May 31, 1938. R. J. WEAN ET AL 2,118,832

TREATING METAL SURFACE

Original Filed June 1, 1934 6 Sheets-Sheet 1

Fig. 1.

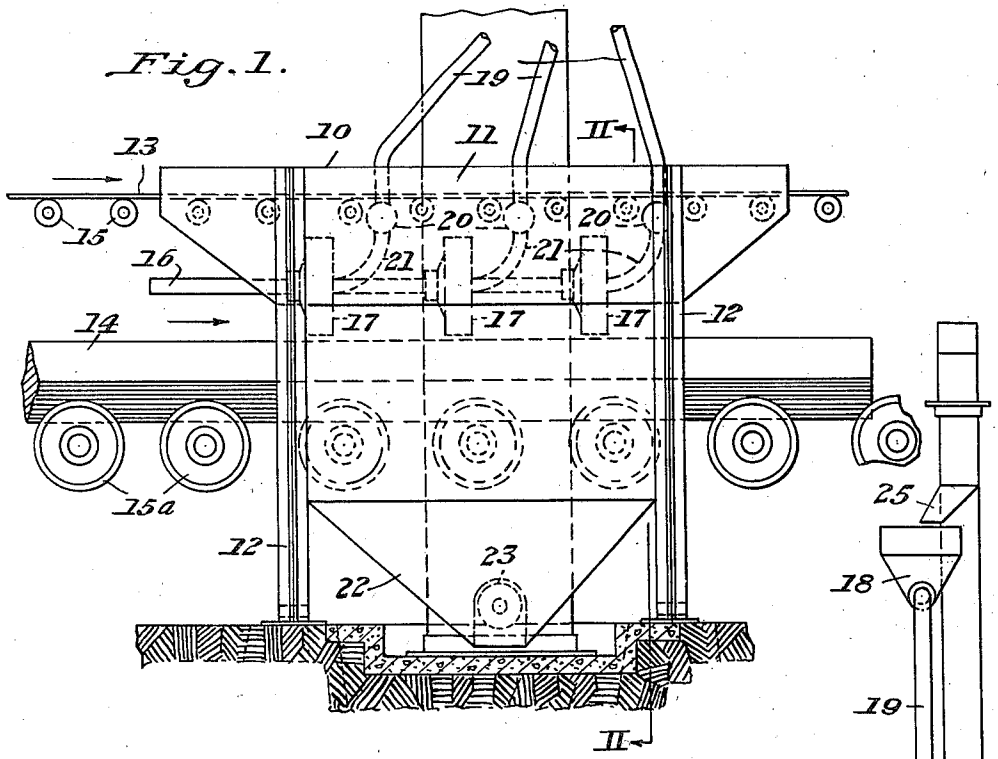
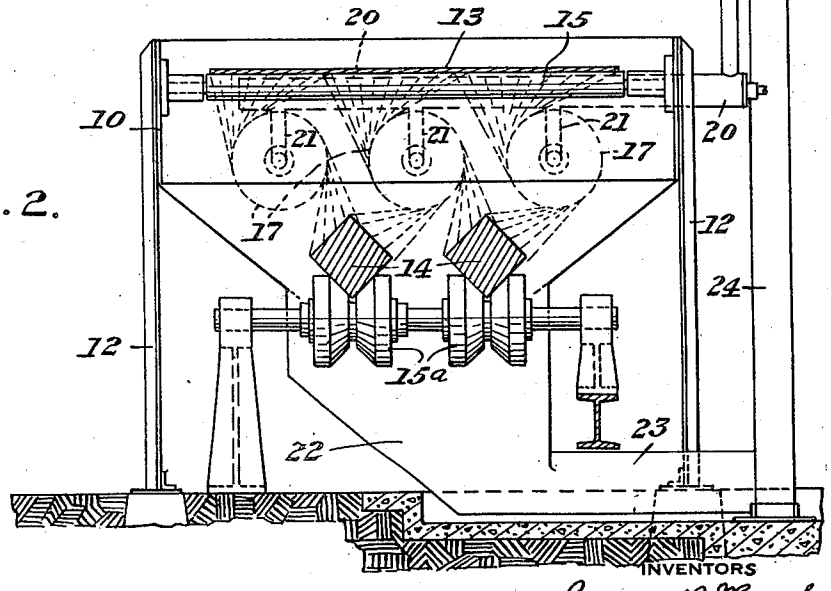


Fig. 2.



