Jan. 2, 1934. W. A. ROSENBERGER 1,941,915

HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

Original Filed April 2, 1930 6 Sheets-Sheet 1

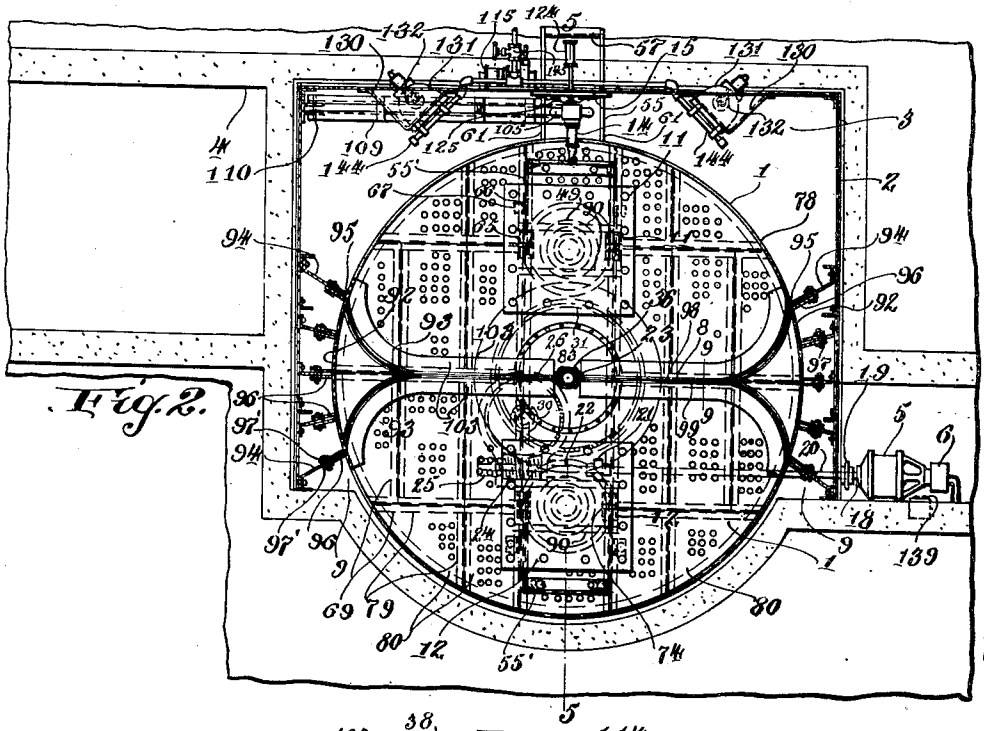


Fig. 2.

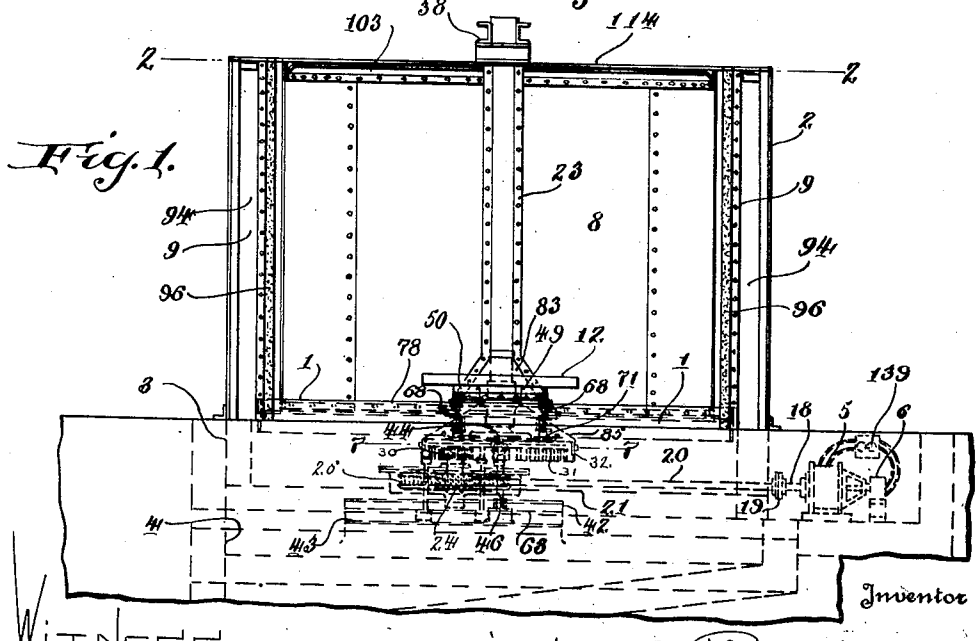


Fig. 1.

Witness

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Fig. 3.

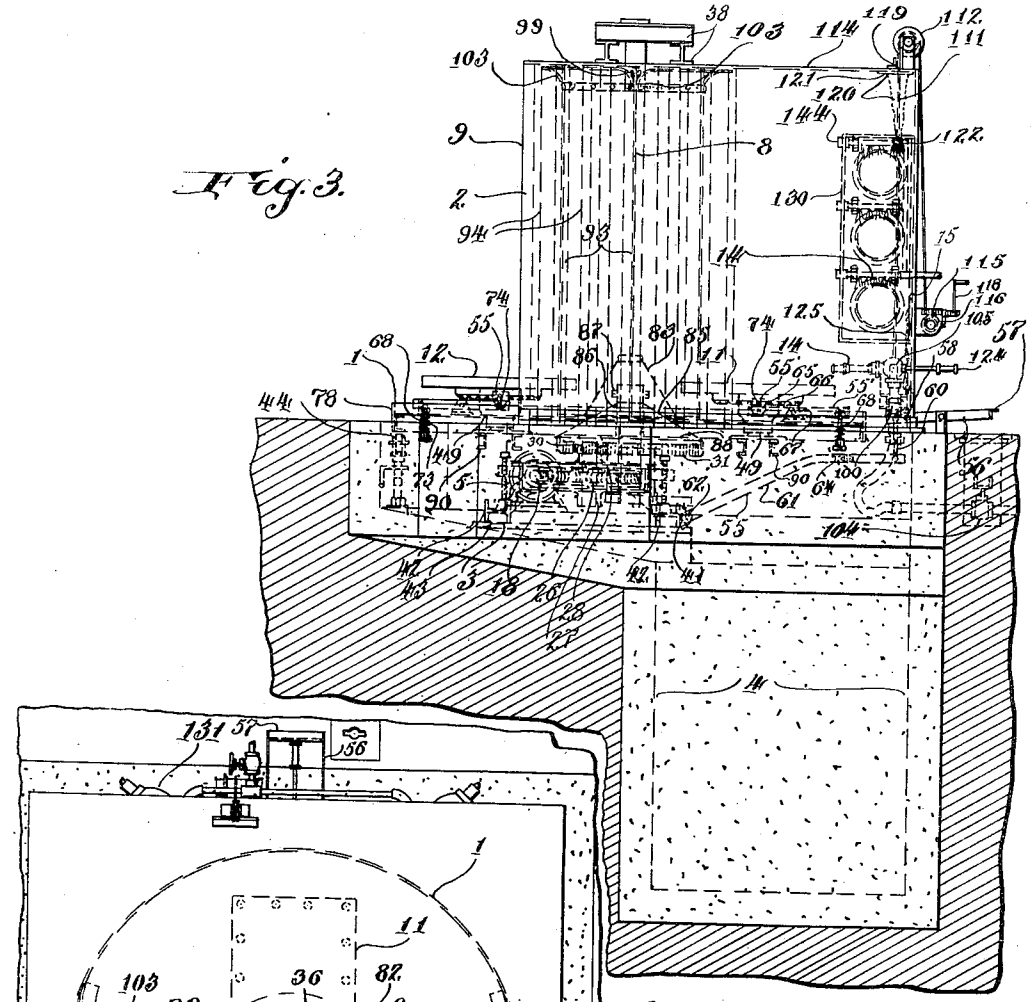
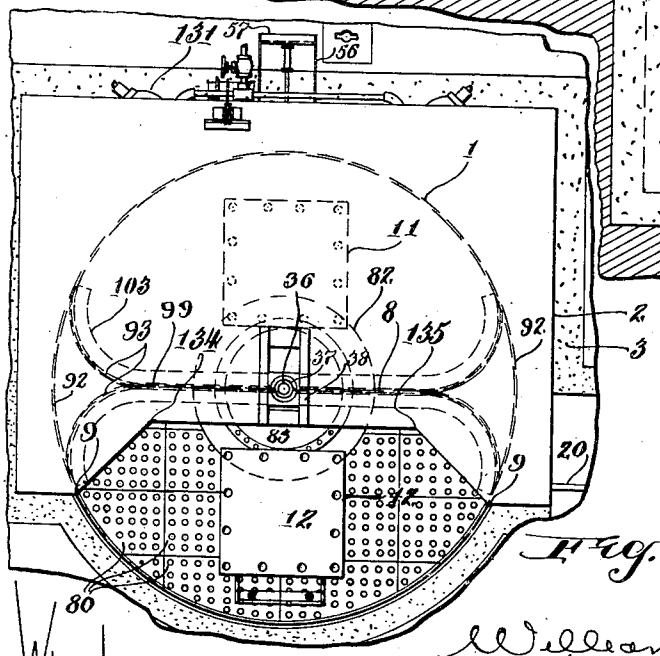


