April 20, 1937. V. E. MINICH 2,077,638

ABRASIVE MACHINE

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Fig. 1

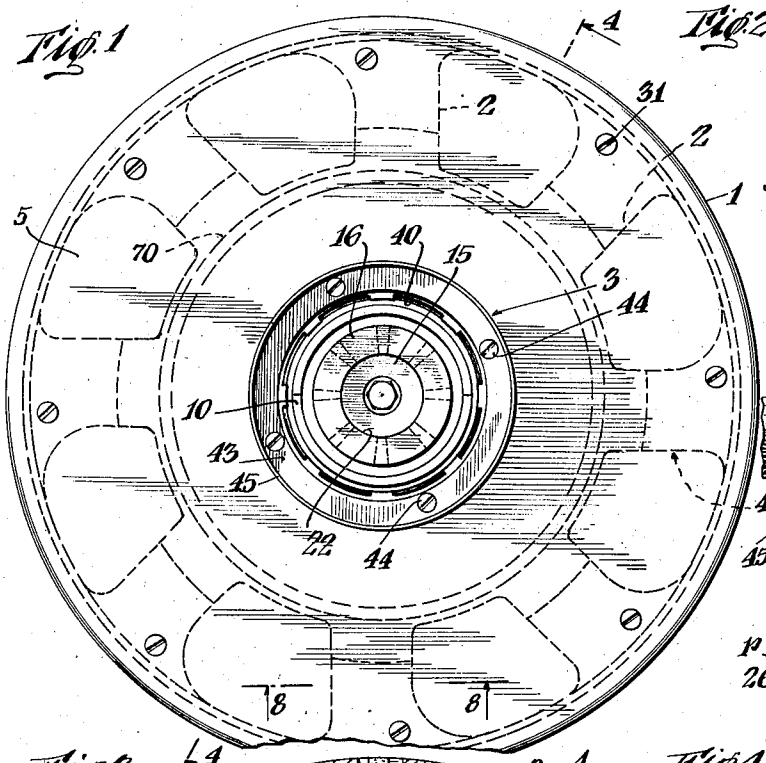


Fig. 2

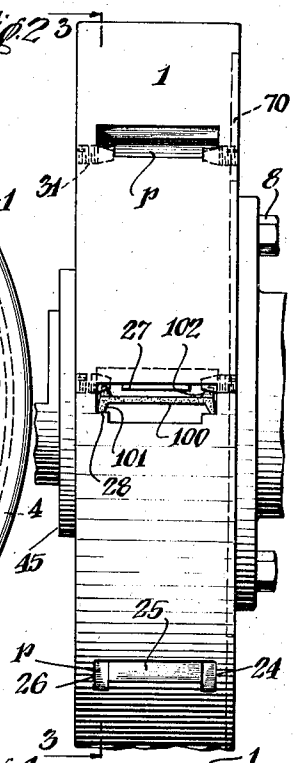


Fig. 3

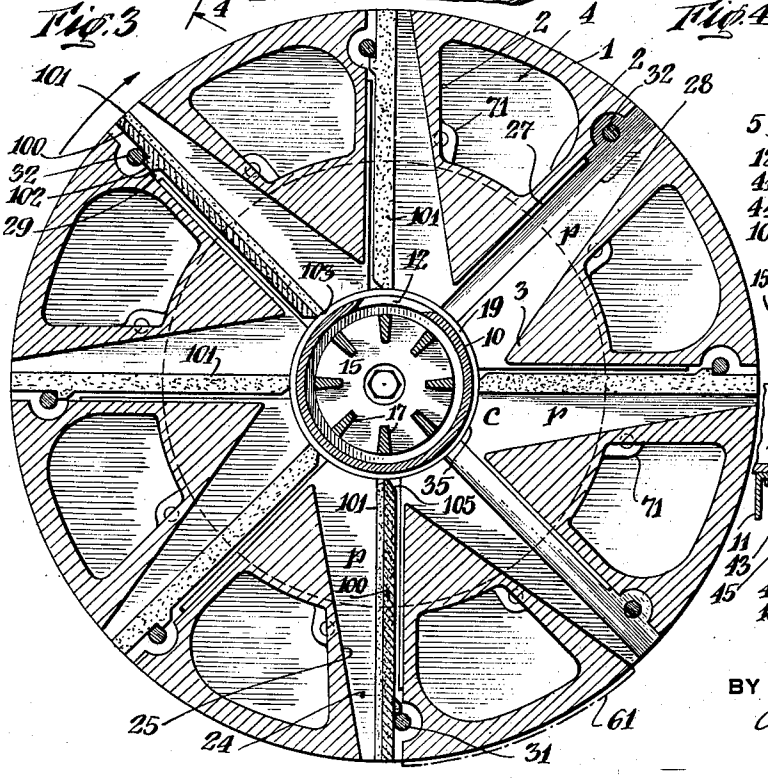
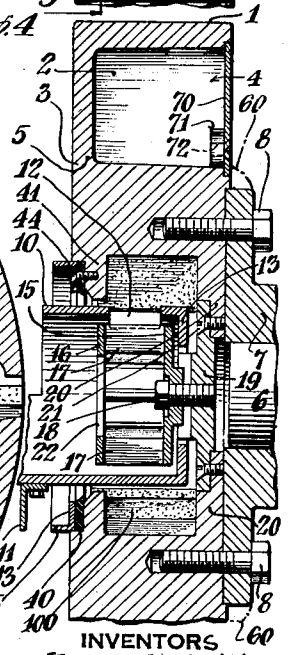