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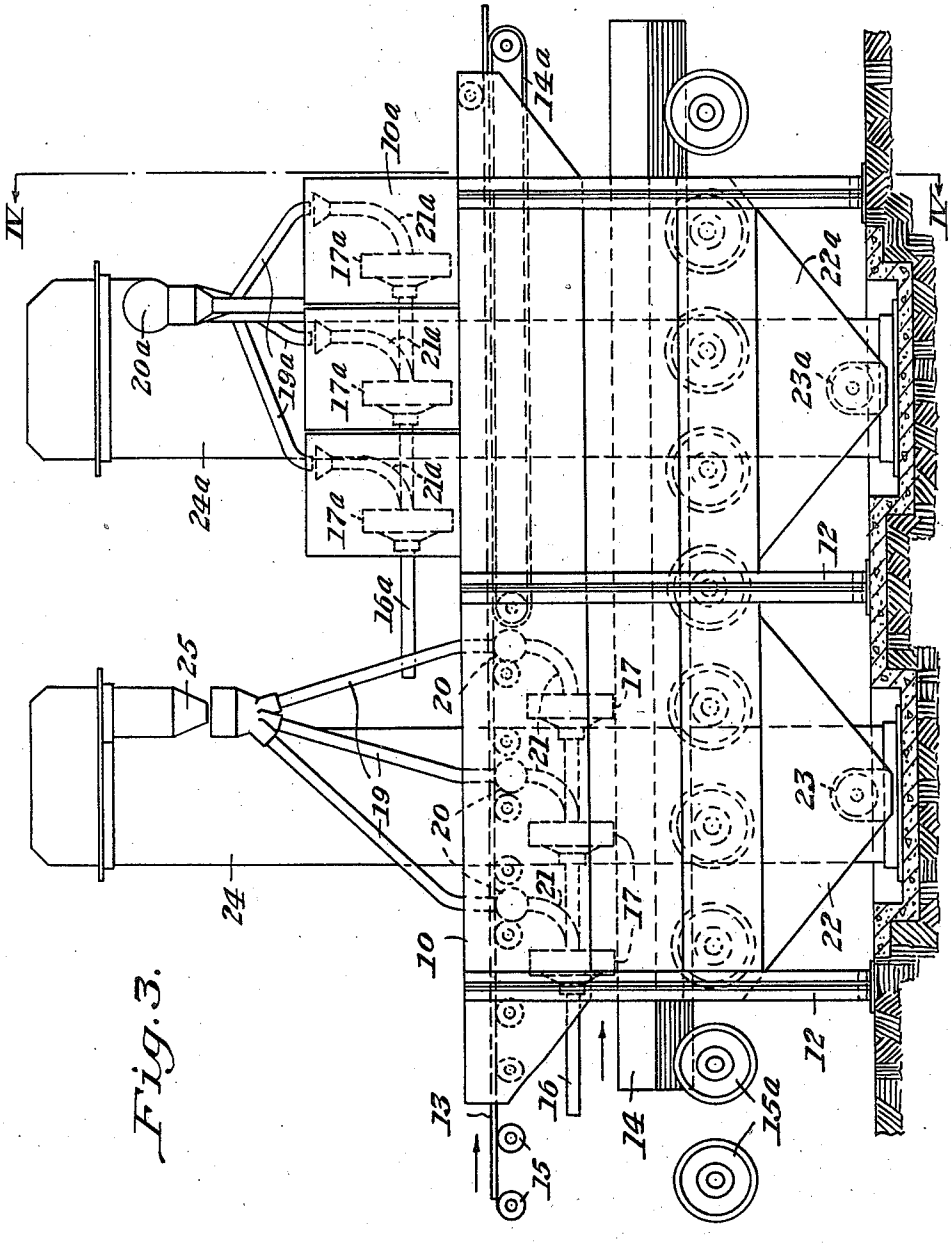


Fig. 3.

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Fig. 4.

