This invention relates to apparatus for surface treating metal articles. The invention relates particularly to apparatus for cleaning, hardening, roughening or otherwise treating the surface of metal sheets, billets and other metal articles by the abrasive effect of a stream of abrasive particles projected against such surfaces at relatively high velocities.

In the abrasive-treating of the surfaces of metal articles, I propose to employ one or more rotary abrasive-throwing wheels mounted so that the wheels may be easily manipulated so that the thrown abrasive will most effectively and advantageously attack the work. The apparatus herein described can be economically and effectively used in various treating operations, such as cleaning, hardening and roughening metallic sheets, billets and other hard objects.

Where a rotary wheel is employed, it is desirable that the wheel and associated apparatus for handling the articles to be treated be so designed as to be compact and rugged, and permit the obtaining of the maximum utilization of the wheels, and at the same time permit considerable flexibility in the operation thereof, so that articles of various sizes may be treated in a single installation.

In apparatus of the class to which this invention relates, it is especially desirable that the abrasive-throwing wheels be disposed along the path of travel of the articles along a production line so that all of the surfaces of the articles may be treated in the course of a single trip through the apparatus, thus permitting maximum speed of operation and maximum efficiency of the apparatus.

Another desideratum of this class of apparatus is that the apparatus should be adaptable to operate with maximum efficiency upon sheets, billets or the like of various sizes, with simple adjustment, whereby a minimum amount of apparatus may be employed in a mill producing a large variety of sizes of articles.

The present invention concerns apparatus comprising a conveyor for transporting articles such as sheets and billets along a predetermined path, and a plurality of abrasive-throwing wheels mounted adjacent the conveying means in positions to project the abrasive against all surfaces of the sheets or billets. Another feature of the invention is the provision of suitable mounting means for the wheels, whereby they may be adjustably positioned to change the positions of the abrasive streams relative to the respective surfaces of the articles to be treated, thus permitting maximum utilization of the abrasive streams projected by the wheels.

Another feature of the invention is the provision, in one embodiment of the invention, of an arrangement of a plurality of wheels so arranged that a minimum number of wheels are adapted to treat a plurality of sheets or billets.

Various other features and advantages of the invention will be apparent from the following particular description and from an inspection of the accompanying drawings, wherein:

Fig. 1 is a top plan view of an apparatus constructed according to the invention;

Fig. 2 is a side elevational view of the apparatus in Fig. 1;

Fig. 3 is an enlarged vertical cross-section, taken along the line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken along line 4—4 of Fig. 3;

Fig. 5 is a top plan view of a portion of the apparatus shown in Fig. 4;

Fig. 6 is a horizontal cross-sectional view taken along the line 6—6 of Fig. 4;

Fig. 7 is an enlarged vertical cross-sectional view of the abrasive throwing wheel, this view being taken along the line 7—7 of Fig. 3;

Fig. 8 is a diagrammatic view of the apparatus, illustrating the manner in which the wheels may be arranged when relatively wide sheets are to be cleaned;

Fig. 9 is a diagrammatic side elevational view of the apparatus shown in Fig. 8;

Fig. 10 is a diagrammatic vertical cross-sectional view of an apparatus showing an arrangement of wheels for simultaneously treating the face and the edges of a sheet or plate; and

Fig. 11 is a fragmentary view, partially in cross-section, of another device for cleaning the edges of sheets or billets.

In the drawings accompanying and forming part of this specification, certain specific disclosure of the invention is made for purposes of explanation, but it will be understood that the details may be modified in various respects without departure from the broad aspect of the invention.

The apparatus illustrated in Figs. 1 to 6, inclusive, shows a conveyor C adapted to transport horizontally a pair of sheets or billets S1 and S2 past two spaced abrasive wheel assemblies W, each consisting of three wheels 50, 150 and 250 (Fig. 4), adapted to project streams of abrasive against both sides of both of the spaced sheets and past a plurality of spaced edge-treating mechanisms V, each having a wheel 350 adapted
to project a stream of abrasive against the edges of the sheets.