Fig. 4

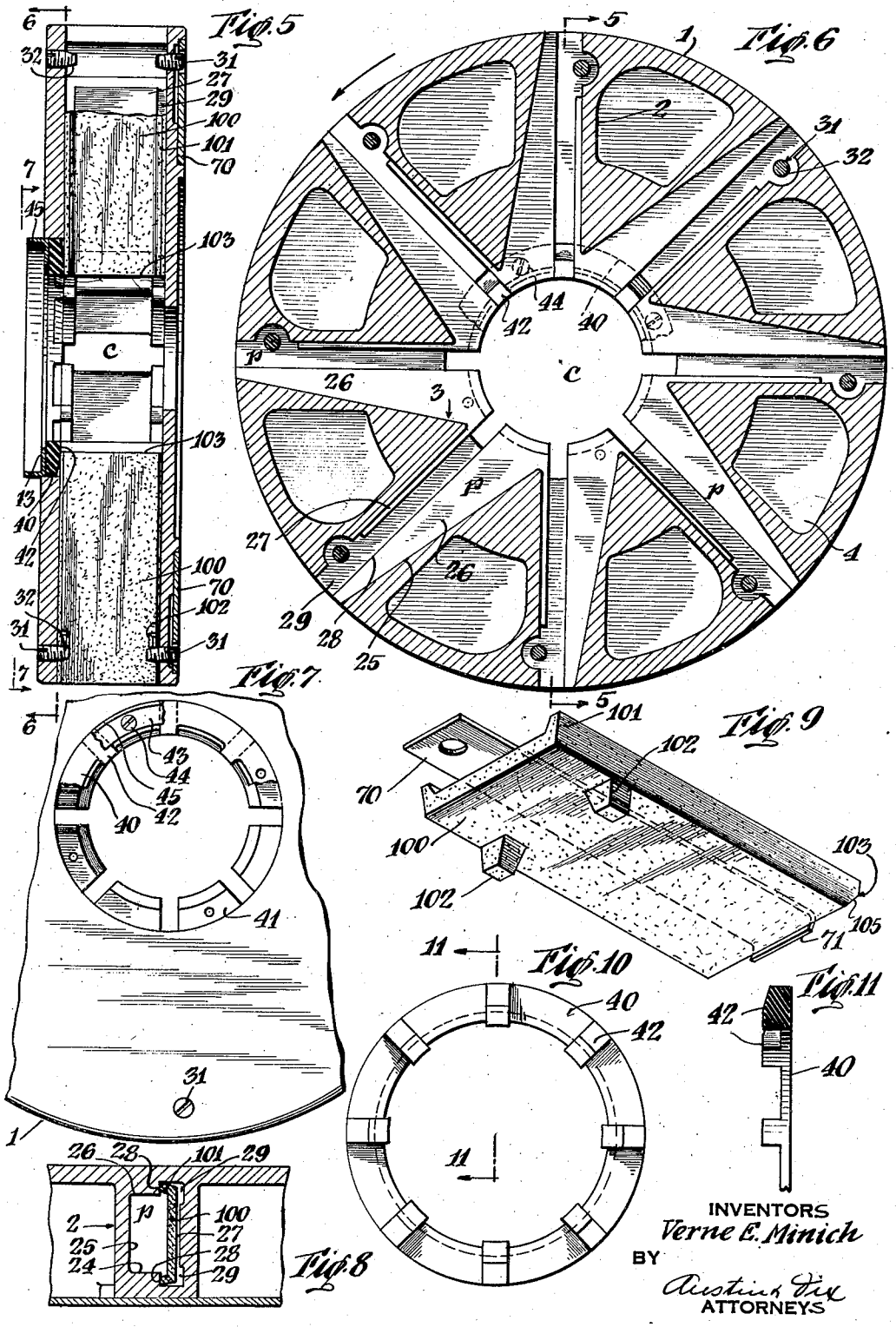


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Fig. 13

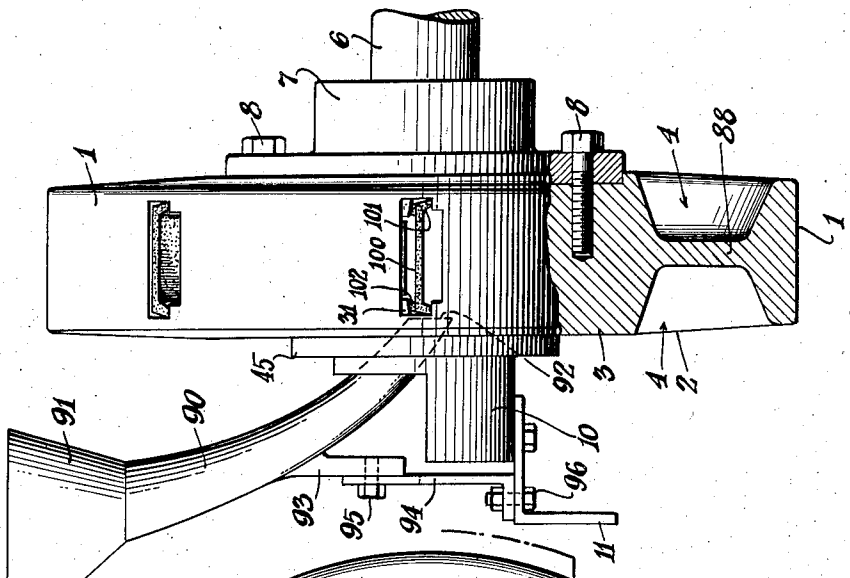
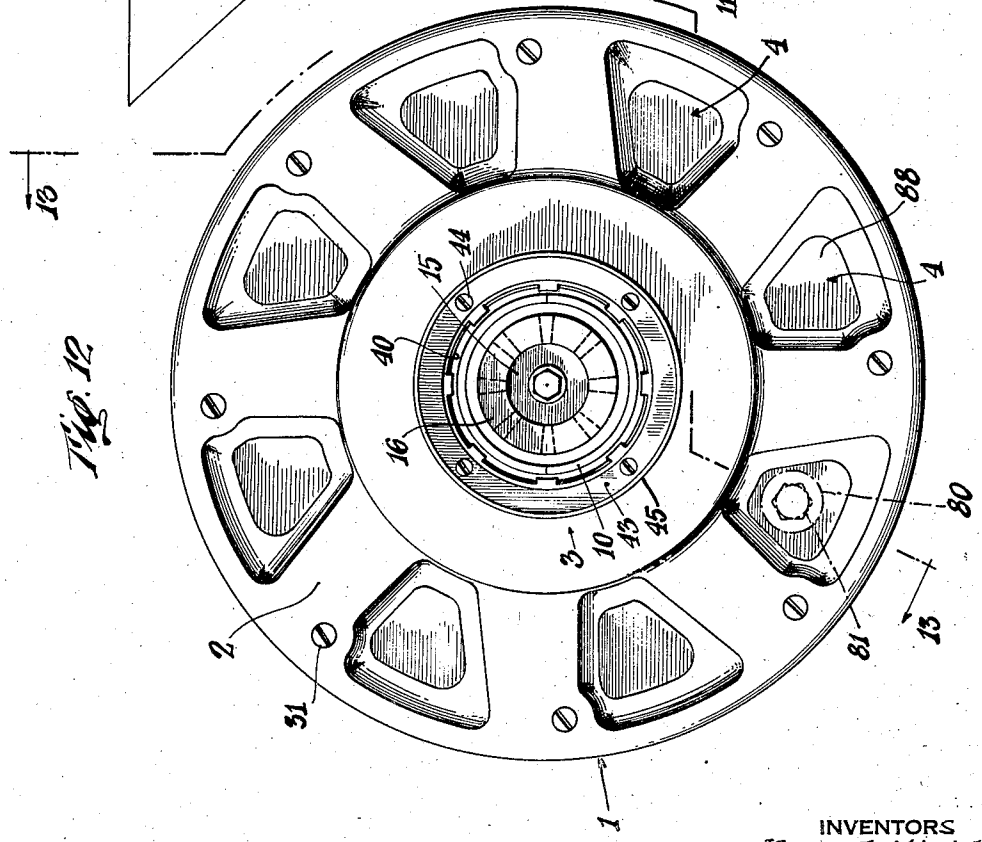


Fig. 12



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2,077,638

ABRASIVE MACHINE

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Application October 20, 1934, Serial No. 749,259

18 Claims. (Cl. 51—9)

This invention relates to abrasive machines and more particularly to an abrasive wheel adapted to throw abrasive at blasting velocities and effective for cleaning metal castings, forgings, billets and rolled steel sheets.