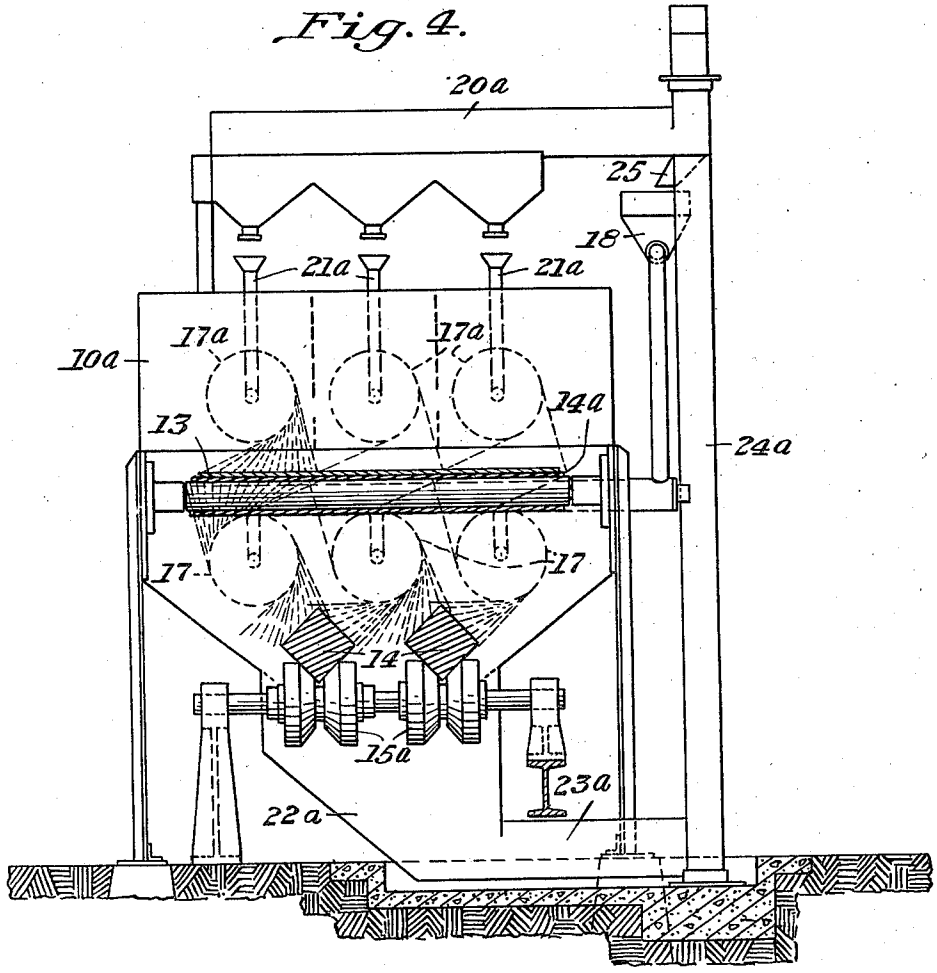
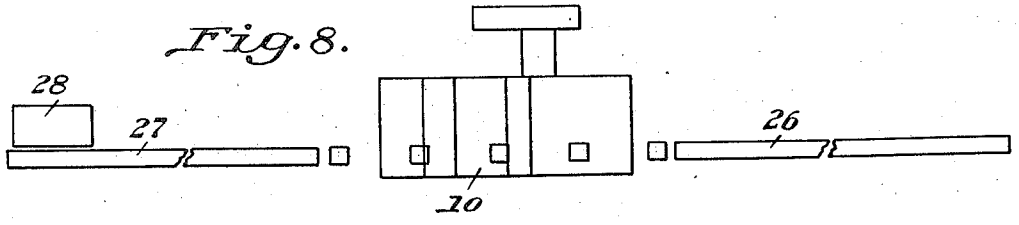


Fig. 8.



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Fig. 6.

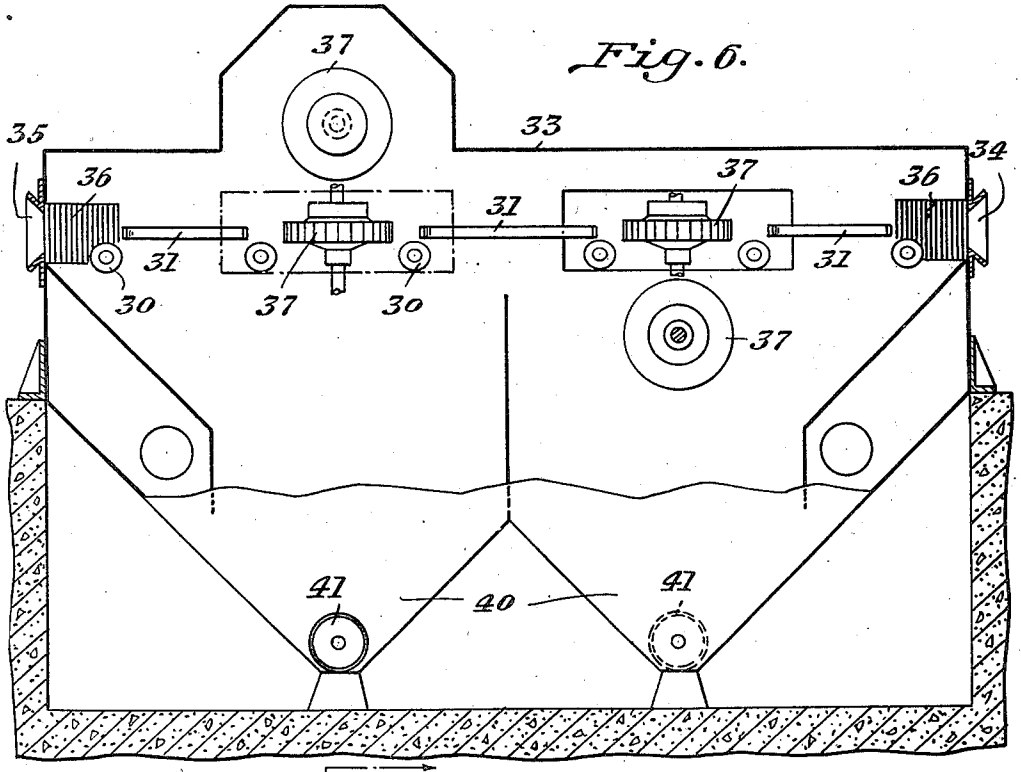
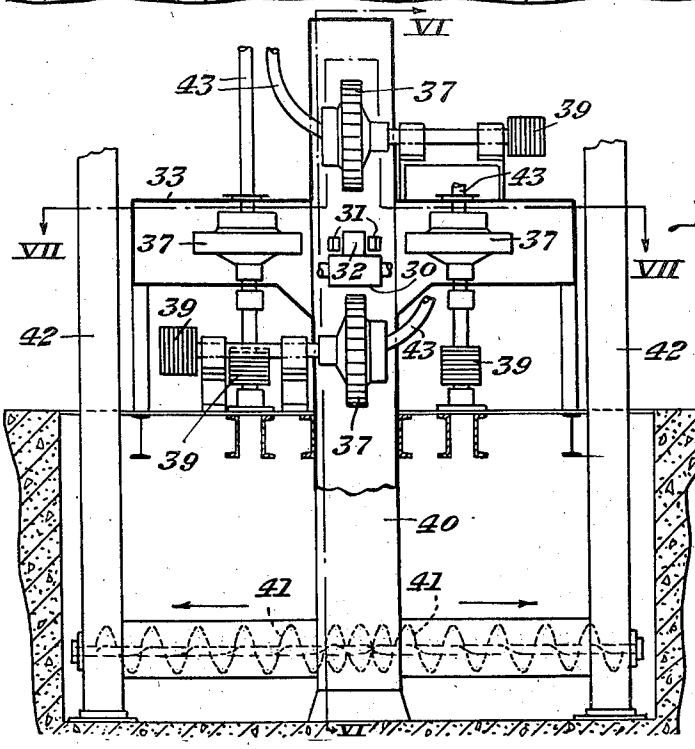