Fig. 4.



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Peter W. Plaut.

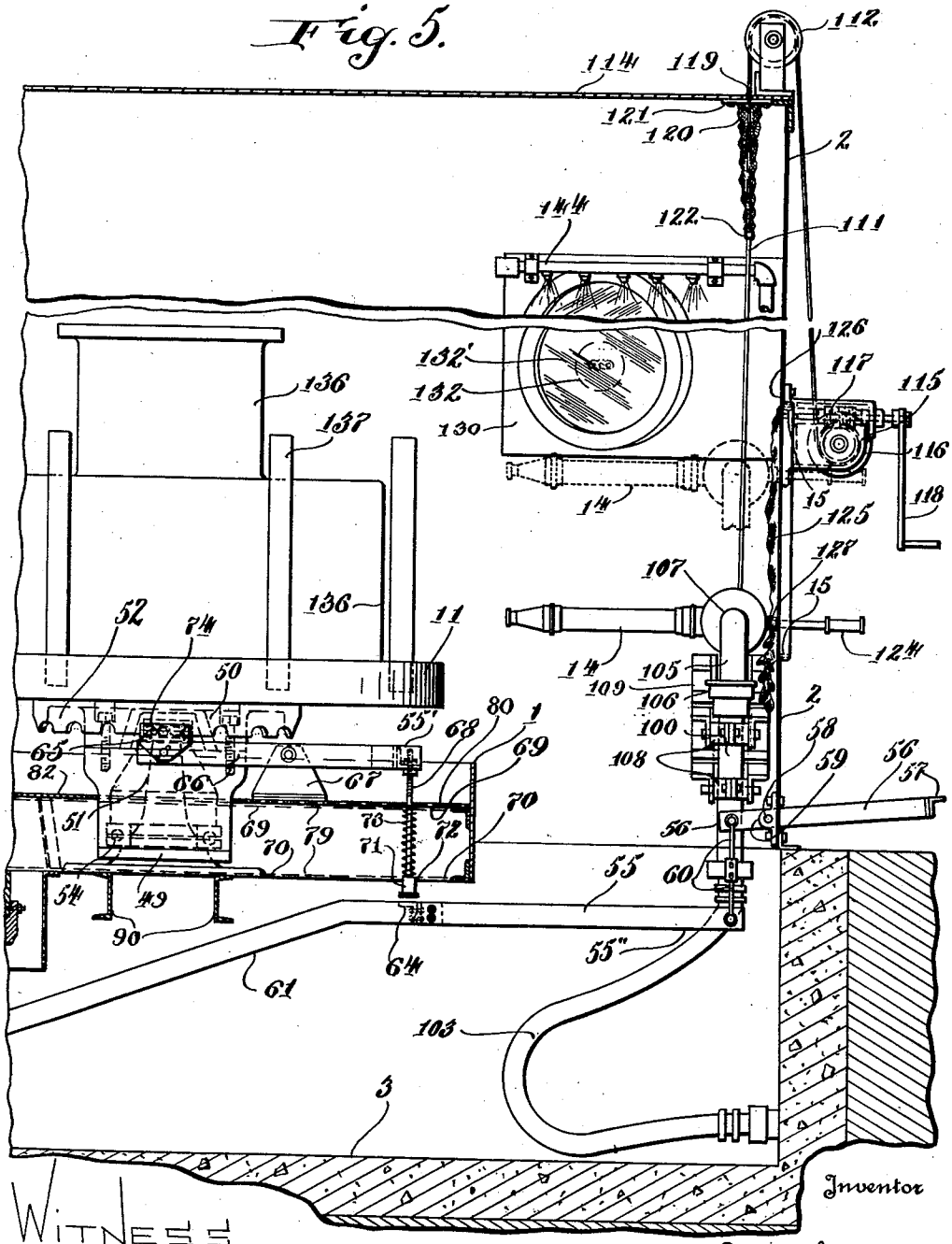
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HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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Fig. 5.