According to this invention the improved wheel comprises a continuous rim portion, a hollow hub portion providing a central chamber, and hollow spokes or conduits radiating from the hub portion to the rim portion of the wheel. A tubular control member, independently and preferably adjustably mounted, extends into the hollow hub portion. The abrasive is fed into the tubular control member and is thrown through a discharge opening in the side wall thereof by means of a rotatable impeller, which may be suitably secured to the hub portion of the wheel to rotate therewith. The abrasive thrown through the discharge opening in the control member, moves out of the wheel through the open passages extending through the hub, hollow spokes and rim portion of the wheel. The discharge opening in the tubular control member directs the abrasive into the wheel passages as they respectively pass a predetermined point. By adjusting the discharge position of the control member the direction of the abrasive discharge from the wheel may be regulated and controlled.

The rim portion, hub portion and hollow spokes of the wheel may be formed from a single metallic casting. The adjacent hollow spokes and rim portion may be connected by a web of metal providing a series of exterior sunken recesses on one or both sides of the wheel, which recesses may be closed, if desired, by a removable cover. The wheel as thus constructed has no inner pockets, ledges or cavities within which dust or abrasive may collect and thereby throw the wheel out of dynamic balance. In event that the wheel should become unbalanced due to uneven erosion of the throwing blades, abrasive passages, or for other cause, the wheel can be brought back into dynamic balance by removing the unevenly worn throwing blades and substituting a set of balanced blades.

The channel shaped throwing blades are formed from hard wear resisting material and may be easily inserted into and removed from the abrasive passages through the rim of the wheel. Means are provided for directing and retaining the abrasive entirely within the side flanges of the channel shaped throwing blades, preventing the abrasive from contacting and eroding the side walls of the abrasive passages. A centering disc or plate is interiorly attached to the shaft side of the hub portion. This disc is of such thickness as to extend inwardly beyond the inside face of the adjacent blade flanges, thereby directing the abrasive within the rear flange of the channel shaped blades and out of contact with the back wall of the abrasive passages.

A gasket is provided at the front face of the wheel which closely surrounds the tubular control member and fits tightly against the front side edge of each blade, thus operating to confine the abrasive within the front flange of the blade and prevent the abrasive from contacting the front side of the abrasive passages. The gasket and centering disc, above referred to, are so designed as to confine the abrasive movement entirely within the side flanges of the removable and replaceable throwing blades and preventing escape of any abrasive out of the confines of the side flanges of the blades where it would erode the permanent parts of the machine.

Spillage of the abrasive between the stationary control member and the rotating wheel is also prevented by the gasket above referred to.

The diameter of the centering disc is such that the inner end of the blades, when inserted into the abrasive passages, will abut the circumferential edge of the disc. The centering disc thus limits and defines the position of the throwing blades within the passages.

Each throwing blade is removably retained within its passage by means of a removable screw which extends into the spoke and engages a lug projecting from the blade positioned therein. The worn blades may be quickly removed from the wheel by partially withdrawing the screw and pulling the blade out of the passage by means of a hook, provided for the purpose. Fresh blades can be quickly inserted into the wheel through the rim and are pushed inwardly until the inner ends thereof strike the centering disc. The screws are then manipulated to engage the blade lugs. The side walls of the abrasive passages are preferably provided with overhanging shoulder portions against which the top edge of the side flanges of the blade abut when in operating position within the passage. These shoulders prevent the abrasive from jumping over the flanges of the blade to erode the side walls of the abrasive passages.

The continuous rim extending around the wheel protects the throwing blades from the destructive effect of the abrasive which rebounds from the work surface and would otherwise strike the blade. The continuous rim here provided is thick and heavy and is not seriously affected by

the impinging action of the rebounding abrasive.

An object of this invention is to provide means for directing and retaining the abrasive fed into the wheel entirely within the confines of the removable and replaceable blades.

Another object of this invention is to provide an abrasive throwing wheel which is free from interior pockets, crevices and ledges where dust and abrasive may collect to erode the wheel or throw the same out of dynamic balance.

Another object of this invention is the provision of removable and replaceable means for maintaining the wheel in dynamic balance.

Another object of this invention is to provide an abrasive throwing wheel which is strong and durable in construction, efficient in operation, whose permanent parts are protected against the abrading effect of moving abrasive and which is furthermore equipped with throwing blades adapted to maintain the abrasive within the confines thereof, means being provided for quickly and easily removing and replacing the blades when worn.

