Dec. 21, 1943. R. B. HUYETT ET AL 2,337,048

ABRADING APPARATUS

Filed Sept. 3, 1941 2 Sheets-Sheet 1

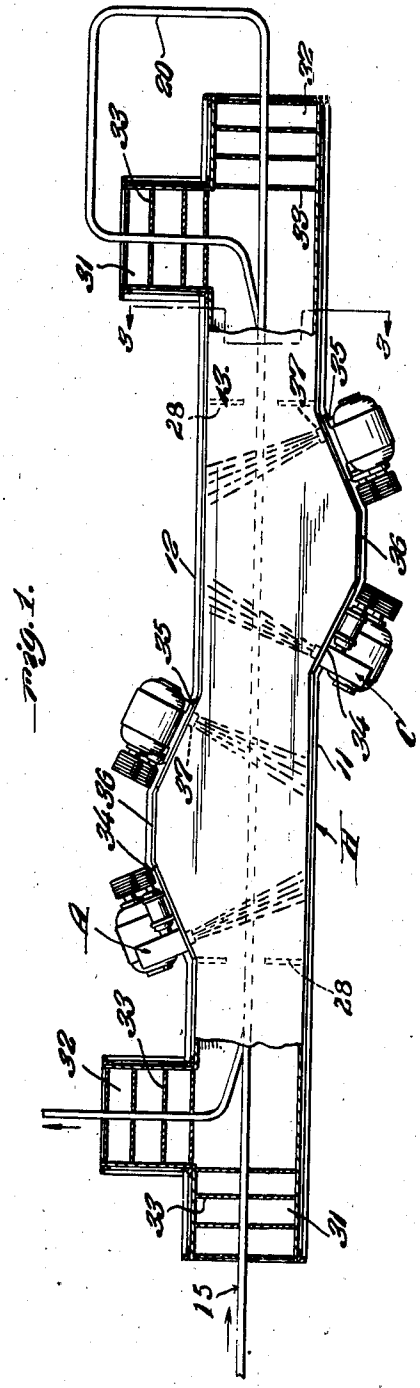


Fig. 1.

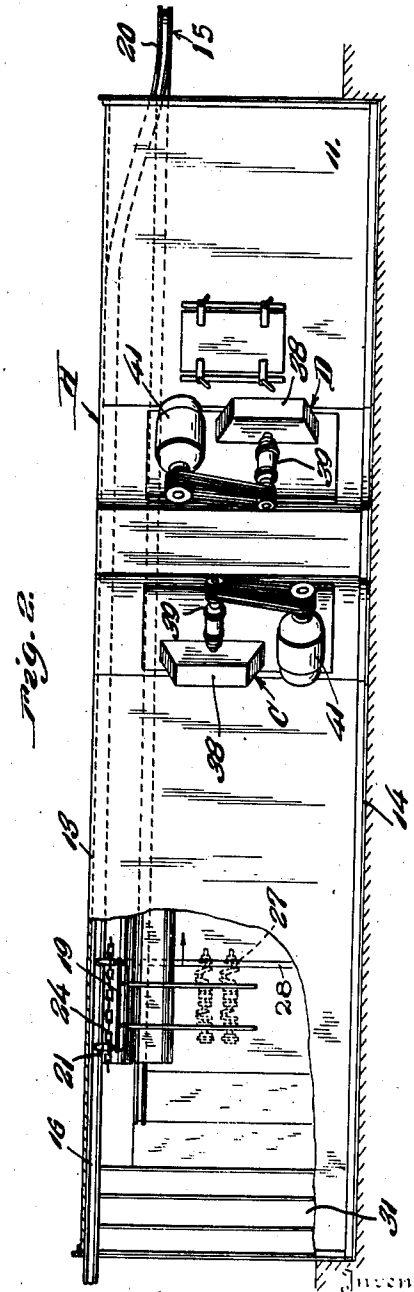


Fig. 2.