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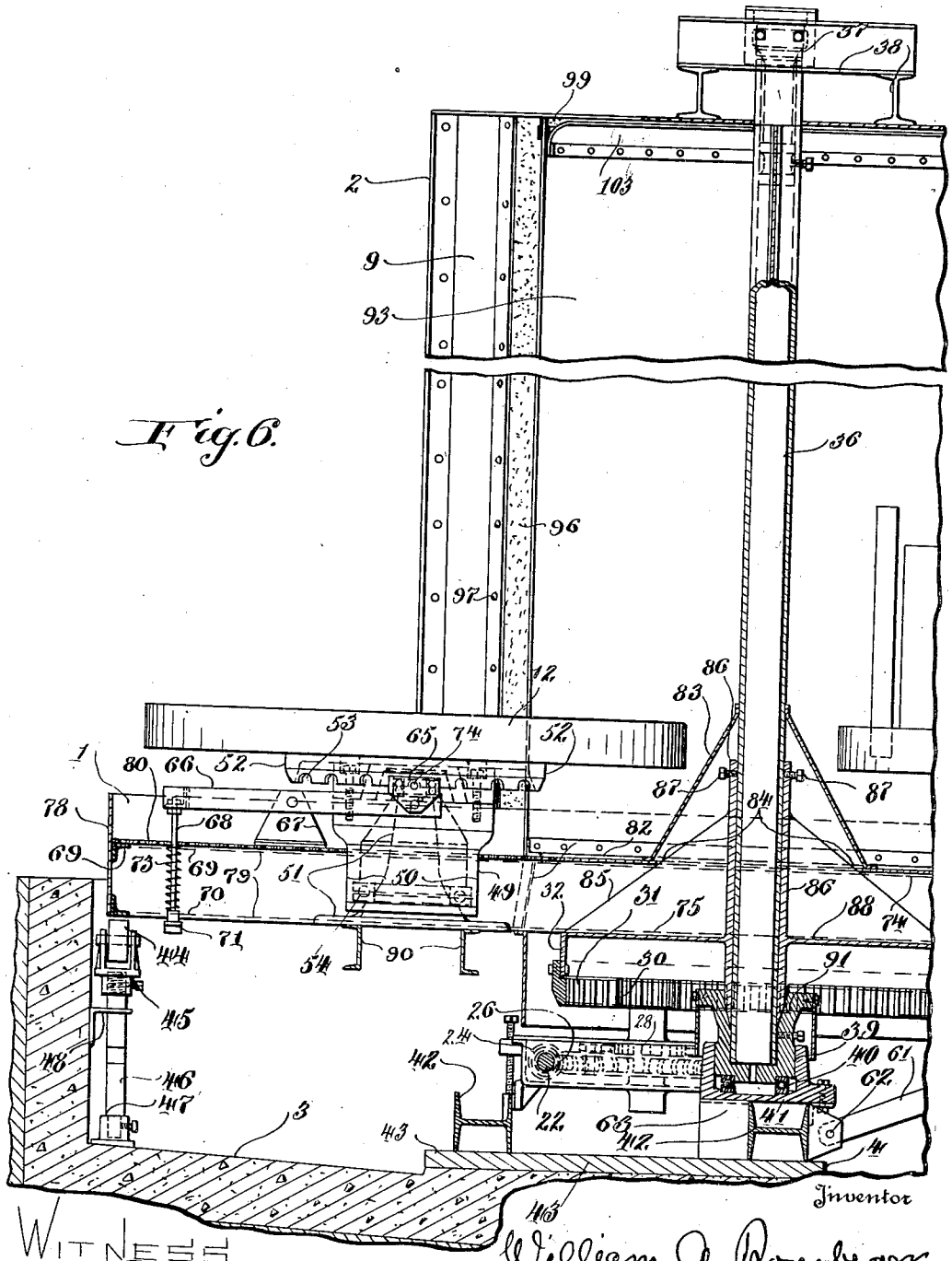
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HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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Fig. 6.



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HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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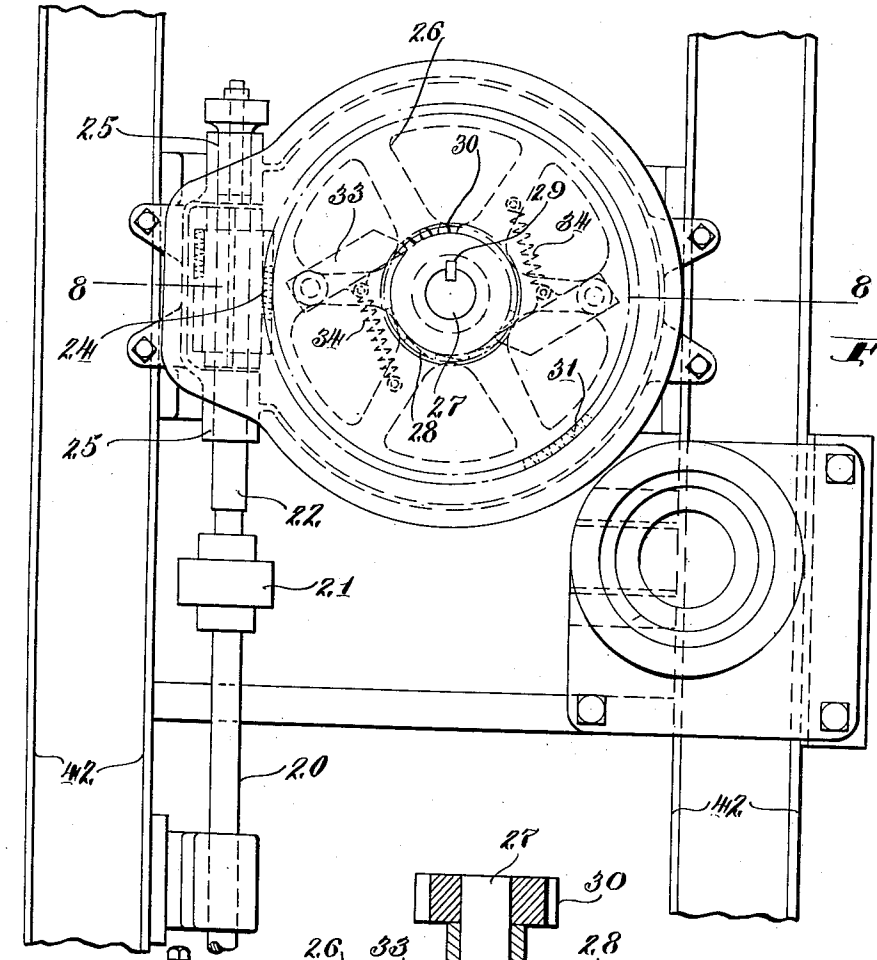


Fig. 7.

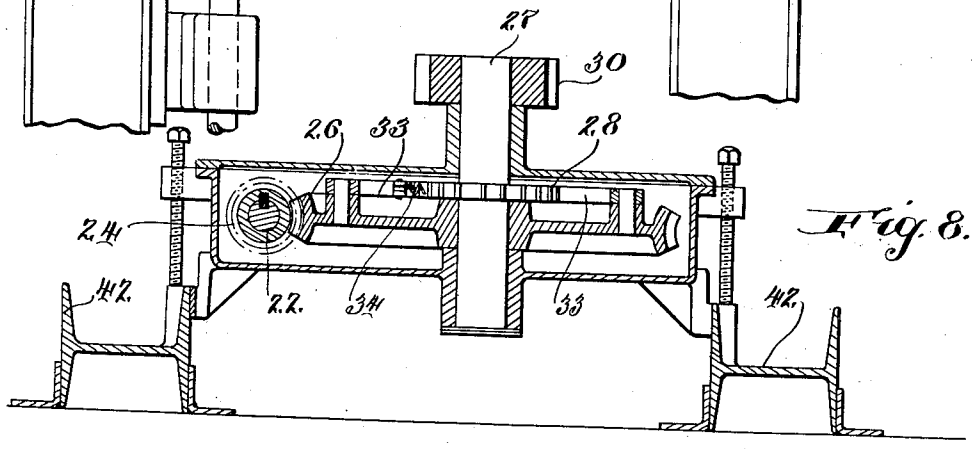


Fig. 8.

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HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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Fig. 10.