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

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a side view of the wheel as it appears when fully assembled;

Fig. 2 is an end view of the wheel shown in Fig. 1;

Fig. 3 is a longitudinal cross-sectional view through the wheel showing the interior construction thereof, this view being taken on line 3—3 of Fig. 2;

Fig. 4 is a transverse cross-sectional view of the wheel taken on line 4—4 of Fig. 1;

Fig. 5 is another transverse cross-sectional view of the wheel with the tubular control member and impeller removed, this view being taken through the wheel along the line 5—5 of Fig. 6;

Fig. 6 is a longitudinal cross-sectional view through the wheel with the tubular control member and impeller removed, this view being taken on line 6—6 of Fig. 5;

Fig. 7 is a fragmentary face view of the wheel as it appears when the tubular control member and impeller have been removed, this view being taken in the direction of the arrows 7—7 of Fig. 5;

Fig. 8 is a fragmentary cross-sectional view through the wheel showing particularly the abrasive passage with the throwing blade positioned therein, this view being taken on line 8—8 of Fig. 1;

Fig. 9 is a perspective view of a removable and replaceable throwing blade showing associated therewith a hook device which may be conveniently used in removing the blades from the wheel;

Fig. 10 is an enlarged side view of the protective gasket which is attached to the front side of the wheel and against which the removable and replaceable throwing blades abut, preventing the passage of abrasive between the throwing blade and the inner side of the wheel front wall;

Fig. 11 is a fragmentary cross-sectional view of the gasket, this view being taken on line 11—11 of Fig. 10;

Fig. 12 is a side view of a completed wheel of somewhat modified construction; and

Fig. 13 is an end view of the wheel shown in Fig. 1, certain parts being broken away to illustrate more clearly certain features of this construction.

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

Referring more particularly to Figs. 1 to 4 of the drawings, the wheel generally comprises a continuous rim portion 1, a hollow hub portion 3 providing an abrasive receiving chamber *c* therein, and conduits or hollow spokes 2 radiating from the hub portion 3 to the rim portion 1. As shown more particularly in Figs. 5 and 6, the abrasive passage *p* extending through each spoke, also extends into the interior of the hub portion 3 and emerges out through the rim portion 1 so as to provide a free passage for the abrasive from the central chamber *c* out through the rim portion of the wheel. The space between the adjacent radiating spokes 2 and the rim portion 1 is closed by a web 5 providing a series of sunken recesses or hollows 4 on one side of the wheel. The recesses 4 may be closed by a removable plate 10 which is held in place by means of screws 12 secured to lugs 11 projecting inwardly from the hub portion 3 of the wheel. The web 5 and the plate 10 present a wheel having smooth exterior sides faces to which neither dust nor abrasive can cling. The wheel as thus constructed is free from external or internal pockets where dust and abrasive could collect and throw the rotating wheel out of dynamic balance. The wheel is rotatably mounted on a shaft 6 splined to collar 7 which is connected to the hub portion 3 by means of removable bolts 8.

A tubular control member 10, provided with an inwardly extending flange 13 at the inner end thereof, extends into the hollow hub portion 3. The control member 10 is mounted independently of the wheel on a suitable support 11. Abrasive, fed into the control member, is thrown out through a discharge opening 12 in the side wall thereof, and then enters the abrasive passages *p* as the inner ends of the passages successively pass the discharge opening. The abrasive moves radially out of the discharge passages *p* and is then thrown tangentially with abrading force against the work surface.

A rotating impeller, shown more particularly in Figs. 3 and 4, is rotatably mounted within the control member, and throws the abrasive out through the discharge opening 12. The impeller comprises a rear side plate 15 and a front side plate 16 connected by a plurality of radiating impeller vanes 17. The impeller may be rotatably connected to the hub portion 3 of the wheel to rotate therewith by means of a bolt 18 which extends through the rear side plate 15 and screws into a centering plate 19 fixed to the rear wall 20 of the hub portion by means of the screws 21. The abrasive is fed, by means of a feed pipe (not shown), through the large center opening 22 in the front side plate 16 into the impeller. The abrasive drops radially across the impeller vanes 17 and then is carried within the tubular control member 10 until the discharge opening 12 is reached when the abrasive is thrown by the vanes 17 with considerable force through the opening. By adjusting the position of the discharge opening 12, the

direction of the discharge of the abrasive from the wheel may be regulated and controlled. The position of the discharge opening 12 is adjusted by rotating the tubular control member 10 to bring the discharge opening to the point desired.

Removable and replaceable channel shaped throwing blades or wear shoes, as shown more particularly in Fig. 9, are positioned within the abrasive passages *p*. Each blade is formed from hard wear resisting material and comprises a bottom portion 100 and side flange portions 101 providing a channel shaped blade adapted to confine the abrasive therein as it moves out of the passage. Each of the abrasive passages, shown in Figs. 4, 5, 6 and 8, are completely enclosed by surrounding metal forming the hub portion, spokes and rim portion of the wheel. Each passage extends from the central chamber *c* outwardly through the rim portion, the circumferential dimension of the passages decreasing while the axial dimension of the passage remains approximately uniform from the central chamber to the periphery of the wheel. Each passage is defined by front side wall 24, rear side wall 26, a bottom wall 27 and a top wall 25. The side walls are each provided with a shoulder portion 28 which overhangs the abutting top edges of the side flanges 101 of the blade, as clearly shown in Fig. 8.