Referring to Figs. 1 and 2, the conveyor $C$ comprises a side frame 1 having supporting legs 3 and 4, and a somewhat similar parallel side frame 2 having supporting legs 5 and 6. Journal bearings 11 and 17 support the side frames 1 and 2, and the upper and lower sets of supporting rolls 8 and 10, which constitute upper and lower conveyors for supporting sheets (indicated at $S_1$ and $S_2$).

The driving arrangement comprises upper and lower pinch rolls 9 and 10, supported in bearings 11 and 12 supported by the end portions of the side frames 1 and 2. The upper and lower stationary pinch rolls 9 and 10 cooperate with movable pinch rolls 13 and 14, rotatably mounted in bearing blocks 15 and 16, adjustable in the side frames and urged apart by a spring 19 to move the rolls 13 and 14 toward their respective cooperating upper and lower stationary rolls 9 and 10, which are rotated by a suitable driving means (not shown).

The wheel assembly $W$ is carried on a vertical standard 20 secured in a suitable base 21 (see Figs. 3-7). Supported on the standard 20, at a point midway between the lower and upper sets of rolls 8 and 10, is a sleeve 22 having a securing pin 23 extending therethrough and engaging the standard 20 to fixedly retain the sleeve in adjusted position. Formed integral with the sleeve 22 is a horizontally extending bracket 24 having dove-tailed grooves 25 formed in its top surface for receiving the discharging abrasive therefrom.

Supported on the table 26 is a motor 30 having a shaft 31 which carries a pulley 32 driving a multiple belt 33 trained over a pulley 34 carried on a shaft 35.

The shaft 35 is journaled in bearings 36 and 37 formed integral with the brackets 38 and 39 supported on the upper surface of the table 26. Mounted on the shaft 35 is an abrasive-throwing wheel 50 which will be described more in detail hereinafter.

An adjusting arrangement 40, for positioning the table 26 on the supporting bracket 24, comprises an arcuate rack 41 formed on the lower surface of the table 26, with a pinion 42 carried on a shaft 43, which is journaled in bearings 44 and 45 formed integral with the bracket 24.

A hand wheel 46 is secured to the end of the shaft 45 for rotating the same to rotate the pinion 42, and thus slide the table 26 angularly about the bracket 24, in a manner which will be apparent, to thus swing the wheel 50 angularly about a vertical pivot passing centrally of the wheel.

The wheel 50 (Figs. 3 and 7) comprises a hub portion 51 supporting spaced, parallel, side plates 52 and 53 of disc form, secured in spaced relation by spacing studs 54, and having secured thereon between a plurality of radially-extending abrasive projecting blades 55, which extend from the periphery of the plates 52 and 53 to a point inwardly short of the axis of the plates 52 and 53 to define a central space. Also secured to the hub 51 is an impeller 56 having a plurality of radially-extending impelling shorting blades 57 terminating short of the inner ends of the blades 55.

Interposed between the outer ends of the impelling vanes 57 and the inner ends of the blades 55, is a relatively stationary cylindrical control cage 58, which may comprise an outer cylindrical member 59 and an inner cylindrical member 60, which control cage 58 is mounted by suitable means (not shown), and does not rotate with the several members carried by the hub 51. The outer cylinder 59 is provided with substantially diametrically opposite abrasive discharge openings 61 and 62 in the tubular side wall thereof, each extending a substantial distance circumferentially, and the inner cylinder 60 is provided with diametrically opposite abrasive discharge openings 63 and 64 adapted to register with the openings 61 and 62, but which do not extend as great a distance circumferentially as the openings 61 and 62.

The cylinders 59 and 60 are provided with individual supporting members 65 and 66, whereby the cylinders may be rotated relatively to one another to close either one or the other, or both, of the outlets defined by the openings 61, 63, 62, and 64, respectively.

A suitable feed is provided adjacent the control cage 58, and is adapted to supply abrasive to the interior of the control cage 58, wherein the abrasive is engaged by the blades 57 of the impeller 56, and thrown out through the openings 61 and 63, and 62, and also through the openings 64 and 66, when the cylinders 59 and 60 are in the position of adjustment shown in Figs. 3 and 6.