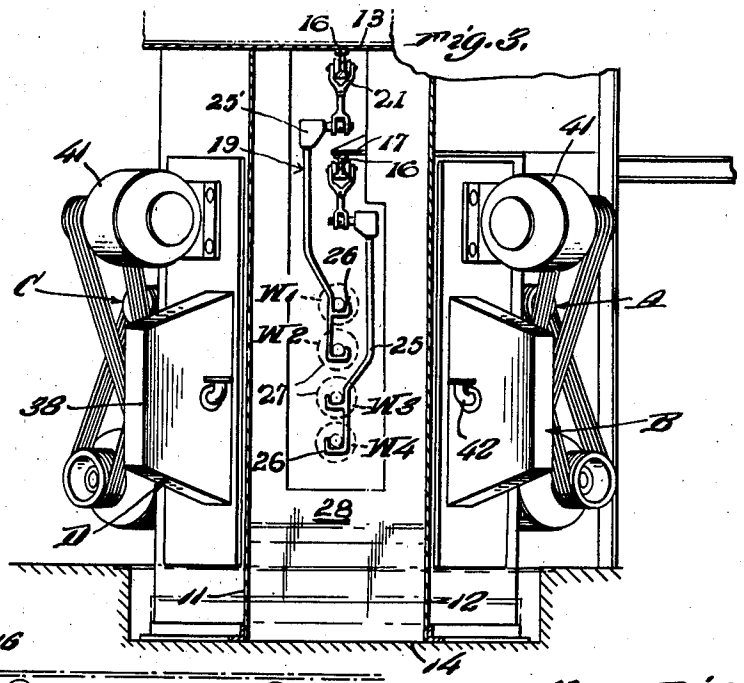
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ABRADING APPARATUS

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Fig. 3.



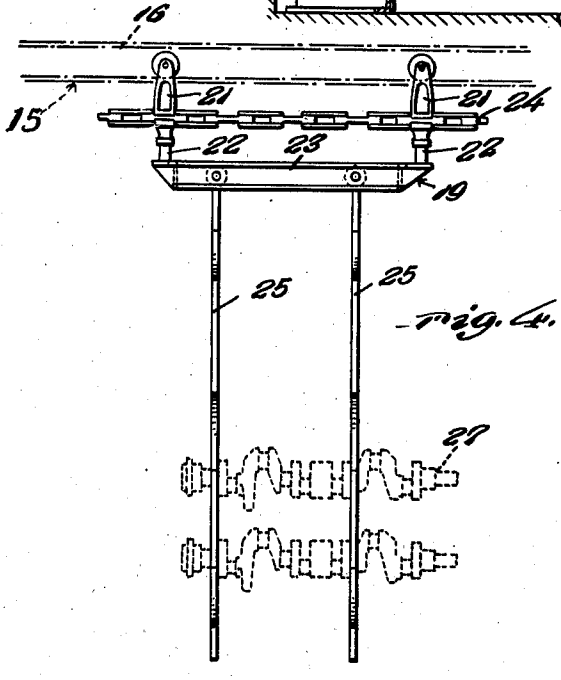


Fig. 4.

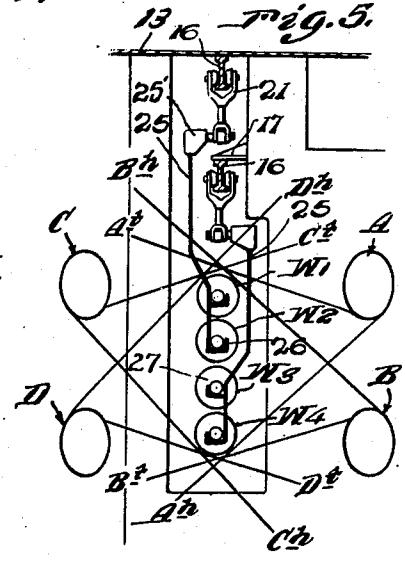


Fig. 5.

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ABRADING APPARATUS

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Application September 3, 1941, Serial No. 409,420

12 Claims. (Cl. 51—9)

This invention relates to blast cleaning or abrading apparatus and more particularly to abrading apparatus of the type employing means to project a blasting medium in combination with means to transport articles or workpieces to be cleaned through the blasting medium projected by said blasting means.

It has been proposed heretofore to place workpieces upon simple conveyors and transport them through abrasive blasts from substantially fixed blasted means. The arrangements thus far developed have been unsatisfactory in that the surfaces of the workpieces so treated have not been uniformly blasted but have been overblasted in part and underblasted in part. To overcome this defect, various expedients have been proposed, such as supporting the workpieces upon a spindle and effecting their rotation while passing through the blast stream. This is an expensive arrangement in that conveyors of special types as well as special driving means to effect rotation of the workpieces must be provided and maintained. It has also been proposed to move the blasting means as the article passes thereby. Again additional mechanism is required with its attendant initial cost and maintenance. In both arrangements, the maintenance cost is considerable because of the tendency of the abrasive used to get into the moving parts of the mechanism and cause undue frictional wear.