Each blade is provided with one or more lugs 102 projecting from the bottom face thereof. Removable screws 31 project through the side walls of the abrasive passage to engage the lugs 102, thus removably retaining the blades in operating position within the passages. The inner ends 32 of the screws are preferably tapered so as to lift the blade and hold the upper edge of the side flanges 101 of the blade in close abutment against the overhanging shoulders 28 of the passage side walls. The bottom wall 27 of each passage *p* may be provided with shallow grooves 29 along the side edges thereof to make room for the lugs 102 projecting from the blade and to facilitate insertion and removal of the blade from the passage.

It is important that all the abrasive discharged through the control opening 12 be confined entirely within the channel shaped blades. Referring more particularly to Figs. 4 and 5, it will be noted that the centering plate 19 projects into the central chamber *c* a distance substantially equal to the thickness of the side flange 101 of the throwing blade. When the throwing blade is properly positioned within the passage, the inner end 103 thereof abuts against the circumferential edge 35 of the centering plate. The centering plate 19 thus limits the inserted position of the throwing blades and also serves to properly center the same. Further, since the centering plate 19 extends over the inside flange of the blade, the abrasive is prevented from working in between the blade and the back side wall 26 of the abrasive passage. It will also be noted by referring to Figs. 5 and 9 that the inner end of the blade is beveled at 105 at approximately a 45° angle, presenting a knife or feather edge which cuts or cleaves the abrasive stream, directing all the abrasive into the passages *p* on either side of the blade. The abrasive, therefore, has no opportunity to work itself between the back of the blade and the wall 27 of the passage. The shoulders 28 of the abrasive passage overhanging the top edge of the side flanges of the blades also assist in holding the moving abrasive within the confines of the blade and out of contact with the side walls 24 and 26 of the passage.

The inside of the front face of the wheel is also protected from abrasive wear by means of a gasket 40 which surrounds the tubular control member 10 and is secured to the front wall 41 of the hub portion 3 of the wheel. As shown more particularly in Figs. 2, 4, 5, 6, 7, 10 and 11, the gasket 40 is circular in form and is provided with a plurality of raised segments 42 of greater thickness. Each raised section 42 is designed to tightly abut against the front side flange 100 of the adjacent throwing blade so as to prevent the abrasive from working in between the side flange of the blade and the front side wall 26 of the abrasive passage. The gasket 40 may be of rubber or other wear resisting material and may be held in position by means of a metallic ring 43 which is secured to the front wall 41 of the hub portion by means of screws 44. The ring 43 may be provided with an outwardly extending flange 45 which gives additional protection to the front face of the wheel. The gasket 40 is circular in form and fits closely around the outside face of the tubular control member 10, thus eliminating or greatly reducing spillage of the abrasive which might otherwise work out of the machine between the tubular control member 10 and the front wall 41 of the hub portion of the machine.

It is now seen that the gasket 40 and the centering plate 19 operate to confine the abrasive so that the abrasive can only escape from the wheel radially across the inner ends of the removable and replaceable throwing blades and within the side walls of the blades, preventing escape of any abrasive between the sides of the blades and the side walls of the abrasive passages *p*. The wheel as thus constructed is highly resistant to wear, strong and durable and is protected against the eroding effect of the abrasive at points where the abrasive may do the most damage. The machine is free from internal or external pockets, ledges and other cavities to which abrasive might cling during rotation of the wheel to wear the wheel and throw the same out of dynamic balance.

A wheel of approximately twenty inches in diameter, as herein disclosed, must rotate at approximately 2200 revolutions per minute to effectively clean castings, billets, forgings and rolled steel sheets. A slight amount of increased wear on one side or the other of the wheel is sufficient to throw such a rapidly rotating body out of dynamic balance. Over-balancing results of the abrasive wears one side of the throwing blade more than the other side.

In the event that the throwing blades wear unevenly, it is preferable to remove the blades and to replace them with a new set of matched and balanced blades. The old blades which are partly worn may be kept and later matched with other blades until a matched set of partly worn blades has been collected. These partly worn blades can then be inserted into the machine.

There is shown in Figs. 12 and 13 a throwing wheel of somewhat modified construction. In this form the rim 1 and the spokes 2 are connected to the hub portion 3 of the wheel by means of a web 88 which is positioned centrally so as to provide sunken recesses 4 on both sides of the wheel. The sunken recesses 4 are so shaped that they will not retain dust and abrasive during rotation of the wheel.