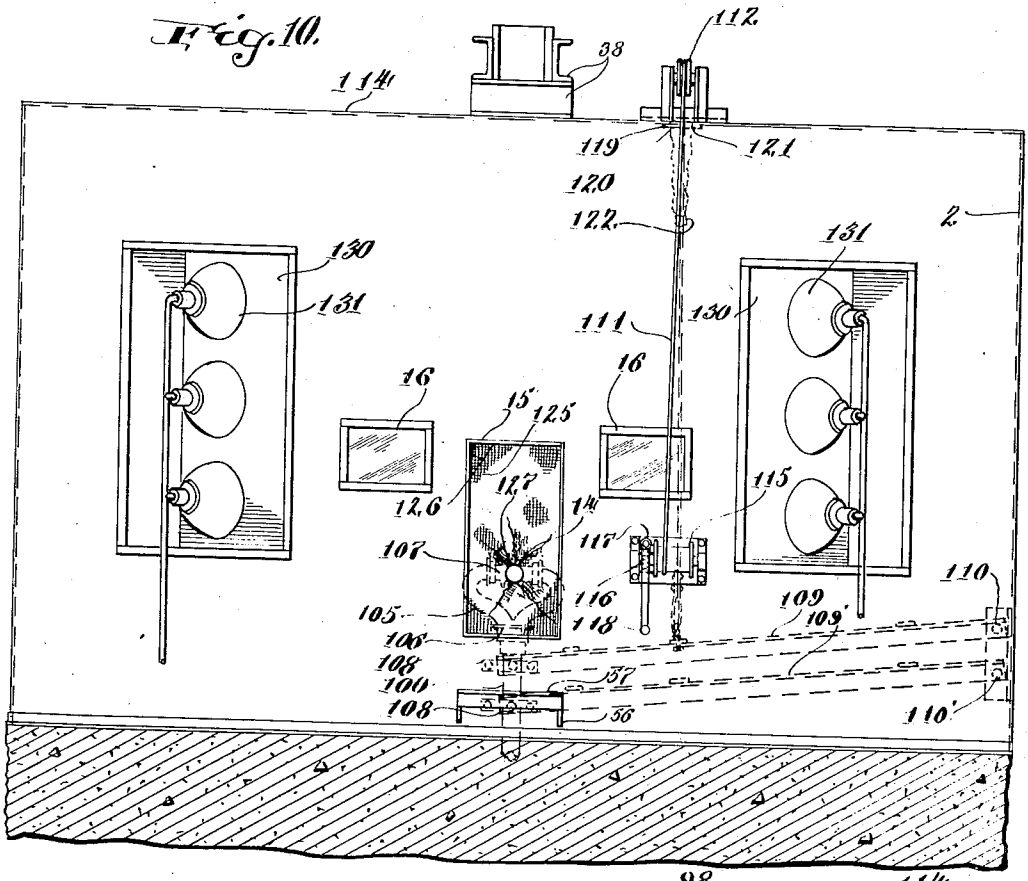
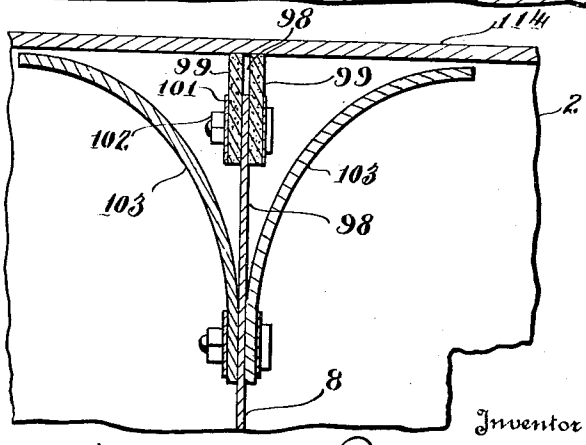


Fig. 9.



Witness

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Patented Jan. 2, 1934 1,941,915

UNITED STATES PATENT OFFICE

1,941,915

HYDRAULIC CORE KNOCKOUT AND CLEANING APPARATUS FOR CASTINGS AND THE LIKE

William A. Rosenberger, Hagerstown, Md., assignor to Pangborn Corporation, Hagerstown, Md., a corporation of Maryland

Application April 2, 1930, Serial No. 440,951
Renewed November 4, 1933

15 Claims. (Cl. 141—1)

The invention relates to the art of cleaning particularly large cored castings by the hydraulic method, the object being to remove the core sand and supports as well as to remove the burned sand from the outside of the castings. The cleaning of castings in this way is known to be old practice and the invention relates to an improved apparatus whereby the cleaning of castings by the hydraulic method, including the handling of the castings and their presentation to and removal from the cleaning area in front of the nozzle is greatly facilitated.

The castings are cleaned by means of one or more jets or streams of water projected at high pressure. In order to accomplish the desired result with economy and efficiency both as to time and the use of the water supply, the stream must be directed by hand and the operator must therefore have a view of the casting, and as the castings which are handled in this way are of considerable size, in order to operate efficiently, it is necessary to handle them by means of a travelling crane. The improved apparatus is particularly adapted to this purpose.

The apparatus consists of a mechanically driven rotatable table which is turned through the desired angle at the will of the operator, and a steel or other suitable housing or enclosure for preventing the escape of the water. The table is provided with an upright partition which may be arranged diametrically or in any convenient manner so that in the mid or operative position of the table the partition serves to close the housing which is otherwise open at one side referred to herein as the front where the castings are introduced and removed.

The table or main table, as herein illustrated, is provided on each side of the central partition with a work support or turntable on which the castings to be cleaned are placed. The partition, in accordance with the preferred construction shown, is suitably sealed at the top and sides to prevent the escape of the water and the housing contains a nozzle connected to a high pressure water supply. The nozzle is preferably so suspended that it can be moved up and down and swung laterally and vertically to turn the stream in the direction of the part of the work to be treated, and there is a window adjacent the nozzle so that the operator can observe the casting. The preferred form also includes a waterproof fabric bag or shield surrounding the nozzle which is exposed at a second opening, the flexible means serving to prevent the escape of the water through the opening. There is also suitable lighting means to make it easy for the operator to observe the work.

It will be understood that in the mid or operative position of the main table with the upright partition closing the opening in the side of the housing, one of the work supports will be exposed at the opening and the other support will be in front of the nozzle. In the preferred form shown the roof of the housing is cut away forming an extension of the said opening over a portion of the exposed table. A casting to be treated is thus conveniently placed on the exposed table while the other table carrying a second casing completely enclosed in the housing is located in the path of the jet from the nozzle.

The invention includes, in addition to the improvement thus outlined, various features and details contributing to the facility and efficiency of the operation, which details, together with the main feature of the invention, will be more fully hereinafter described. The machine of the invention in the preferred form is illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a front elevation of the hydraulic apparatus for knocking out cores and cleaning castings.

Figure 2 is a horizontal section on the line 2, 2, Figure 1.

Figure 3 is a side elevation looking from the right in Figure 2.

Figure 4 is a top plan of the housing, etc.

Figure 5 is a fragmentary section at the rear of the machine, on the line 5, 5 in Figure 2, but on a larger scale showing the nozzle and nozzle actuating mechanism in detail, and also showing the work on the table and in front of the nozzle, i. e., in cleaning position. It also shows the brake mechanism in detail.

Figure 6 is a section in the same plane at the front.

Figure 7 is a horizontal section on the line 7, 7 in Figure 1.

Figure 8 is a section on the line 8, 8 of Figure 7.

Figure 9 is a section on the line 9, 9, Figure 2.

Figure 10 is an elevation of the rear wall of the housing looking from the outside.

Referring to the drawings by numerals, each of which is used to indicate the same or similar parts in the different figures, the machine shown comprises a main rotatable table 1, enclosed in a suitable housing 2, beneath which is a drainage basin 3, including a pit or well 4 shown as located at one side into which the wash water is drained,

and from which it may be pumped or otherwise removed, the sand and the like being permitted to settle. The table is rotated from one position of rest to another at the will of the operator by any driving means suitable and easily controlled for this purpose, the same being shown in the form of an electric motor 5. The apparatus is provided with any suitable braking mechanism shown in the present instance as a magnetic brake 6. The table 1 has a central partition 8, shown as vertical and upright, and extending diametrically across the table. This partition in the operative position of the table being hereinafter described, extends across the housing 2, completely closing the housing by suitable sealing means to be described, preventing the escape of water from the front of the housing which is otherwise open at 9 as indicated for the admission of the work. On each side of the partition 8, the main table 1 is shown as provided with suitable supports 11, 12, for the work. In the preferred form illustrated these work supports are mounted to rotate and are otherwise hereinafter referred to as turntables. Any preferred mechanism may be provided to rotate the turntables, this rotation being checked at the will of the operator. In the form shown, the work is rotated by the impact of the water as hereinafter described. The water used in washing the castings is directed against the work by a nozzle 14 within the chamber and manually controlled by the operator by way of opening 15 in the housing, and the operator observes the work looking through a glass window 16.