It will now be seen that, when the motor 30 is energized, the shaft 35 will be rotated and will rotate the assembly constituted by the hub 51, the side plates 52 and 53 and the blades 55 and the impeller 56. If abrasive is fed through the inlet pipe 67, the impeller vanes 65 will throw the abrasive out through the upper and lower outlets, above-described, to provide upper and lower streams of abrasive (indicated respectively by $a$ and $b$ in Fig. 7), impinging against the sheets $S_1$ and $S_2$, respectively.

If the outer cylinder as shown in Figure 3 is rotated in a clockwise direction relative to the inner cylinder through an angle of approximately 45°, the upper outlist will be closed and the lower will remain open, thereby preventing the abrasive from being thrown outwardly, and only the stream $b$ will be projected. On the other hand, if the outer cylinder is rotated in a counterclockwise direction 45° from the position shown in Fig. 3, the lower will be closed and the upper outlet will remain open, thereby discontinuing the lower stream of abrasive $b$, and permitting the upper stream to continue. If the outer cylinder is moved approximately 75° in either direction relative to the inner cylinder, both streams will be closed off and no abrasive will be projected by the wheel.

The upper wheel 160 is also supported for pivotal adjustment relative to a vertical axis through the wheel. Mounted on the standard 20, above the sleeve 22, is a sleeve 70 which may be locked into any desired position of adjustment by a pin 71 extending through the sleeve 70 and into a suitable opening in the standard 20. The sleeve 70 is formed integral with a vertical zontal arm 72, at the free end of which is formed a bearing 73 and a rotatable stub shaft 74, on the lower end of which is carried a sleeve 75. Formed integral with the sleeve 75 is a horizontally-extending bracket 76 having an offset arcuate arm 77, the free end of which is slideable on a supporting bracket 78 integral with the sleeve 70. A supporting plate 79 is secured to the bracket 76 and the arm 77, and carries a motor 80 driving a shaft 81, on which is carried 75...
a pulley 92, which in turn drives a multiple belt 93, trained over a second pulley 94, carried on a horizontal shaft 55. The shaft 93 is journaled in bearings 86 and 87 supported from triangular brackets 88 and 89, depending from the bracket 76 and the supporting plate 78, respectively.

Carried on the outer end of the shaft 55 is a wheel 150, which may be similar to the wheel 50, previously described, or the wheel may be similar to the wheel 210 as illustrated in Fig. 5. The conveyer 53 has a motor 100 hereafter described. The wheel 150 is adapted to project the stream of abrasive c downwardly against the surface of the sheet 51 when the motor 100 is energized. Where a wheel having a double-cylinder control cage, such as that disclosed in Fig. 7, is employed, the control cage will be adjusted so that the upper outlet will be closed; and, if desired, a wheel having a single-cylinder control cage may be substituted.

Attached to the arcuate arm 77 is an arcuate rack 90, which meshes with a pinion 91 carried on a stub shaft 92 journaled in a bearing 93, which is formed integral with the sleeve 76. The arm 77 is fixed on the shaft 55. The pinion 91 is adapted angular movement of the rack 90 and to slide the arcuate arm 77 along on the supporting bracket 78. This movement of the arm 77 effects corresponding angular movement of the bracket 76, and the wheel 150 is moved angularly about a pivot passing vertically through the center of the wheel.

The lower wheel 250 may be supported in a manner similar to either of the wheels 50 or 150, but for the purpose of illustration a third type of supporting arrangement is disclosed.

Supported on the standard 20 below the level of the bottom sheet 51 is a sleeve 100 adjustable second position fixed by a pin 101, which sleeve 100 has an axle 102 formed integral with 103. At the outer end of the table 102, is a bearing 103 in which is journaled a rotate stub shaft 104 carrying a collar portion 105 formed integral with a table 106. The table 106 has a depending flange 107 adapted to engage the arcuate edge of the table 102 for guiding the table 106 for pivotal movement on the table 102.