In overcoming the aforesaid disadvantages of the prior art, it is an object of this invention to provide efficient blast cleaning means wherein a conveyor of relatively simple type can be employed in combination with substantially fixed blasting means, the necessity for complicated mechanisms for effecting rotation of the workpieces or displacement of the blasting means being eliminated.

A further object of this invention is the provision of blasting apparatus including the combination of a relatively simple conveyor with a novel arrangement of blasting means whereby all surfaces of the workpieces are substantially uniformly cleaned with a minimum expenditure of blasting effort in a minimum of time.

Still a further object of this invention is the provision of a multi-pass conveyor in combination with a novel arrangement of blasting means wherein the total blasting effort is efficiently utilized to uniformly clean all surfaces of the workpieces under treatment, thereby avoiding wasteful overblasting and undesirable underblasting of the surfaces.

Further objects of the invention will appear from the following description and claims considered in connection with the attached drawings, wherein

Figure 1 is a plan of a preferred embodiment of the invention, portions of the housing being removed to show the interior.

Fig. 2 is a side elevation of the apparatus of Fig. 1, a portion of the side wall being removed to illustrate the workpieces therein.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a side elevation of one of the work supports.

Fig. 5 is a diagrammatic illustration taken on line 3—3 of Fig. 1 and illustrating the manner in which the various blasts are effective on the workpieces.

The embodiment herein described, which is to be understood as only illustrative of one application of the present invention, comprises a housing generally indicated at H which includes side walls 11 and 12, a ceiling 13, and a base 14, the side walls and ceiling being connected and supported in conventional manner as by angle irons or the like.

A conveyor 15 of the monorail type is provided to convey the workpieces through the housing in two separate substantially vertically spaced paths. Conveyor 15 includes a rail 16 entering housing H at the left end as viewed in Fig. 1, making a complete turn at the right end at 20 and re-entering the housing and leaving at the left end. Rail 16 is secured to ceiling 13 of the housing and to a bracket 17 secured to the side wall 12 in any suitable manner so that the two rail sections in the housing are at different elevations as shown in Figs. 3 and 5, and in substantially vertical alignment.

A series of work supports 19 (Figs. 3 and 4) each comprising two yoked roller assemblies 21, with an arm 22 extending downwardly from each yoke, and a connecting link 23, are provided to run on rail 16, each of roller assemblies 21 being secured to a continuous chain 24 driven by suitable drive means to move the work supports along rail 16. A plurality of rods 25 of the shape shown in Figs. 3 and 5, and with hooks 26 thereon, are secured to links 23 by angle bracket and pin assemblies 25' to support workpieces such as crank shafts 27. As shown in Figs. 3 and 5, work supporting rods 25 are shaped in such manner that workpieces 27 carried thereby are in vertical alignment and spaced vertically from one another in the two paths of travel through the housing. By reason of the vertical alignment

of the upper and lower sections of rail 16, any workpieces thereon will be maintained in vertical alignment regardless of their size or shape.

It is to be understood that different types of work supports will be used for different types of workpieces, such as cylinder blocks, crank shafts, cylinder heads, or other articles, the present illustration being particularly adapted for crank shafts of internal combustion engines. It is also to be noted that the conveyor mechanism provides only for translation of the workpieces, and no rotation of the workpieces during their travel through the housing is involved.

To prevent leakage of the flying abrasive at the ends of the blasting zones, panels or baffles 23 are preferably provided, as shown in Figs. 1 and 3, each panel being provided with an opening through which the work supports and the workpieces may pass.

To further prevent leakage of the flying abrasive from the ends of housing H, an entrance vestibule 31 and an exit vestibule 32 are provided at each end of the housing, a plurality of curtains 33 of flexible material, such as rubber or fabric, being placed in each of the vestibules to provide a series of lock chambers through which the workpieces must pass. Separate vestibules for entrance and exit of the workpieces at each end of the housing are preferably provided to prevent all curtains 33 of any one vestibule being maintained open by the passage of two work supports therethrough simultaneously.