The details of the different elements of the machine already specified, will now be described.

The shaft 18 of the motor 5 is connected by a suitable joint 19 which may be of the universal type, to a drive shaft 20 which is connected by a second coupling 21, which may be of the universal or any suitable type, to the shaft 22, of a worm 24, which is supported by suitable bearings 25 engaging the worm shaft 22. This worm, in turn, engages a worm wheel 26, see particularly Figures 6, 7 and 8, which, in the preferred form shown is free to rotate on an upright shaft 27, to which is secured a ratchet wheel 28. This shaft 27 carries a toothed pinion 30 also secured to the shaft. This pinion 30, in turn, meshes with an internal ring gear 31 which is secured to the bottom of the main table in any suitable manner, being shown in Figure 6 as bolted to a depending web 32 on the plate 88 to be described.

In accordance with the preferred form of the invention, the ratchet 28 is connected to the worm wheel 26 in a manner permitting the table to be rotated forwardly by hand independently of the power drive. To this end the worm wheel 26 carries pawls 33 engaged by springs 34 whereby the worm wheel 26 drives the ratchet 28 in right handed rotation, and in turn, drives the table through the pinion 30 and the ring gear 31 in the corresponding direction, the table being further free to rotate forwardly, i. e., in the direction in which it is driven by the motor independently of the form and motor, permitting it to be moved by hand when the motor is not operated. While this feature may be utilized for other purposes, it permits the machine to be operated, the table being turned by hand in case the power drive is rendered inoperative from any cause.

By reference to Figure 6, it will be noted that the main table 1 is mounted on a central upright hollow shaft 36. This is aligned at the top by means of a bearing 37 supported on suitable steel I beams 38, or in any preferred manner, and this shaft and the entire weight of the table is supported and aligned at the bottom by means of a suitable side bearing 39 and thrust bearing 40, supported on frame members 41, 42, which, in turn, rest on suitable concrete or other foundation structure 43. The table as shown is supported, only at the time of placing the work on the supports or turntables 11, 12, at the circumferential edge, particularly as to the ring 78, by means of antifriction rollers 44 normally spaced slightly below the bottom edge of said ring 78. These rollers are mounted in suitable removable and interchangeable forked brackets 45, and the brackets 45 are shown as supported on suitable removable upright pins 46 mounted in sockets or other suitable supports, 47, 48, secured to the concrete 13.

Mounted on the main table 1 on each side of the partition 8, as already specified, are work supports or turntables 11, 12. These work supports in the form of the invention shown are mounted to rotate, being provided for this purpose with a suitable pedestal 49, supporting each turntable at the center. Each pedestal 49 has an upper end external member 50 secured to the bottom of the turntable 11, 12 and a lower and internal member 51 secured to the main table 1. The external member 50 and the turntable are supported on the internal member 51 to rotate thereon by antifriction balls 54.

The work supports or turntables 11, 12, when released at the will of the operator swing or rotate freely in response to any impulse to change the angular position of the work in order that all portions may be presented for washing. The impact of the washing stream is ordinarily utilized for this purpose and to maintain the work supports and the work in the desired angular position during the cleaning and core removing operation, until such a time as a change of position is desired, the work support brake or turntable brake 55 is provided, see particularly Figure 5. This brake in the preferred form shown is normally engage and is released at the will of the operator to permit the work support, which is inside of the housing or cabinet 2 at the time and hence in range of the hydraulic jet, to be released so that it may rotate in response to the impact of the jet or any impulse applied for this purpose.

The brake construction as shown comprises an upper brake assembly 55′ and a lower assembly 55″. This upper assembly is duplicated, being provided in connection with each work support or turntable on the main table and the lower actuating assembly is stationary and adapted to cooperate with the upper assembly of each work support as the corresponding work support comes into position in front of the nozzle. The lower or actuating brake assembly consists of a pedal lever or other suitably actuated control lever 56 having a pedal 57, see Figure 3, outside the casing. The control lever 56 extends through the casing 2, being shown as pivoted intermediately at 58 on a suitable bracket 59 secured to the wall of the casing and resting on the foundation.

All these details may be widely varied within the scope of the invention. The end of the pedal lever opposite to the pedal and inside of the casing or housing 2 is connected in any suitable manner as by means of a tension member or connecting rod 60 to a double lever 61, which is placed in a substantially radial position as to the main table 1 and beneath the table, the outer and up-

per portion being shown as substantially horizontal, and the inner portion being inclined downwardly toward the center of the machine, beneath the central portion of the table where it is shown as pivotally mounted at 62 on the supporting frame member 42 which supports the lower center bearing 39, 40 of the table, see particularly Figures 3 and 6. This actuating arm or lever 61 is provided near its center with an upwardly disposed presser foot 64 which is elongated at right angles to the length of the lever 61 which is shown as radially disposed.

Obviously, the actuating lever 61 with its presser foot 64 can be raised at the will of the operator by applying the foot to the pedal 57, Figure 3, at the outer end of the pedal lever 56, rocking the inner end of the lever 56 upwardly and applying upward tension to the tension rod 60 which is connected to the outer end of the lever 61, and the upper or moving brake mechanism 55' which operates in connection with each of the work supports 11, 12, and moves therewith, is reproduced as many times as there are work supports. It consists of a brake shoe 65, mounted on the end of a brake beam or brake shoe lever 66, which is pivoted intermediately on an upright bracket 67 on the table and connected at its outer end remote from the shoe to two spaced rods 68, which extend downwardly through upper and lower flanges 69, 70 of the table beams, each being provided at its lower end with an enlarged portion or foot 71, which slides in a suitable aperture in the lower flange 70 at 72 and in the form of the invention shown the foot 71 is held normally depressed, and the shoes 65 normally raised by means of helical springs 73 which encircle the thrust rods 68, bearing each at its upper end against the lower side of the upper flange 69 of the table frame, and at its lower end against the top of the foot 71.

Each of the work supports 11, 12 is provided on its lower side with a depending integral bead or rib 52 of circular outline in plan and preferably having its lower edge notched at 53, the notches being spaced along the rib to give the desired location of the work support in its respective positions of rest as hereinafter further explained. The brake shoe 65 engages in braking position the lower edge of the bead 52, the bead being tapered and the shoe having a correspondingly formed aperture to receive the bead. The shoe is further provided with a transverse pin 74 which crosses the aperture in the shoe and engages the corresponding notches 53 in the bead 52 in the operative or braking positon of the parts.

It will be apparent from the construction shown in Figure 5 and the description, that the brake is normally applied by means of the spring 73 which tends to depress the right hand end of the brake shoe lever 66 and to raise the brake shoe holding it in contact with the bead 52 on the bottom of the work support. The moving brake mechanism 55' carried by either work support which happens to be in the washing position in front of the nozzle is shown in Figure 5 as capable of being released at the will of the operator who places his foot on the pedal 57, Figure 3, at the outer end of the brake pedal lever 56, see also Figure 5, depressing the pedal and raising the actuating lever 61 which brings the presser foot 64 on said actuating lever in contact with the foot 71 at the lower end of the brake thrust rod 68, raising this rod and depressing the brake shoe 65, and throwing it out of contact with the braking bead 52. The work is then rotated to the desired angular position in any suitable manner as by the impact of the jet from the hose, then the foot being removed from the pedal, the work table that holds the work being treated is locked in the new angular position until it is found desirable to rotate it again or to remove it from the washing chamber by rotating the main table 1.