Supported on the table 102 is a plate 108 on which is mounted a motor 110 driving a shaft 111 which carries a pulley 112, which in turn carries a multiple belt 113, trained over a second pulley 114, carried on a horizontal shaft 115. The horizontal shaft 115 is rotatably mounted on bearings 116 and 117 supported from triangular brackets 118 and 119, respectively, and carries a wheel 250 which is similar to the wheel 50 described in detail in the foregoing specification.

Where a wheel having a double-cylinder control cage is employed, the upper opening only will be opened. If a stream of abrasive is projected only in an upward direction against the lower surface of the sheet 51, carried by the rolls 18.

Formed on the lower surface of the table 108 is an arcuate rack 125, with which meshes a pinion 126 carried on a pin 127 journaled in a suitable bearing (not shown) in the table 102. A suitable crank 130 is connected to the shaft 127 for rotating the pinion to move the table 108 angularly about the pivot provided by the stub shaft 104.

From the foregoing it will be seen that each of the three wheels 50, 150 and 250 may be similarly swung out of operative position for the purpose of adjustment or repair. Furthermore, if desired, the height of any individual wheels relative to the conveyer may be adjusted by suitable adjustment of the respective sleeve on the standard. For the purpose of adjustment of the wheels, relative to the standard, suitable openings 20a as shown more particularly in Figs. 5 and 6 may be provided in the standard. Furthermore, other types of securing means for locking the sleeves in the desired positions on the standard may be provided, as will be understood by those skilled in the art.

As set forth above, any desired number of wheel 75.
assemblies may be provided as are found necessary to suitably clean the sheets passing through the apparatus, and within the present embodiment two such assemblies, \( W_1 \) and \( W_2 \), are shown, both of which preferably are identical in construction.

The abrasive-treating wheel assembly \( V \) comprises a bracket \( 181 \) secured on the side frame \( I \) and supporting a horizontally-disposed wheel \( 350 \) and a driving motor \( 152 \) suitably connected to the wheel \( 350 \); a feed conduit \( 153 \) is supported adjacent the wheel \( 350 \) for supplying abrasive thereto. A wheel assembly \( 350 \) is provided adjacent each side of both upper and lower rolls \( \theta \) and \( \infty \) in position to project a stream of abrasive horizontally against the edges of the sheets \( S \) and \( S_1 \) supported by the conveyor \( C \) to thereby treat the edges of these sheets as the sheets are moved past the level of the wheels. A sufficient number of wheel assemblies is provided adjacent each edge of the sheets so that the surface of the edges is subjected to the impinging action of a stream of abrasive for a sufficient period to thoroughly treat it.

A suitable housing or housings (not shown) may be provided for inclosing the wheel assemblies. Preferably an individual housing is provided for each assembly in a suitable arrangement being made for permitting the passage therethrough of the sheets and for collecting the spent abrasive.

Also, a suitable arrangement may be provided for supplying abrasive to the several feed conduits, which may take the form of a flexible conduit and piping system (not shown).

It is also within the contemplation of the invention to provide for treating bars and other shapes of elongated metal articles in addition to sheets. Such articles may be treated by the apparatus disclosed with suitable modifications in the conveyor rolls and the pinch rolls, so that the articles will be securely positioned in the proper position to receive the stream of abrasive.

Where it is desired to treat sheets of such widths that it is impractical to employ a wheel having an impingement pattern long enough to extend laterally the entire width of the sheet, another arrangement of wheels may be made to treat the sheets in a single trip through the apparatus. Such an arrangement is shown diagrammatically in Figs. 8 and 9, wherein a plurality of spaced rolls \( 200 \) are arranged to support a sheet \( S_2 \) having a width several times the width of the impingement pattern of an abrasive-throwing wheel. Disposed above the rolls \( 200 \) are three abrasive-throwing wheels \( 201, 202 \) and \( 203 \) which are arranged in echelon, being staggered longitudinally and transversely of the sheet \( S_2 \) supported on the conveyor.