Fig. 5.



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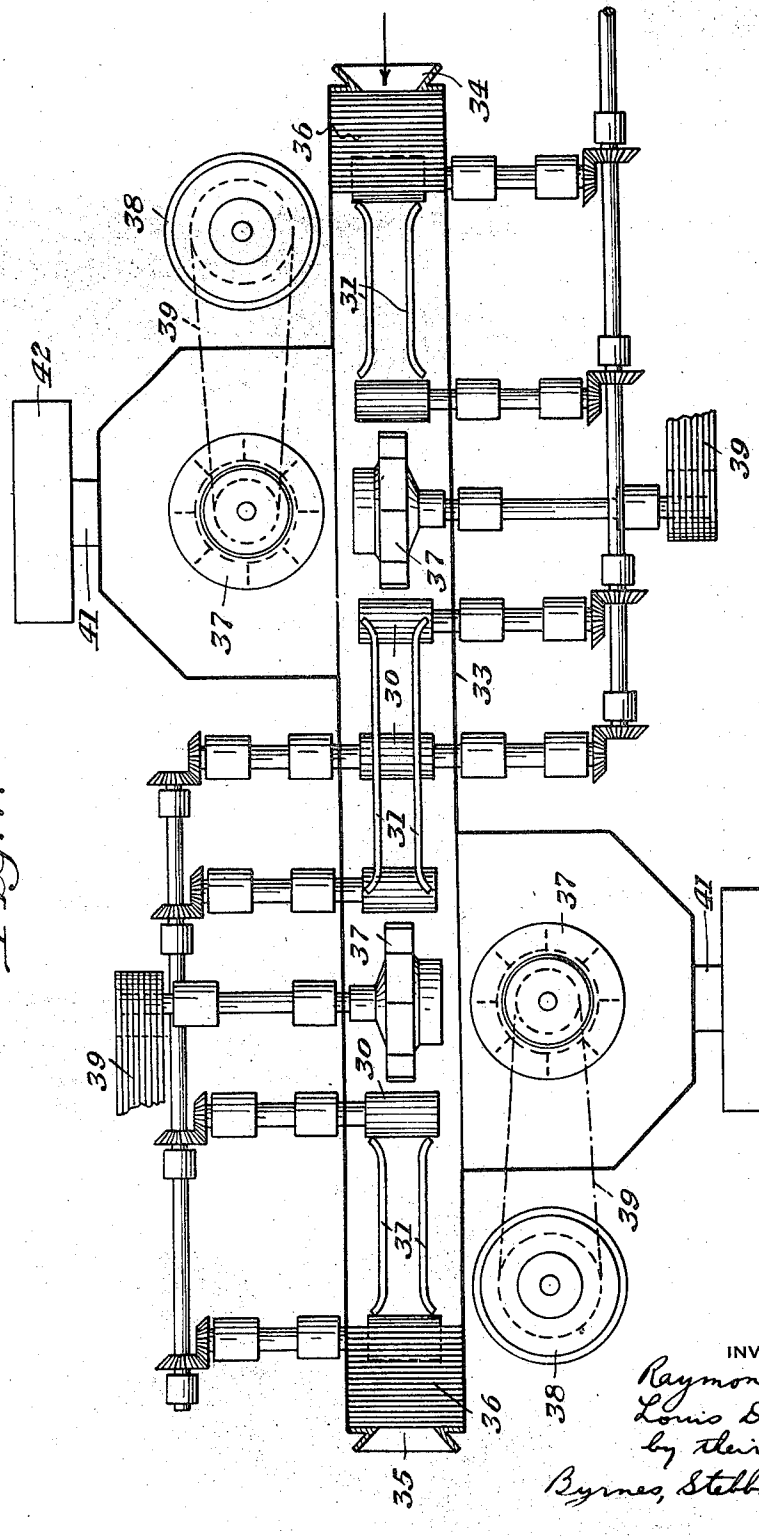


Fig. 7.