The table or main table 1, see Figures 2, 5 and 6, already partially described, consists of a short cylindrical or disc like structure having its axis vertical and formed as to its outer periphery of a plate 78 which is bent in the form of a ring. The table of which the ring 78 forms the periphery, consists of an open frame of steel shapes, indicated by reference character 79. These steel beams or shapes 79 have horizontal top flanges 69 spaced below the top of the ring 78 as indicated in Figures 3, 5 and 6, and are spaced apart to form a support for steel or other suitable grids 80, which afford a footing for the workman placing castings on the work support and any parts which may be dropped from the turntables. They also serve as a temporary support for the castings and prevent the work from falling into the pit 3, the grids at the same time permitting the water and sand to pass into the pit. These frame members 79 also have horizontal bottom flanges 70 which support the table as hereinafter described.

The center table includes a conical water guard 83, which encircles the shaft 36, being secured to the shaft at the top of the cone and to a circular horizontal plate 82 at the bottom. This plate 82 is secured to the top flanges 69 of frame members 79 and encircles the shaft, the plate 82 being as shown centrally apertured at 84. The shaft 36 is enclosed near the lower end within a heavy sleeve 86, which is secured by means of set screws 87. This sleeve has a circular flange or plate 88 formed thereon or secured thereto at right angles to the axis of the sleeve, the top surface of the same being substantialy in the plane of the lower edge of the peripheral ring 78. The frame members 79 near the center rest on this plate and are secured to it, the frame being open at the center for the shaft 86. The plate 88 also supports at its outer periphery a depending flange 32 already described, which carries the ring gear 31 which drives the table. The flange or plate 88 is shown as provided with vertical radial webs or fins 85 of triangular shape whereby the plate 88 is braced and rigidly connected to the central hub or sleeve 86. These webs are located between the beams 79 projecting above the same at the upper corner. The weight of the work supports 11, 12 and the castings theron, is further sustained by means of channel irons 90, secured to the bottom flanges 70, and in the form of the invention illustrated, arranged at right angles to the radius at this point.

It is of interest to note that the table is normally supported at the center by means of the bearings 39, 40, the upper half 91 of which is formed to receive the lower end of the sleeve 86, also enclosing the lower end of the shaft 36, and that the outer edge of the table particularly the ring 78, is normally spaced from the rollers 44 bearing thereon only during loading. It is also noted that the center shaft of the table 36 is aligned and supplied laterally by the top bearing 37.

Reference has been previously made to the

partition 8 which is shown as extending upwardly from the table 1, and diametrically across it from side to side between the work supports 11, 12. This partition 8 is secured to the center shaft 36 of the table on each side of said shaft at 23 and is provided at each end with an upright arcuate portion 92 extending upwardly from the table to the top of the casing 2 and presenting an outwardly disposed arcuate surface of the same radius as the outer surface of ring 78, forming the periphery of the table and constituting in effect an upward extension of the outer ring surface at each side. These arcuate portions 92 are supported at the bottom on the table and at each edge by means of oppositely convex arcuate deflector plates 93 secured to or integral with the main portion of the partition 8. The partition 8 thus presents at each end a circular outwardly disposed arcuate surface which forms an extension of and directly overlies the corresponding portions of the outer surface of the peripheral ring 78 of the table, the spray being to a large degree deflected from these arcuate surfaces by deflectors 93 reducing the tendency of the water to escape past the edges.

As has already been pointed out, the partition 8 in the operative position of the table when either of the work supports 11, 12 is opposite the nozzle, effects a complete closure of the housing 2 or rather the otherwise open front of the housing at 9 whereby the work support 11, which is in front of the nozzle is completely enclosed and the work support on the opposite side of the partition 8 is exposed at the opening 9, the table 1 being shown as projecting beyond said opening, so that the work can be removed and a new piece of work placed on the support.

In order to further prevent the escape of the water which is discharged at high pressure from the nozzle inside the housing, it has been found necessary to effect as complete a sealing of the contact between the housing 2 and the partition 8 as is possible.

To this end a series of fins or plates 94 are secured to the side walls of the housing 2 just inside the front opening 9 and vertically arranged, the plates being shown in sectional plan as substantially in line with the radii of the table, and having their inner edges 95 arcuately arranged on substantially the same circle and center as plates 92. The fins 94 are shown as five in number on each side and equally spaced for substantially the length of the upright arcuate walls 92 forming the ends of the table partition 8. These fins 94 are provided at their vertical edges 95 which are disposed toward and slightly spaced from the arcuate walls 92 of the table partition, with flexible wiping strips 96 preferably of rubber, extending beyond the edges 95 into close contact with the arcuate walls 92 of the partition 8, there being preferably one strip on each side of each plate 94. The wiping strips 96 are held together and to the plates 94 by any suitable fastening means as bolts 97, passing through the plates and the rubber strips 97.

The top of the partition 8 is formed with an upwardly projecting top edge portion 98 extending the entire length of the partition in the direction of the diameter of the table. This edge 95 is provided with flexible wiping flaps 99 which may be of rubber or fabric. These are shown preferably on each side of the partition extending upwardly beyond the partition into close contact with the ceiling of the housing at 114. These flaps are secured in any suitable manner as by means of beads 101 held by any suitable fastening means 102. The top edge portion of the partition is further provided with deflectors 103 in the form of upwardly and outwardly curved plates as shown secured to the top edge portion 95 of the partition and extending almost into contact at their upper edges with the ceiling so that they deflect backwardly and downwardly most of the water which tends to pass over the top of the partition. The flaps 99, on the other hand, are in closed contact with the ceiling, serving to effect a complete closure or seal between the partition 8 and the top wall or ceiling 114 of the housing.

It will thus be apparent that when the table is in the position shown in Figure 2 or in a position spaced 180 degrees therefrom, the vertical sides of the partition 8 will be in sealed relation to the walls of the housing adjacent the opening 9 and the top edge of the partition will be in sealed relation with the top or roof of the housing, effecting a complete and almost watertight enclosure of the work support which is exposed to the jet from the hose, the other work support which is in work receiving position, being on the contrary completely exposed.

The nozzle 14, see Figure 5, is so mounted as to provide for free manual control, assisted when desired by a mechanical hoist. It is adapted to swing vertically and laterally, and is free to move in a vertical direction. As shown, it is fed by and mounted upon an upright pipe 100, which is supported for vertical movement as hereinafter described and is supplied with water from any suitable source as by a hose 103, controlled by a valve 104. The nozzle 14 is mounted directly upon a pipe bracket 105, which consists of a forked pipe entering the nozzle from both sides by way of swivel joints 107. This provides for a vertical swing of the nozzle. The bracket 105 is connected to the upright pipe 100 by a swivel joint 106, which permits the nozzle to swing laterally. The upright pipe 100 is, in turn, supported by two separate spaced swivel bearings 108 on two vertically swinging parallel arms 109, 109', pivotally mounted one above the other and separately pivoted, at 110, 110' on a suitable stationary support which, in the form of the invention shown is secured to the upright wall of the housing.