The wheels \( 201, 202 \) and \( 203 \) are disposed angularly with respect to the shoe \( S \); in such a manner that the abrasive streams projected by each wheel impinges against one-third of the surface of the sheet, the two outer wheels \( 201 \) and \( 203 \) each thus treating the marginal outer third of the sheet, and the central wheel \( 202 \) treating the center third of the sheet.

Preferably a second set of wheels (not shown) is provided below the sheet and disposed similarly to the wheels \( 214, 232 \) and \( 203 \) (shown), for the purpose of treating the lower surface of the sheet simultaneously with the treatment of the upper surface, thus providing for a complete treatment of the sheet in a single trip through the apparatus.

In Fig. 10 is shown an arrangement by which one surface and the edges of a sheet may be treated simultaneously by the use of two wheels. The wheels \( 210a \) and \( 210b \) each consists of a pair of side plates \( 211 \) carrying radially-extending blades \( 212 \) and a rotatable impeller \( 213 \), having impeller vanes \( 214 \) and a stationary casing \( 215 \) disposed between the ends of the vanes \( 214 \) of the impeller, and the blades \( 212 \). The control case \( 215 \) has a discharge opening \( 216 \) in the tubular side wall thereof through which abrasive is projected from the impeller \( 213 \) into the path of the blades \( 212 \). A suitable arrangement (not shown) is provided for rotating the side plates \( 211 \) which carry the blades \( 212 \) and also the impeller \( 213 \).

The wheel \( 210a \) is disposed above the sheet \( S_2 \), which rests upon a suitable conveyor \( 219 \) and slightly to one side of the sheet in a position to project a stream of abrasive \( p \) against the left-hand half of the upper surface of the sheet \( S_2 \) and also the left-hand edge thereof.

The wheel \( 210b \), which is similar in all respects to the wheel \( 210a \), is disposed in a corresponding but reversed position above and slightly to the right of the sheet, and is positioned and adjusted to project a stream of abrasive \( q \) angularly against the right-hand half of the sheet \( S_2 \) and against the right-hand edge thereof. Thus it will be seen that the abrasive streams of \( p \) and \( q \) treat the surface of the sheet \( S_2 \), and likewise treat the side edges at the same time. If desired, one or more wheels may be disposed in such positions as to treat the lower surface of the sheet \( S_2 \), which will be apparent from the foregoing.

Still another arrangement is shown in Fig. 11 for treating the edges of sheets which is particularly adapted to removing mill scale and similar foreign material from the surface of the edges in a simple and inexpensive manner.

This arrangement comprises a circular knurling wheel \( 251 \) having the usual sharpened teeth \( 251a \). The wheel \( 251 \) is supported by a bracket \( 252 \) mounted adjacent the sheet to be treated, which standard has a pair of arms \( 253 \) in which is slidably mounted a rod \( 254 \) carrying a clevis member \( 255 \) for \( 251 \) engaged by \( 256 \) and \( 258 \) mounted. The rod \( 254 \) is urged toward the edge of the sheet \( S_2 \) to be treated by a spring \( 256 \), bearing against a collar \( 257 \) formed on the rod. Thus the wheel is resiliently urged into engagement with the edge of the sheet \( S_2 \), and as the sheet passes along the conveyor the knurling wheel bites into the mill scale and other foreign matter on the edge of the sheet, and bushes the same, causing it to fall from the sheet, thus leaving the edge of the sheet clean and in suitable condition for treatment.

A circular knurling wheel \( 251 \) may be substituted for the horizontal impingement wheels \( 200 \) of the apparatus shown in Fig. 1. In this embodiment the bracket \( 252 \) may be supported in a suitable manner from the standard \( 151 \).

Thus it will be seen that the invention provides a simple and compact arrangement for cleaning all of the surfaces of a plurality of sheets or billets simultaneously, in such a manner that the operation may be completed in a relatively short period, and in the course of a single trip of the sheets or billets through the apparatus. By reason of the arrangement of the conveyor for transporting the plurality of sheets simultaneously in spaced arrangement, and the disposition of a single wheel between two adjacent sheets which
wheel may be operated to project two streams of abrasive in opposite directions, it is possible to treat the sheets with a lesser number of wheels than would be required if the arrangement provided for treating only one sheet at a time. Because of the novel arrangement of conveyors and wheels, the apparatus may be made compact without crowding any of the elements thereof.