Side walls 11 and 12 are preferably extended outwardly (Fig. 1) to provide blasting zones, or chambers, each chamber being defined by two oblique walls 34 and 35 and a well 36 substantially parallel to the side walls. One or more abrasive throwing or blasting means, preferably employing centrifugal wheels 37 of the type shown in Keefer Patent No. 2,246,522, issued on June 24, 1941, are mounted on walls 34 and 35 as shown at A, B, C, and D. In addition to the throwing wheel, each of said units includes a housing 38, a shaft 39 supported on the side wall, and suitable drive means for the shaft, such as an electric motor 41. Abrasive may be fed to the wheels 37 through feed spouts 42 which, in turn, are fed from a suitable overhead hopper (not shown).

It is characteristic of such centrifugal wheels that they project abrasive in a rectangular pattern with the abrasive being most dense in the so-called head stream adjacent one end of the pattern, and tapering off in density to the so-called tail stream at the opposite end of the pattern. Such wheels can be arranged and rotated so that they discharge abrasive from a point on their upper periphery in which case they are called over-shot wheels, or discharge abrasive from their lower periphery, in which case they are called undershot wheels.

In the present invention, each of the blast wheels is positioned so that its blast is directed simultaneously onto the articles supported by each pass of the conveyor. In addition, some of the wheels are of the over-shot type, and some of the under-shot type (dependent upon the size and shape of the workpieces), and are positioned to direct their blasts at predetermined angles to the direction of travel and the workpieces so that as a result of the total treatment, the articles are substantially uniformly cleaned on all surfaces, this being accomplished without the necessity of providing means to rotate, reciprocate, or otherwise move the articles except in simple translation, the blast means being maintained stationary.

In operation, the workpieces are loaded upon work supports 25 and translated through the housing by chain 24 at a substantially steady speed. After its initial pass through the housing, each workpiece is turned end for end in loop 23 at the right end of the housing and returned for its second pass.

For purposes of economy to avoid extra handling, it is desirable to make rail 16 a part of the regular conveyor system of the plant in which case it is not necessary to load and unload the workpieces on a special blasting conveyor.

In the operation of the embodiment herein described, the workpieces are conveyed through housing H in the first pass of the conveyor, which is preferably on the portion of rail 16 supported at the higher level. Referring to Figure 5 which is a section similar to Fig. 3 and in which the wheels have been shown diagrammatically with the vertical outlines of their blast patterns, in passing wheel A which is at a high level and preferably of the undershot type, the right sides and portions of the upper surfaces of the workpieces W^1 and W^2 are cleaned by the tail portion of the blast stream, the outer limit of which is shown at *At*, as well as the surfaces facing opposite the direction of travel of the workpieces, the latter being caused by the inclination of the blast from A at an angle toward the direction of travel of the workpieces W^1 and W^2. At the same time, the head stream from wheel A, bounded by the line *Ah* is effective upon the right side, and the upper and forwardly facing surfaces of workpieces W^3 and W^4 which are traveling in the opposite direction on the lower level pass of the conveyor suspended from bracket 17.

As workpieces W^1 and W^2 continue their travel, they encounter the blast from wheel B which is positioned at a lower level than wheel A and preferably of the overshot type. The head portion of the blast from wheel B, defined at its outer boundary by the line *Bh* is effective on the right side, the under surfaces and the forwardly facing surfaces of workpieces W^1 and W^2. At the same time, the tail portion of the B wheel blast, defined at its outer boundary by the line *Bt* is effective upon the right, portions of the upper, and the rearwardly facing surfaces of workpieces W^3 and W^4 that are simultaneously passing wheel B. It is to be understood that the latter workpieces are not the same workpieces that were just referred to in connection with wheel A as the conveyor has now moved forward.

In continuing their travel, workpieces W^1 and W^2 next encounter the blast from wheel C, which is a wheel somewhat similar to wheel A, mounted at a high level and of the under-shot type, except that it is positioned at the opposite side of the housing. The blast pattern produced by wheel C is similar to that of the pattern from wheel A, except that the opposite side surface of the workpieces are blasted. The outer boundary of the tail stream for wheel C is indicated at *Ct* and the outer boundary of the head stream at *Ch*.

As the workpieces continue their travel, they enter the blast from wheel D which resembles that of wheel B in that it is at a low level and of the over-shot type.

In passing through the blast from wheel D, the side surfaces opposite to those blasted by wheel

B are blasted in addition to portions of lower surfaces, and the forwardly facing surfaces of workpieces W^1 and W^2. The outer boundary of the tail stream of wheel D is indicated at D*t* and the outer boundary of the head stream is indicated at D*h*.