To provide for raising and lowering the nozzle, the arm 109 is connected to one end of the cable 111, which is led over a sheave 112 shown as mounted on top of the housing, the cable being led through the top wall 114 for this purpose. From the sheave 112 the cable is led downwardly to a drum 115 mounted on a suitable bracket secured to the outside of the housing wall. This sheave or drum is in turn connected to a worm wheel 116, which is engaged by a worm 117, operated by a hand crank 118. The object of the hoisting mechanism and vertical adjustment is to take care of exceptionally high work. For ordinary work the vertical and lateral swing of the nozzle are sufficient. The nozzle 14 is shown in its uppermost position in dotted lines in Figure 5.

To prevent the escape of the water through the opening 119 in the roof or top wall 114 around the cable 111 an elongated bag 120 of waterproof fabric is provided. This bag is shown as slightly tapered and is secured at 121 at its large end to the inside of the top wall 114, i. e., to the ceiling of the housing around the opening 119

and the lower small end of the bag is secured at 122 at a point on the cable which is spaced downwardly from the ceiling or roof 114 by the full length of the bag in the lowermost position of the nozzle.

The direction of the nozzle is controlled by hand for which purpose the nozzle is provided with a projecting handle 124 which projects outwardly through a vertically arranged elongated opening 15 provided in the wall of the housing for this purpose. To prevent the escape of the water through the opening, it is covered with loose baglike waterproof fabric 125 secured at its edges at 126 to the wall of the housing around the opening. The fabric is also provided with a central opening to pass the nozzle handle and the portion of the fabric surrounding this opening is secured to the handle or handle shaft at 127.

In addition to the glass window 16 provided to enable the operator to observe the condition and position of the work and the opening 15 providing for the control of the nozzle and the projection of the handle through the wall, the rear wall of the housing is also provided with vertically extending angular pockets 130 in which are located reflectors 131 of any suitable number. These are shown as arranged in vertically extending series. These reflectors which are seated in suitable openings in the wall are so placed as to have their focal axes directed toward the work and each is provided with a light bulb or other suitable source of light 132, whereby the work is suitably illuminated.

Figure 4, which is a top plan of the housing shows a work support or table 12 in work receiving position, the table being exposed not only at the front as illustrated in Figure 1, but at the top, the roof being cut away for this purpose at 134, 135, forming an extension of the front opening 9, so that the work may be handled from above by means of a travelling crane or the like.

In Figure 5 a piece of work 136, is shown in position on the work support 11, being held by temporary uprights 137.

In the operation of the apparatus the main table 1 is revolved by operation of motor 5, controlled by push button 139 or in any suitable manner until one of the work supports or turntables 11, 12, is in or near the center of the opening 9 in the front wall and the opening 134, 135 in the roof as indicated in Figure 4. The button 139 being then released, the motor and table 1 are stopped by the automatic brake 6 described as a magnetic brake and the work is placed in position on the exposed work support 12 being, if necessary, secured to eliminate any chance of displacement. As soon as the work is properly placed and secured, if necessary, on the work support 11 or 12, which happens to be exposed, the motor 5 is again started as by pushing the button 139 and the main table 1 is rotated until the work support 12 carrying the casting to be cleaned is immediately in front of the nozzle 14. At this time the other work support indicated by reference character 11 is exposed in the opening 9 and 134, 135, which is the corresponding opening in the ceiling, so that another casting may be placed on the exposed work support 11 while the casting on the support 12, which is inside the housing, is being cleaned.

A high pressure stream of water from the hose 14 is directed against the casting, the condition and position of the work being observed by the operator through the windows 16, the work being at this time, i. e., in washing position, illuminated by lights 132 projected against the work by the reflectors 131. The nozzle being manualy directed by engagement of the handle 124, it may be swung vertically and horizontally by the operation of the swivels 106, 107. If it is found necessary, the nozzle may be also raised and lowered by operating the windlass 115, 116, 117 by means of the handle 118, taking up and letting off the cable 111, whereby the nozzle and the vertical pipe 100 are raised and lowered.

As soon as the portion of the casting thus exposed to the nozzle has been cleaned, the application of the foot of the operator to the brake pedal 57 releases the work support turntable 11 or 12 and by proper control of the nozzle directing the stream against one side or the other side of the work, the work support or turntable is rotated with the work thereon, and as soon as the desired position is reached, the removal of the foot from the pedal 57 permits the brake 65 to engage, stopping the turntable or work support in exactly the right position. As previously stated, the projecting rim or bead 52 which is engaged by the brake shoe 65 is preferably notched at 53 for this purpose, the notches being engaged by the pin 74 placed transversely of the brake shoe, giving a positive operation of the brake.

During washing, the water escapes through the grid 180 carrying sand and other fine core materials which settle in the pit or well 4 connected with the basin 3 into which the water is first passed. Other débris, if any, remaining supported on the grid may be quickly removed. The grid is formed in sections for convenience in handling, avoiding the necessity for making the grid so large that it would be difficult to handle without breakage. Also, the sections are easily and cheaply replaced.

As the different faces of the casting are cleaned and the core material is washed from the cored openings thus exposed to the jet from the nozzle, the turntable or work support is released by throwing off the brake as described and rotated to a new position, and when washing has been completed, the main table 1 is again rotated through a half revolution bringing the table 12 into washing position and the table 11 to the position outside the housing in the opening 9 in which it is so exposed that the casting may be easily removed and another casting to be cleaned placed thereon by a crane or otherwise. It is of importance to note that during washing the escape of the water is prevented by the seals 96 at the edges of the movable partition 8 on the table, the bulk of the water being deflected from the sealed edges by the deflectors 93 and that the escape of water over the top of the partition 8 between the top of the partition and the roof of the housing is prevented by the sealing flaps 99, the bulk of the water being deflected from contact with the sealed edges by deflectors 103.

In this way the escape of water from the housing is reduced to the minimum and practically eliminated. At the same time the transfer of castings from loading position to washing position is effected by power and almost automatically the handling of the castings being further facilitated by the complete exposure of the work support in loading position, in which position it may be noted that the side or edge of the table is supported and the excess load and

shock is taken from the shaft bearings by the rollers 44 placed beneath the edge of the table immediately adjacent the loading position.

If for any reason it is found desirable to rotate the table by hand in case the electric power fails or the driving gears or motor become inoperative, the table may be rotated in a forward direction independently of the drive and without resistance of the driving gear, the pawls 33 and ratchet 28 being provided for this purpose. At times mud is found to accumulate on the lights and reflectors or the glasses 132' which may protect them. To remove this material without difficulty, a spray nozzle pipe 144 is provided over each reflector directed at the same. These pipes are connected to a source of high pressure water supply controlled by valve 145 so that washing can be performed at any time by merely turning the valve.

I have thus described specifically and in detail a hydraulic core knockout and casting cleaning apparatus embodying the features of my invention in the preferred form in order that the nature of the invention and the manner of operating, applying and using the same may be clearly understood. However, the specific terms herein are used descriptively rather than in a limiting sense, the scope of the invention being defined in the claims.

What I claim as new and desire to secure by Letters Patent is:

1. A hydraulic apparatus for cleaning castings comprising an enclosure, a rotatable table inside the enclosure, power means for rotating the table, and means for supporting the castings, mounted on the table to rotate freely thereon, a nozzle and means for supplying high pressure water whereby a jet of water is projected against the castings, a brake mounted on the table and having controlling means within the convenient reach of the operator for checking and stopping rotation of the support relatively to the table, the impact of the jet being utilized as a means for rotating the support and the work thereon to expose its different sides successively to the jet, the brake serving to stop the work support in any desired position to prolong the exposure of any particular portion at the will of the operator.