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Fig. 10

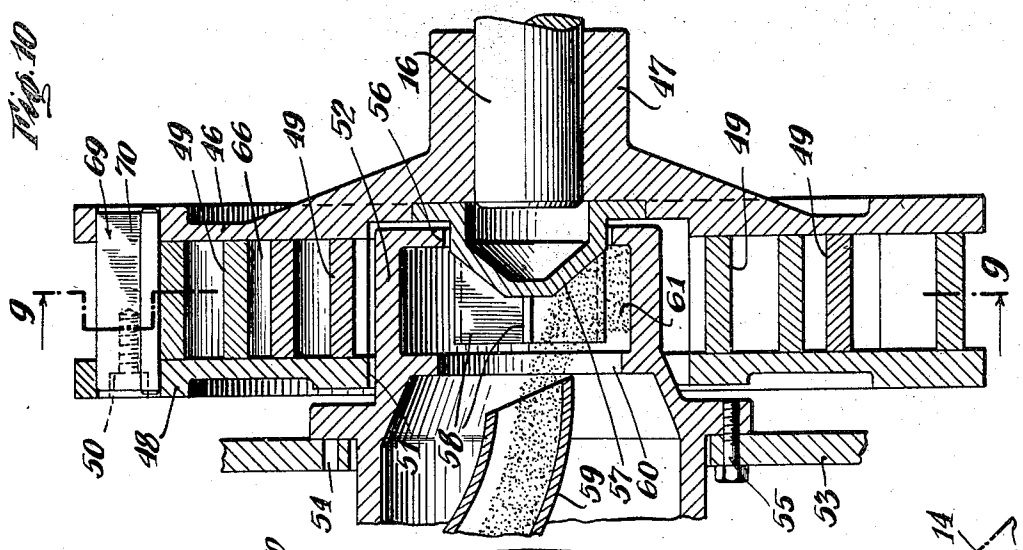
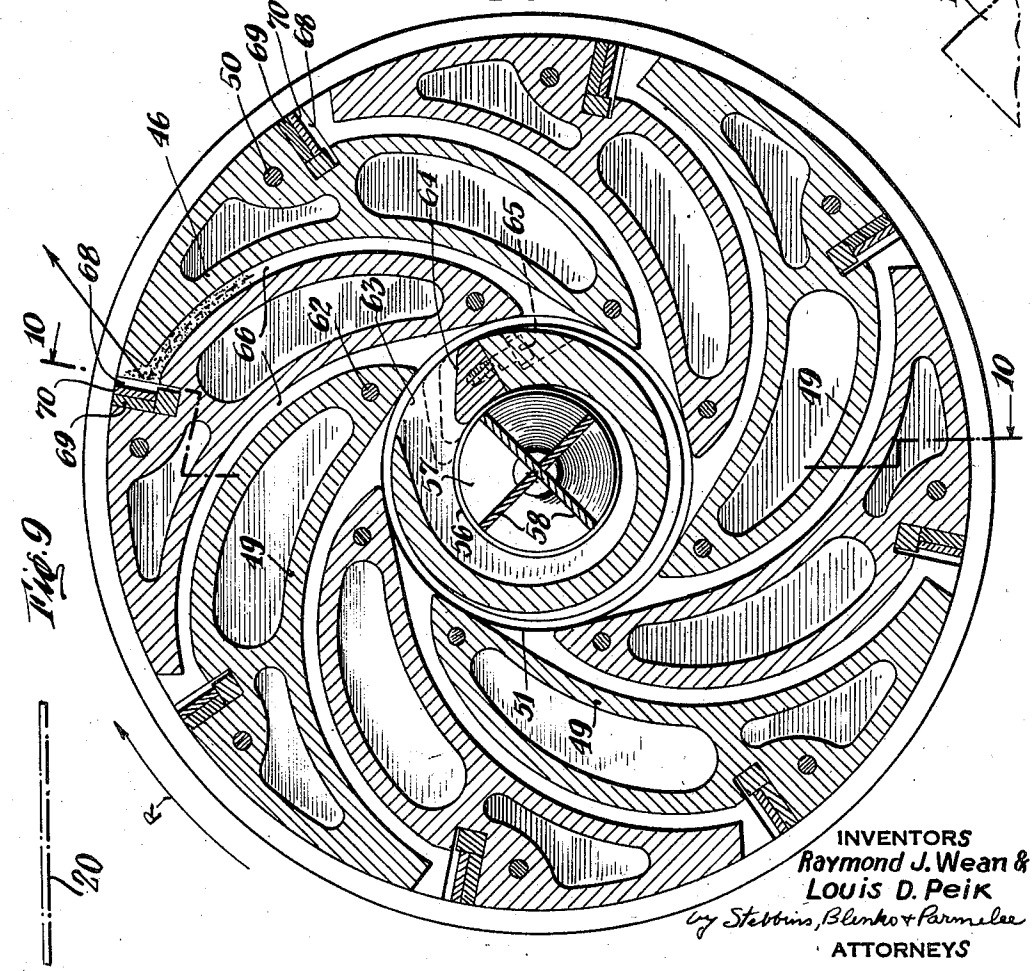