It is to be understood that in the above described operation of units C and D, workpieces W^3 and W^4 on the lower level run of the conveyor are being simultaneously treated by the blasts from those units.

Where workpieces such as relatively simple blocks are to be cleaned, it is possible to use only one set of blasting units, that is either wheels A and B, or wheels C and D, the workpieces being reversed by the loop in the conveyor rail so that a different side is exposed to the blasts during the different passes through the housing. However, with workpieces of complicated shape and with numerous recesses therein, such as crank shafts and cylinder blocks, the arrangement disclosed herein is preferred.

By the use of the conveyors at different elevations, the arrangement of over-shot and under-shot blast units, and the blast patterns projected at predetermined angles relative to the travel of the workpieces, it has been found possible to clean all surfaces of the individual workpieces uniformly with substantially on underblasting or overblasting. Because of the arrangement of the path of the workpieces in planes spaced from one another, the entire effect of each blast is utilized at all times with no interference of the blast on one workpiece by the presence of another workpiece in the blast.

While the blast chambers defined by walls 34, 35, and 36 have been shown as spaced longitudinally of the housing, it is to be understood that they may be arranged opposite one another with the opposing wheels in staggered relation or in other positions, the only controlling factor being the necessity of avoiding direct conflict of opposing blasts.

In the illustrated embodiment of the invention, the selection of the various wheels as of the under-shot or the over-shot type has been governed by the type of workpiece being cleaned therein, such as, crank shafts. If other types of workpieces are being cleaned, such as cylinder blocks, such wheels as wheel A of the illustrated embodiment are preferably of the over-shot type and such wheels as wheel B are preferably of the under-shot type.

It is to be understood that the invention may be embodied in specific forms other than that illustrated without departing from the principle or essential characteristics thereof. The embodiments shown are therefore to be considered as illustrative and not restrictive, the scope of the invention being defined by the appended claims rather than the foregoing description and drawings. All modifications and changes which come within the meaning and range of equivalency of the claims are therefore intended to be included therein.

We claim:

1. Blasting means comprising a housing, means to transport workpieces to be blasted through said housing in one path and return said workpieces through said housing in a second path spaced from said first path in a predetermined plane, and a plurality of centrifugal blasting wheels in said housing positioned to blast said workpieces as they are transported along said paths, said wheels being spaced along one side of said paths and spaced apart in a plane substantially parallel to the plane of the paths of said workpieces, one of said wheels being positioned to direct its blast at an acute angle relative to the direction of travel of said workpieces and another of said wheels being positioned to direct its blast at an obtuse angle relative to the direction of travel of said workpieces.

2. Blasting means comprising a housing, means to transport articles to be blasted through said housing in one path and return said workpieces through said housing in a second path spaced in a predetermined plane from said first path, and a plurality of centrifugal blasting wheels in said housing positioned on opposite sides of the plane of said paths and spaced from one another in a plane substantially parallel to the plane of said paths, at least one of said wheels being arranged to direct its blast at an acute angle to the direction of travel of the workpieces along one of said paths and another wheel arranged to direct its blast at an obtuse angle to the direction of travel of the workpieces along said same path, each of said blasting wheels being arranged to direct its blast simultaneously on workpieces in both paths.

3. Blasting means comprising a housing, means to transport workpieces to be blasted through said housing in one path, turn said workpieces end for end, and return them through said housing in a second path spaced in a predetermined plane from said first path, and a plurality of centrifugal blasting wheels in said housing positioned on opposite sides of the plane of said paths and spaced from one another in a plane substantially parallel to the plane of said paths, at least one of said wheels being arranged to direct its blast at an acute angle to the direction of travel of the workpieces along one of said paths and another wheel arranged to direct its blast at an obtuse angle to the direction of travel of said workpieces along said same path, each of said blasting wheels being arranged to direct its blast simultaneously on workpieces in both paths.

4. The combination claimed in claim 3 wherein said wheels are arranged in pairs, one wheel of each pair being of the overshot type and the other wheel being of the undershot type.

5. Blasting means comprising a housing, means to transport workpieces to be blasted in a horizontal path through said housing, means to turn said workpieces end for end, and return them through said housing in a second horizontal path vertically spaced from said first path, and a plurality of centrifugal blasting wheels in said housing positioned on opposite sides of said paths and at different levels, the lower wheels being of the overshot type and the upper wheels of the undershot type, at least one of said wheels being arranged to direct its blast at an acute angle to the direction of travel of the workpieces along one of said paths and another wheel arranged to direct its blast at an obtuse angle to the direction of travel of said workpieces along said same path, each of said blasting wheels being arranged to direct its blast simultaneously on workpieces in both paths.