As shown more particularly in Fig. 13 the abrasive is contained in a suitable hopper 91 and is conducted by means of a feed pipe 90 into the impeller. The discharge end 92 of the feed pipe 90 preferably projects a short distance into the

open impeller so that the abrasive will drop substantially radially across the impeller throwing blades 17. The feed pipe 90 may be adjustably supported by means of a suitable bracket 94 which is connected to a lug 93 projecting from the feed pipe 90 by means of a bolt 95. The bracket 94 is adjustably secured to the supporting frame 11 by means of bolts 96. The position of the discharge end 92 of the feed pipe 90 may thus be adjusted with respect to the impeller so that the abrasive is properly injected therein.

Abrasive rebounding from the work surface can have little wearing effect on the wheel inasmuch as the rim 1, which the rebounding abrasive would strike, is very thick and heavy and is immune to any appreciable wear. If desired, however, the rim 1, between the discharge mouths of the abrasive passages, may be covered with suitable wear resisting material such as a rubber blanket 61, if desired. The collar 7 attaching the operating shaft 6 to the wheel may also be provided with a suitable gasket 60 to prevent the rebounding abrasive from wearing these exposed parts. The centering plate 19 prevents the abrasive from working in between the back side wall 26 of the abrasive passages and the adjacent side flange of the throwing blade, and likewise the gasket 40 prevents abrasive from working in between the front side wall 24 of the abrasive passage and the adjacent side flange 101 of the throwing blade. The overhanging shoulders 28 furthermore confine the abrasive within the side flanges of the blade. Thus the removable and replaceable throwing blades take substantially all the wear caused by the abrasive moving through the wheel, and the wheel will last indefinitely.

The throwing blades may be quickly and easily removed by partially withdrawing the wedge screws 31. A hook member comprising a handle portion 70 having a hook portion 71 at the end thereof may be used to pull the blade from the passage. As illustrated in Fig. 9, the hook member may slide over the blade and the hook portion 71 hooked over the inner end of the blade. A slight outward pull on the handle 70 will remove the worn blade. New blades may then be quickly inserted into the respective abrasive passages and each individual blade locked in place by turning the wedge screws 31 inwardly so as to wedge against the lugs 102 of the blade and press the top edge of the side flanges 101 of the blade against the overhanging shoulder portion 28 of the passage.

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. An abrasive throwing wheel including, a smooth continuous rim portion, conduits extending from said rim portion inwardly short of the axis of rotation of the wheel so as to define a central abrasive admitting chamber, abrasive passages extending radially outwardly from said chamber through said conduits and emerging through said rim, and means for feeding abrasive into said chamber.

2. An abrasive throwing wheel including, a smooth continuous rim portion, conduits extending from said rim portion inwardly short of the axis of rotation of the wheel so as to define a central abrasive admitting chamber, web portions connecting said rim and conduits, abrasive passages extending radially outwardly from said chamber through said conduits and emerging out through said rim, and means for feeding abrasive into said chamber.

3. An abrasive throwing wheel including, a smooth continuous rim portion operative to retain the wheel in dynamic balance, conduits extending from said rim portion inwardly short of the axis of rotation of the wheel to define a central abrasive admitting chamber, said conduits providing abrasive passages extending substantially radially from said chamber outwardly, and means for feeding abrasive into said chamber.

4. An abrasive throwing wheel including, a rim portion, a hub portion, hollow spokes radiating substantially radially from said hub to said rim portion, and means for feeding abrasive into said hub portion.

5. An abrasive throwing wheel including, a rim portion having a smooth continuous outside surface, a hub portion, hollow spokes radiating substantially radially from said hub to said rim portion, means for feeding abrasive into said hub portion, and means for directing a contracted stream of abrasive through said hollow spokes as they respectively arrive at a predetermined point during rotation.

6. An abrasive throwing wheel including, a smooth continuous rim portion, a hub portion, means for feeding abrasive into said hub portion, and hollow spokes radiating substantially radially from said hub to said rim providing an exit through the rim for the abrasive introduced into the hub portion of the wheel.

7. An abrasive throwing wheel including, a rim, conduits extending from said rim inwardly short of the rotating axis of the wheel defining a central abrasive receiving chamber, means for feeding abrasive into said chamber, said conduits radiating from said chamber to said rim each providing a substantially radially extending passage for the abrasive entering said chamber and discharged through said rim, and web portions connecting said rim and conduits providing sunken recesses on each side of the wheel.