The provision of an adjustable support for each wheel, whereby the wheel may be rotated about the vertical axis passing through the wheel, and may at the same time be adjusted vertically relative to the sheet to be treated, permits the maximization of the strength of the sheet of abrasive. As explained in the foregoing, the adjustable mounting permits the abrasive stream to be swung in any direction about a vertical pivot so that the end of the impingement pattern may be made to coincide with the margin of the sheet which is being treated. This adjustable arrangement also permits the treating of sheets of various widths in a single apparatus without requiring any changes in the elements of the apparatus other than a change in the adjustment of the positions of the wheels.

Inasmuch as the driving mechanism and the wheel are constructed as a unit, and adapted to be used as a unit, the arrangement is both compact and sturdy, and no unusual difficulties in transmitting power from the motor to the wheel are encountered. Since the motor which drives the wheel may be energized by electricity through flexible conductors, no serious difficulties are encountered in supplying electric energy to the motors.

The provision of means for treating the edges, during the passage of the sheets through the apparatus, and as a part of the same operation with the treating of the side faces of the sheet or billet, permits the entire treating operation to be carried out in a single operation. Thus, only a minimum amount of handling of the sheets is required.

The arrangement of rolls in the roll conveyor is such that no appreciable wear of the rolls results from the abrasive being thrown against. As pointed out previously, the rolls are disposed in spaced relation, and the wheels are so positioned that the abrasive is directed from passes between the rolls and does not strike the rolls to any appreciable extent. Furthermore, since the sheets are urged along on the pinch rolls, which may be disposed at a considerable distance from the wheels, and since there are no driving mechanism, such as gearing and the like, disposed adjacent any of the wheels, undue wear of the driving mechanism due to the presence of abrasive particles is minimized. The arrangement of the wheel assemblies is such that they may be individually shielded from the remainder of the apparatus, or all may be shielded in a single housing from the remainder of the apparatus.

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 in the apparatus without departing from the spirit of the invention.

This application is a continuation in part of my co-pending application Serial No. 727,965, filed May 26, 1934, which issued into Patent No. 2,077,637 on April 20, 1937, and particularly the subject matter shown in Figures 7 and 8 of the drawings of said co-pending application.

What is claimed is:

1. Apparatus for cleaning and removing scale and extraneous material from metallic objects including, a pair of conveyors arranged in generally parallel relationship and adapted to transport the metallic objects to be cleaned, a centrifugal abrasive throwing wheel positioned between said conveyors, said wheel being operable to direct an abrasive stream simultaneously against the objects supported on each of said conveyors, and abrasive throwing wheels positioned exterior to said conveyors, each of said wheels having means for directing a single stream of abrasive against the objects supported thereon.

2. Apparatus for treating sheets comprising a rotatably mounted abrasive-throwing wheel for projecting abrasive at high velocities, means associated with said wheel for controlling the abrasive discharge from said wheel selectively to project abrasive in streams in either or both of two opposite directions, and means for transporting the sheets to be cleaned past and through either or both of said streams.

3. Apparatus for cleaning and removing scale and other extraneous materials from metallic objects including, a conveyor for transporting said objects along a linear path, an abrasive throwing wheel operable to direct a stream of abrasive against the objects supported on a driven conveyor, a drive shaft for said wheel, power means for rotating said shaft, and means for shifting the position of said wheel with respect to said conveyor including a supporting standard, a bracket pivotally mounted on said standard, a second bracket supporting said wheel, shaft and power means, said second bracket being pivotally mounted on said first named bracket, said brackets together providing a swingable jackknife support for said wheel.

