear plate in assembled position, an impeller disposed in said abrasive feeding device and means for releasably securing said impeller to said wear plate.

WALTER L. KEEFER.

CERTIFICATE OF CORRECTION.

Patent No. 2,108,006. February 8, 1938.

WALTER L. KEEFER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, second column, line 30, claim 13, for the word "blade" read blades; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of March, A. D. 1938.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)