8. An abrasive throwing wheel including, in combination, a rotatable side wall, removable and replaceable channel-shaped throwing blades extending inwardly short of the axis of rotation of said wheel defining a central abrasive receiving space, means for supporting said blades, said blades having a bottom portion and flange portions extending along the side edges of said bottom portion, and a member positioned centrally of said rotatable side wall and rotating therewith, said member being of such thickness as to extend inwardly over the adjacent flange of said blades to thereby direct the abrasive within the adjacent flange of said blades and out of contact with the side wall of the wheel.

9. An abrasive throwing wheel including in combination, confining walls which define a central abrasive receiving chamber and an abrasive passage radiating from said chamber, a removable and replaceable throwing blade positioned within said passage extending from said central chamber outwardly, a lug projecting from said blade, and means associated with said confining wall adapted to engage said lug to removably retain said blade in operative position within said passage.

10. An abrasive throwing wheel including in combination, confining side walls, outwardly removable and replaceable blades positioned between said confining walls and extending from

adjacent the wheel periphery inwardly short of the axis of rotation of the wheel to define a central space, said blades having a generally channel shaped cross section including a bottom wall portion and side flange portions, shoulder portions projecting from said confining walls overhanging the side flange portions of the blade, means for retaining said flange portions in abutment against said shoulders, and means carried by the wheel adapted to abut one side edge of the inner end of each blade to thereby fix the position of the blade in the wheel and direct the abrasive fed into said central space within the channel confine of said blades.

11. An abrasive throwing wheel including in combination, confining side walls, a removable and replaceable throwing blade extending from adjacent the wheel periphery inwardly short of the axis of rotation of the wheel, said blade having a bottom wall portion and side flange portions, shoulder portions projecting from said confining walls overhanging said flange portion of the blade, a lug associated with said throwing blade, means associated with a confining wall adapted to engage said lug to removably retain the blade in operative position within the wheel and to retain said flange portion in abutment against said shoulder, and centering means carried by the wheel for positioning said blade therein.

12. An abrasive throwing wheel including in combination, confining walls, removable and replaceable abrasive throwing blades positioned between said confining walls and extending inwardly short of the axis of rotation of the wheel to define a central abrasive receiving chamber, a tubular control member extending into said chamber, and means surrounding said tubular member fixed to the adjacent confining wall preventing leakage of the abrasive.

13. An abrasive throwing wheel including, a smooth continuous rim portion, confining walls which define a central abrasive receiving chamber and abrasive passages radiating from said chamber, removable and replaceable throwing blades positioned within said passages radiating from said chamber outwardly, said rim enclosing the outer ends of said throwing blades protecting said blades from the eroding effect of rebounding abrasive.

14. An abrasive throwing wheel including, in combination, a rotatable side wall, outwardly removable channel-shaped throwing blades extending from adjacent the periphery of the wheel inwardly short of the axis of rotation thereof to define a central space, and an element associated with said side wall positioned centrally thereof and rotating therewith, said element tightly abutting and overhanging an adjacent inner end portion of said blades for directing the abrasive fed into said central space across the inner ends of the blades and within the channel confines thereof.

15. An abrasive throwing wheel including in combination, confining side walls, outwardly removable channel shaped throwing blades extending from adjacent the periphery of the wheel inwardly short of the axis of rotation of the wheel to define a central space, and means abutting the inner ends of said blades for directing the abrasive fed into said central space across the inner ends of said blades and within the channel confines thereof, said means comprising a plate positioned adjacent one side edge of the blades and a gasket positioned adjacent the other side edge of the blades.

16. An abrasive throwing wheel including in combination, confining side walls, outwardly removable and replaceable channel shaped throwing blades radially arranged between said side walls, the side edges of said blades seating within corresponding grooves on the inside face of said confining walls, the rear face of said blades adjacent the inner end thereof being inclined forwardly in the direction of rotation of the wheel providing a comparatively thin inner edge to facilitate the movement of the abrasive on to the advancing face thereof.

17. An abrasive throwing wheel including in combination, confining side walls, outwardly removable and replaceable channel shaped throwing blades radially arranged between said side walls, the side edges of said blades seating within corresponding grooves on the inside face of said confining walls, and means for removably locking said blades in operative position within said wheel, the rear face of said blades adjacent the inner end thereof being tapered forwardly in the direction of rotation of the wheel so as to form a comparatively thin inner edge to facilitate the movement of the abrasive on to the advancing face thereof.

18. An abrasive throwing wheel for throwing abrasive at blasting velocities to effectively clean hard, metallic objects including side wall members, removable and replaceable channel-shaped throwing blades, radially arranged between said side wall members and extending inwardly short of the axis of rotation of the wheel to define a central abrasive receiving space, means abutting the inner ends of said blades for directing the abrasive fed into the chamber across the inner ends of said blades and within the channeled confines thereof, said means comprising a plate positioned adjacent one side edge of said blades and a gasket positioned at the other side edge of said blades.

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