Fig. 9



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Patented May 31, 1938 2,118,832

UNITED STATES PATENT OFFICE

2,118,832

TREATING METAL SURFACE

Raymond J. Wean and Louis D. Peik, Warren, Ohio, assignors, by mesne assignments, to The American Foundry Equipment Company, Mishawaka, Ind., a corporation of Delaware

Application June 1, 1934, Serial No. 728,483
Renewed January 27, 1937

7 Claims. (Cl. 51—9)

Our invention relates to the removal of the outer layer of scale or oxide from metal articles such as plates and billets, by means of a stream of abrasive particles.

In the working of metal, it frequently becomes desirable to clean the surfaces of the material so as to free them from adhering layers of scale or oxide. It is an object of the present invention to provide for the accomplishment of this cleaning or scale removal rapidly and economically. Our invention takes the form of a device for continuously subjecting a plate or billet to an abrasive blast with the result that the surfaces thereof are rapidly freed from adhering scale or oxide. In accordance with our invention, we prefer to employ centrifugal force for delivering the abrasive material to the work and, particularly, a revolving wheel such as disclosed and claimed in the U. S. Patent No. 1,953,566 to Louis D. Peik.

For a complete understanding of our invention, reference is made to the accompanying drawings illustrating a preferred embodiment, together with certain modifications. In the drawings:

Figure 1 is a side elevation of one form of apparatus embodying our invention;

Figure 2 is a sectional view along the line II—II of Figure 1;

Figure 3 is a view similar to Figure 1 showing a modified form of construction;

Figure 4 is a sectional view along the line IV—IV of Figure 3;

Figure 5 is a transverse sectional view through a still further form of the invention;

Figure 6 is a sectional view along the line VI—VI of Figure 5;

Figure 7 is a horizontal, sectional view along the line VII—VII of Figure 5 showing parts in elevation;

Figure 8 is a diagrammatic plan view showing one arrangement of the apparatus;

Figure 9 is a sectional view taken in the plane of the abrasive throwing wheel along line 9—9 of Fig. 10; and

Figure 10 is a transverse section taken along line 10—10 of Fig. 9.

Referring now in detail to the drawings and for the moment to Figures 1 and 2, our invention comprises a housing 10 composed of sheet metal walls 11 assembled on a structural framework 12. The housing 10 is closed on all sides but has end openings for receiving plates 13 and billets 14. These articles are adapted to be delivered to the housing by means of roll conveyors 15 and 15a. The conveyor rolls within the housing may be journaled in bearings carried thereby. The external rolls may be supported in bearings, not shown, in any desired manner.

Shafts 16 are journaled in the housing and are adapted to be driven in any convenient way, for example, by motors having chain belt driving connections with the shafts. Each of the shafts carries one or more wheels 17, such as disclosed and claimed in the above mentioned patent.

The abrasive throwing wheel as disclosed in the patent to Louis D. Peik No. 1,953,566, comprises generally a disc 46 having a hub 47 whereby it is mounted on a shaft 16. The wheel may be closed by a disc or ring 48 concentric with the disc 46 having interposed throwing segments 49 forming the discharge passages for the abradant. The wheel may be assembled by means of screws 50.

The wheel has a central cylindrical opening 51 and a stationary member 52, held on a ring-like support 53 extending into this opening. The support 53 is provided with slots 54 to accommodate bolts 55 so that by loosening the bolts the member 52 can be rotatably adjusted, thereby changing its orientation. The innermost end of member 52 has an opening 56 through which there projects an impeller 57 carried by the disc 46. The impeller 57 is provided with radial blades 58 which serve to feed abrasive particles to the wheel. The abradant is supplied in the first instance through a tube 59 and discharged through a central opening 60 in the member 52 into an impeller chamber 61. The chamber has a peripheral outlet 63, one face of which is formed by an extension of the surface 62 and the other of which is formed by a filler block 64 held in place by screws 65. The peripheral length of the opening 63 may be varied by using filler blocks of different sizes, as indicated in Fig. 9. The central container or control cage with its impeller blades 58 serves to discharge the abradant material at a uniform rate through the wheel. The direction of rotation of the head is indicated by arrow R in Fig. 9 and it will be observed that the discharge opening for the central container extends forwardly and outwardly with respect to such direction of rotation.