2. In an apparatus for cleaning castings a rotatable work support, a housing enclosing the support, a nozzle and means for projecting a jet of cleaning material therefrom within the housing and means for directing it from the outside of the housing, a brake and means tending to hold the same, normally applied, for preventing rotation of the support, the work support being otherwise freely rotatable whereby the impact of the jet from the nozzle may be utilized to rotate the support at the will of the operator to present successive faces of the casting to the nozzle, the brake being provided with releasing means within the convenient reach of the operator and adapted to be actuated at the will of the operator during the cleaning operation to permit the desired change of position of the work supporting the casting.

3. The combination in a hydraulic apparatus for cleaning castings of a housing having an opening for admitting the castings on one side, a nozzle within the housing on the other side, a rotatable table projecting beyond said opening, means for supporting a casting on each side of the table, the table having an upright partition between said supports, the partition being of sufficient size and of the proper shape to close the cross section of the housing between said nozzle and said opening, means for projecting water against the castings within the housing, means for sealing the closure between said partition and said housing, and means for deflecting the water from said sealing means.

4. The combination in a machine for cleaning castings hydraulically of a rotatable main table, means for rotating the same at the will of the operator, a stationary housing enclosing the table having an opening on one side exposing the table and a nozzle within the housing on the other side with means providing for the control of the nozzle from outside the housing, a plurality of freely rotatable work supports mounted and oppositely located on the table, the table having an upright partition adapted to close the cross section of the housing between said opening and said nozzle, and braking means operable from outside the housing for controlling the rotation of the support adjacent the nozzle, the impact of the water from the nozzle being utilized to rotate the supports to present different faces of the castings to the nozzle successively.

5. In a hydraulic apparatus for cleaning castings, a housing having an opening for the admission of castings at one side, a nozzle within the housing, a rotary work carrying means also within the housing and adapted to carry the castings from the opening to a position in front of the nozzle, said carrying means having a partition adapted to separate the work thereon and to close the opening, sealing means making contact between the partition and the housing, comprising flexible flaps, and deflecting shields carried by the partition to deflect the water from the flaps.

6. In an apparatus for cleaning castings, a housing having an opening for the admission of castings at one side, a nozzle within the housing, a rotary work supporting member also within the housing and adapted to carry the castings from the opening to a position in front of the nozzle, said member having a partition thereon adapted to close the opening, the partition having at each lateral edge an outwardly disposed arcuate surface coaxial with said member, the housing having flexible flaps engaging said arcuate surface to close the space between said partition and said housing.

7. In an apparatus for cleaning castings, a housing having an opening for the admission of castings at one side, a nozzle within the housing, a rotary work supporting member also within the housing and adapted to carry the castings from the opening to a position in front of the nozzle, said member having a partition adapted to close the opening, the apparatus having at each end of the partition an arcuate surface coaxial with said member and flexible flaps engaging said arcuate surfaces to make contact between the partition and the housing and other flexible flaps making contact between the housing and the partition at the top and means for deflecting the water from said flaps.

8. In an apparatus for cleaning castings and the like, a rotatable table, a stationary housing therefor, the housing having an opening in the top and one side sufficient to admit the castings freely, permitting the use of a crane or similar means for placing the castings on the table, means for spraying the castings on the table within the housing with cleaning material, the table having an upright partition dividing it into

sections, said partition being of an area approaching the area of the cross section of the housing adjacent the opening so that it closes the opening in the opposite positions of the table, the partition being provided adjacent its edges with means for deflecting the cleaning material from the edges of the partition back into the central portion of the housing.

9. In an apparatus for cleaning castings and other sizeable articles by the hydraulic method, an enclosure, a nozzle within the enclosure with means for supplying water under pressure thereto, means for supporting the nozzle whereby it is pivoted to swing laterally and vertically and a support for the nozzle mounted to move and to carry the nozzle bodily toward and from the top of the housing, a cable connected to the support and a winch for taking up and letting off the cable to raise and lower the nozzle, and the enclosure having an opening through which the nozzle may be manually controlled.

10. In an apparatus for cleaning castings and the like by the hydraulic method, a rotatable carrier, a stationary housing therefor open at one side, a partition on the carrier adapted to close the housing, work supporting means on the carrier on one side of said partition and a nozzle within the housing whereby the work supporting means may be enclosed within the housing in front of the nozzle in one position of the carrier and exposed at the opening to receive the work in another position of the carrier, said work supporting means being mounted to rotate freely, and said apparatus including a brake with controlling means projecting outside of the housing whereby the tendency of said work supporting means to rotate may be controlled at the will of the operator.

11. In an apparatus for cleaning castings and the like by the hydraulic method, a rotatable carrier, a stationary housing therefor open at one side, a partition on the carrier adapted to close the housing, work supporting means on the carrier on one side of said partition and a nozzle within the housing whereby the work supporting means may be enclosed within the housing in front of the nozzle in one position of the carrier and exposed at the opening to receive the work in the other position of the carrier, said work supporting means being mounted to rotate freely, and said apparatus including a brake, said brake comprising means operating on the work support and moving with the carrier, and a brake lever located adjacent the nozzle and adapted to engage said braking means when the work support is in front of the nozzle.

12. In a hydraulic machine for cleaning castings a rotatable carrier, a freely rotatable work support on the carrier, a nozzle, braking elements to check the rotation of the work support, said braking elements including two cooperating members, one being mounted on the carrier and having braking means operatively connected thereto to check the rotation of the work support, the second braking member being an actuating lever adjacent said nozzle and a nonrotary support for the same, one said member having a portion elongated in the direction of rotation of the carrier to engage the other said member to operate the brake and control the rotation of the work support which is in front of the nozzle at the will of the operator.

13. In a machine for cleaning castings a rotatable carrier, a nozzle for projecting a cleaning element into contact with the work on the carrier, a work support on the carrier, rotatable in response to the impact of the cleaning element from the nozzle, a braking apparatus to check the rotation of the work support, said braking apparatus including an actuating lever and a nonrotary support on which the lever is mounted within convenient reach of the nozzle, said lever and said carrier being provided with cooperating contact members, one of which is elongated in the direction of rotation of the carrier, braking means on the carrier for stopping the rotation of the work support, said braking means being connected to the contact member on the carrier to be operated thereby.

14. A hydraulic apparatus for cleaning castings comprising an enclosure, a rotatable table inside the enclosure, means for holding the table in any desired angular position, and means for supporting the castings, mounted on the table to rotate freely thereon relatively to the table, a nozzle and means for supplying high pressure water whereby a jet of water is projected against the castings, a brake having controlling means within the convenient reach of the operator for checking and stopping rotation of the support relatively to the table, the impact of the jet being utilized as a means for rotating the support and the work thereon to expose its different sides successively to the jet, the brake serving to stop the work support in any desired position to prolong the exposure of any particular portion at the will of the operator.

15. In a hydraulic machine for cleaning castings a rotatable carrier, means for holding the carrier at the will of the operator in any desirable position, a freely rotatable work support on the carrier, a nozzle, braking elements to check the rotation of the work support, said braking elements including two cooperating members, one being mounted on the carrier and having braking means operatively connected thereto to check the rotation of the work support, the second braking member being an actuating lever adjacent said nozzle and a nonrotary support for the same, one said member having a portion elongated in the direction of rotation of the carrier to engage the other said member to operate the brake and control the rotation of the work support which is in front of the nozzle at the will of the operator.

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