6. Blasting means comprising a housing, means to transport workpieces to be blasted through said housing in one path and return them through said housing in a second path spaced from said first path in a predetermined plane, and a plurality of blasting means for blasting said workpieces, each of said blasting means being of a type to project a blasting medium in

an elongated pattern, varying in intensity from one end of said pattern to the opposite end, at least one of said wheels being arranged to project its blast of greatest intensity upon the workpieces in said first path while simultaneously projecting its blast of least intensity upon the workpieces in said second path, and another of said wheels being arranged to project its blast of greatest intensity upon the workpieces in said second path while simultaneously projecting its blast of least intensity upon the workpieces in said first path.

7. The combination claimed in claim 6 wherein one of said wheels is positioned to direct its blast at an acute angle relative to the plane of said paths and another of said wheels is positioned to direct its blast at an angle of about 90° from the angle of said first means whereby the workpieces transported along said paths will encounter blasts angled toward their direction of travel and opposite to their direction of travel.

8. In apparatus for abrading articles, a housing, a rail section extending through the housing, a rail loop at one end of said rail section, another rail section extending from said loop through the housing below the first rail section, means movable on said rail sections and said rail loop for supporting articles to be abraded whereby the articles in moving through the housing on said means are supported in one path and turned end for end by said rail loop and supported entirely below the first path during return movement through the housing, and means at one side of said housing for projecting particles at abrading velocities in a pattern of such vertical dimensions that the projected particles engage the articles during both paths of movement through the housing.

9. In apparatus for abrading articles, an elongated housing, a rail section having a substantially straight portion extending longitudinally of the housing, a rail loop at one end of said straight portion, another substantially straight rail section extending from said loop longitudinally of the housing and positioned substantially vertically below the first rail section, means movable on said rail sections and said rail loop for supporting articles whereby the articles in moving lengthwise of the housing are supported by said means on one straight rail section and turned end for end by said rail loop and supported by said means on the other rail section during return movement in the housing, and blasting means at one side of said housing for projecting particles into engagement with articles supported by said means on both straight rail sections.

10. In apparatus for abrading articles, a housing, a substantially straight rail section extending through said housing, a rail loop at one end of said rail section, a second substantially straight rail section extending from said loop through the housing and spaced below the first track section at a distance greater than the vertical height of an article to be abraded, article supports movable on said rail sections and said loop each support including a downwardly depending rod of a fixed length arranged laterally of the rail sections and a hook for supporting an article to be abraded vertically below both rail sections, and blasting means on said housing positioned to blast the articles as they are moved through the housing on said hooks.

11. In apparatus for abrading articles, a housing, a rail section extending through the housing, another rail section extending through the housing below the first rail section and in a vertical plane defined by the first rail section, a rail loop connecting said rail sections, means movable on said rail sections and said rail loop for supporting articles to be abraded whereby the articles in moving through the housing on said means are supported in one path and turned end for end by said rail loop and supported in the vertical plane of the first path during return movement through the housing, and means at both sides of said housing for hurling particles generally transversely of the housing in outwardly converging patterns of such vertical dimensions that the hurled particles engage the articles in both paths of movement through the housing whereby the angle at which the particles strike the articles in one path differs from the angle at which the particles strike the articles in the other path.

12. Apparatus for abrading individual articles comprising, a housing, a rail section within said housing, a second rail section within said housing spaced below and in substantial vertical alignment with the first rail section, means movable on said rail sections for supporting individual articles to be abraded, means for transferring said movable means from one rail section to the other rail section whereby individual articles in moving within the housing are supported by said movable means on one rail section and by said transfer means and thereafter supported on the other rail section, blasting means projecting particles into the housing and into engagement with the articles supported by said means moving on both rail sections, and blasting means projecting particles into the housing from a substantially opposite direction and into engagement with the articles supported by said means moving on both rail sections.

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CERTIFICATE OF CORRECTION.

Patent No. 2,337,048. December 21, 1943.

ROBERT B. HUYETT, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 37, for "well" read --wall--; page 3, first column, line 29, for "on" read --no--; 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 18th day of April, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.