The abradant which is fed through the opening 63 in the central container is received by the passages 66 constituting the spaces between the adjacent wheel segments 49. These passages may extend outwardly and rearwardly with respect to the direction of rotation and terminate adjacent the periphery of the wheel in radially extending passages 68. The rearward faces of the passages

68 (considering the direction of rotation) are provided with impact plates 69 having abrasive-resisting impact surfaces 70. Such surfaces may be of an exceedingly hard material, such as tungsten carbide or other wear-resisting material.

In the above wheel the orientation of the discharge zone may be readily controlled by adjusting the orientation of the discharge passage 63, and the size of the zone may be readily controlled by adjusting the peripheral length of such passage. The edges of the zone are quite sharply defined so that surface blasting may be carried on accurately and successfully over such zone and maximum efficiency obtained from the abradant. The speed and character of the surface blasting effected may be varied by changing the speed of the wheel and by the size and character of the abradant employed.

Abrasive material is delivered to the firing wheels from a hopper 18 through conduits 19 and headers 20. Conduits 21 extend from the headers 20 to the axial inlet port of each of the wheels. Screw conveyors (not shown) move the abrasive through the headers.

As shown in Figure 2, the abrasive blast when thrown by the wheels 17, impinges either on the under surface of the plates 13 or the upper surfaces of the billets 14. As described in the Peik patent referred to above, the orientation of the abrasive blast or stream may be controlled by suitable orientation of the discharge passage in the normally stationary container. Thus the wheels 17 may be made to discharge streams either upwardly against the plate 13 or downwardly against the billets 14. The controlled stream of abrasive thrown by the wheel can be directed to impinge either the plates 13 or the billets 14 by suitably orienting the discharge passage 63 in the control container 61. By driving the wheels 17 at high speed, a very effective cleaning blast is provided which rapidly removes layers of scale or oxide from the plates or billets.

The lower portion of the housing 10 is formed into hopper shape, as shown at 22, and the abrasive particles collected therein are delivered by a screw conveyor 23 to an elevator 24, which may conveniently be of the bucket lift type. The elevator 24 returns the abrasive material to the hopper 18 by means of a spout 25.

In order to clean all surfaces of the plates and billets by use of the apparatus shown in Figures 1 and 2, it is obviously necessary to reverse the articles on the conveyors 14 and 15. An arrangement whereby this can conveniently be effected is shown in Figure 8. From this figure, it will be observed that the housing 10 is disposed between an approach conveyor table 26 and a run-out conveyor table 27. Associated with the latter is a mechanism indicated at 28 for turning the billets and plates for a second passage through the housing. The turning mechanism may be of any desired character. Separate approach and run-out conveyors may be provided for plates and billets, or a single set of tables instead, with means for diverting the different classes of material along the respective paths through the housing 10.

Figures 3 and 4 illustrate a similar apparatus which is adapted to clean both sides of a plate in one operation. A portion of the apparatus shown in Figure 3 is substantially the same as that of Figures 1 and 2 and the parts are indicated by the same reference numerals. As to the remainder of the apparatus of Figure 3, the parts thereof are designated by the same numbers as similar parts in Figures 1 and 2 with the suffix "*a*". As shown in Figures 3 and 4, in addition to the housing 10 and associated apparatus for cleaning the under side of plates or the upper sides of billets disposed on edge, there is a second housing 10*a* having a conveyor 14*a* cooperating with the conveyor 15 for passing plates therethrough. Wheels 17*a* are mounted on shafts 16*a* in the housing 10*a* above the conveyor 14*a*.

By this arrangement, plates traveling through the housings 10 and 10*a* successively, have their lower and upper surfaces cleaned respectively by abrasive particles discharged thereagainst from wheels 17 and 17*a* respectively. Billets passing through the housings on the conveyor 15*a* may have their upper surfaces cleaned as in the case of Figures 1 and 2. The abrasive particles discharged by the wheels 17*a* are collected in a hopper portion 22*a* of the housing 10*a* and delivered by a screw conveyor 23*a* to an elevator 24*a*. The elevator 24*a* discharges to a header 20*a* which supplies conduits 21*a* extending therefrom to the inlet ports of the wheels 17*a*.

It will be obvious that by adding a second unit, as shown in Figure 3, to the apparatus of Figures 1 and 2, the simultaneous cleaning of both sides of the plates is easily possible. Billets require a second passage, as in the simpler form of the apparatus, but this can readily be provided after reversing billets on the conveyor, as shown in Figure 8.

A slightly different form of apparatus intended for simultaneously cleaning the four sides of billets of rectangular section, is shown in Figures 5, 6, and 7. This apparatus comprises a roll table 30 having guides 31 therealong for passing billets such as that shown at 32 through a housing 33, where they are subjected to the abrasive action of high velocity streams of particles directed at the four sides thereof. Entry and exit openings in the housing 33 are provided at 34 and 35. Rubber curtains 36 guard against the outflow of abrasive particles through these openings.