4. Apparatus for cleaning and removing scale and other extraneous materials from metallic objects including, a conveyor for transporting said objects along a linear path, an abrasive throwing wheel operable to direct a stream of abrasive against the objects supported on said conveyor, and means for shifting the position of said wheel with respect to the objects supported on said conveyor including, a fixed supporting standard, an arc support for said wheel pivotally mounted on said standard swingable over said conveyor through a predetermined arc, and means for pivotally mounting said wheel on said swingable bracket whereby said wheel can be swung through a predetermined arc about said supporting standard and assume various positions with respect to the objects supported on said conveyor.

5. An abrasive-throwing wheel including a rotor adapted to be rotated at high peripheral speed, a plurality of throwing blades mounted on said rotor and extending from a central space of the rotor toward the periphery thereof, an impeller fixed to rotate with said rotor, and a control cage surrounding said impeller and extending into said central space, said control cage including a plurality of concentric cylindrical members each having a plurality of openings in the side walls thereof, and means mounting said cylindrical members for relative angular movement to bring said openings into and out of registration.

6. An abrasive-throwing wheel including a rotor adapted to be rotated at high peripheral speed, a plurality of throwing blades mounted on said rotor, an impeller fixed to rotate with said rotor.
rotor, and a control cage disposed between said impeller and said blades including a pair of telescoped tubular members each having a plurality of openings in the side wall thereof, and means for forcing the abrasive through said discharge outlets and into the path of rotation of said blades.

7. An abrasive-throwing wheel including a rotor adapted to be rotated at high peripheral speed, an impeller centrally mounted on said rotor, a series of throwing blades mounted on said rotor and extending from adjacent said impeller toward the periphery of the rotor, a pair of telescoped tubular members surrounding said impeller and each having a plurality of openings in its side wall adapted to register with openings in the other tubular member, and means for angularly moving said tubular members to bring one or more pairs of said corresponding openings selectively into registration to cause said wheel to project a corresponding number of streams of abrasive.

8. Apparatus for treating metal surfaces comprising a conveyor for advancing metal material, and a second conveyor for advancing metal material, said conveyors being disposed substantially parallel, and a centrifugal abrasive throwing device mounted between said conveyors for rotation in a plane substantially perpendicular to the surfaces of the material on said conveyors, said device being effective to treat the material on both conveyors simultaneously.

9. A blasting machine adapted to throw two oppositely directed streams of abrasive to clean hard metallic surfaces positioned at opposite sides of said wheel, including a rotor having radially arranged throwing blades extending inwardly short of the axis of rotation of said rotor to provide a central abrasive receiving space, a tubular control member positioned within said central space, said control member having a plurality of discharge outlets of limited peripheral length positioned substantially diametrically opposite one another, and impeller means for urging abrasive through said outlet openings and depositing it in the path of said blades, and control means for closing at least one of said outlets.

10. Apparatus for cleaning metal sheets, or plates comprising a frame, a conveyor for moving metal material therealong, abrasive throwing wheels mounted on the frame for rotation and each adapted to project a plurality of streams in opposite directions, said wheels being spaced apart across the width of the conveyor and along the path of material moving therealong, and a second conveyor on the opposite side of the wheels from the first-mentioned conveyor, said second conveyor being adapted to support the material in position to be cleaned by said wheels while being moved.

11. An abrasive-throwing wheel including rotatably mounted, radially arranged throwing blades terminating inwardly short of their axis of rotation to provide a central space, a control member disposed in said central space and having a plurality of outlet openings therein, means for urging abrasive through said outlet openings and depositing it in the path of said blades, and control means for closing at least one of said outlet openings.

12. Apparatus for blast cleaning metal objects including, a conveyor for transporting said objects along a linear path, an abrasive throwing wheel operative to direct a stream of abrasive against the objects supported on said conveyor, means for shifting the position of said wheel with respect to the objects supported on said conveyor including, a fixed supporting standard positioned to one side of said conveyor, a bracket pivotally mounted on said standard swingable over said conveyor through a predetermined arc, means for retaining said bracket in fixed position, means for pivotally mounting said wheel on said swingable bracket whereby said wheel may assume various positions of adjustment with respect to said bracket and the objects supported on said conveyor, and means for settling said pivotally mounted wheel supporting means in the desired selected position with respect to said bracket.

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