A plurality of wheels 37 are carried on shafts journaled on suitable bearings, for delivering streams of abrasive particles against the four sides of the billet 32. The various wheels have individual driving motors 38 with chain belt driving connections 39 to the wheel shafts.

The abrasive delivered to the billets is collected after discharge from the wheels and impinging on the work, in hoppers 40 below the top and bottom wheels 37. It will be noted that there is a horizontally disposed wheel substantially in vertical alinement with each of the vertically disposed wheels. The abrasive collecting in the hoppers 40 is removed therefrom by screw conveyors 41 and elevators 42, whence it is returned to the wheels through supply conduits 43 and connections such as shown in Figures 1 through 4.

It will be apparent from the foregoing description that our invention provides for the cleaning of metal articles such as plates and billets, in a very effective manner, with great rapidity and at very low cost. The apparatus shown is not costly to construct and can easily be built to have a long life. The type of wheel employed, as explained in the patent before mentioned, confines the abrasive material to the work and prevents unnecessary wear on the enclosing housing. As shown and described herein, the apparatus is susceptible of variations to adapt it to perform different functions. Plates and billets may be cleaned on one side or on all sides simultaneously, as desired. Various widths of plates may be

accommodated by using more or fewer wheels properly spaced. The effect of the blast of abrasive material is to polish the metal surfaces as well as merely to clean them. The speed of travel of the material may be increased by using a plurality of wheels in line to get a repetitive cleaning or abrading action. The abrasive material is collected and re-used. It is also prevented from escaping from the enclosing housing. Any injurious effect on workmen in the vicinity is thereby avoided.

While we have illustrated and described herein but one preferred embodiment of the invention with certain modifications therein, it will be apparent that numerous changes in the construction and apparatus disclosed may be made without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. Apparatus for cleaning flat pieces of metal or billets comprising a housing, a conveyor for moving elongated metal therethrough, abrasive throwing wheels mounted in the housing for rotation, said wheels being spaced apart across the width of the conveyor and along the path of material moving therealong, and a billet conveyor on the opposite side of the wheels from the first-mentioned conveyor, said billet conveyor being adapted to support billets with one diagonal plane substantially vertical while being moved.

2. Apparatus for treating metal surfaces comprising a housing, a first conveyor for passing sheet metal through said housing, a second conveyor for passing billets through said housing, said conveyors being disposed substantially parallel, and means for projecting a stream of abrasive, said means including a centrifugal abrasive throwing wheel mounted in said housing between said conveyors, and means associated with said wheel for selectively controlling the direction of flight of the abrasive for impingement either against a sheet on said first conveyor or against a billet on said second conveyor.

3. Apparatus for treating metal surfaces comprising a housing, a first conveyor for passing sheet metal through said housing, a second conveyor for passing billets through said housing, said conveyors being disposed substantially parallel, a centrifugal abrasive throwing wheel mounted in said housing between said conveyors, said wheel having means associated therewith for selectively controlling the direction of flight of the abrasive either against one face of a sheet on said first conveyor or against a billet on said second conveyor, and a second centrifugal abrasive throwing wheel mounted on the opposite side of said first conveyor and adapted to project a stream of abrasive against the other face of said sheet.

4. Apparatus for treating metal surfaces comprising a conveyor for passing sheet metal along a predetermined path, means including a second conveyor for passing a plurality of billets simultaneously along a path substantially parallel to a sheet on said first conveyor, and a plurality of centrifugal abrasive throwing wheels mounted between said conveyors and mutually offset in a direction transversely of said conveyors, said wheels having means associated therewith for selectively controlling the direction of flight of the abrasive either against a sheet on said first conveyor or against billets on said second conveyor, said wheels being positioned to project abrasive in streams which combine to sweep substantially the entire width of a sheet on said first conveyor.

5. Apparatus for cleaning sheets or billets, comprising a first conveyor for advancing sheets along a predetermined path, a centrifugal abrasive throwing wheel mounted in position to project a stream of abrasive against a sheet on said conveyor, and a second conveyor on the opposite side of said wheel from the first conveyor, said second conveyor being adapted to convey billets along a predetermined path past said wheel, and means associated with said wheel for selectively controlling the direction of the stream of abrasive either against a sheet on said first conveyor or a billet on said second conveyor.

6. Apparatus for treating metal billets comprising a plurality of conveyors adapted to convey metal billets along predetermined, substantially parallel paths, a centrifugal abrasive throwing wheel mounted adjacent said conveyors and having means associated therewith for controlling the direction of flight of the abrasive, whereby it impinges simultaneously against billets on both of said conveyors.

7. Apparatus for treating metal billets including a plurality of conveyors adapted to convey a plurality of billets along spaced, parallel paths, means including a centrifugal abrasive throwing wheel for projecting a stream of abrasive against one of the billets, means including a second centrifugal abrasive throwing wheel for projecting a stream of abrasive against the other of the billets, and means including a third abrasive throwing wheel for projecting a stream of abrasive against both of the billets.

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