July 13, 1937. W. WATSON ET AL 2,086,653

METHOD OF HYDRAULIC CLEANING OF CASTINGS

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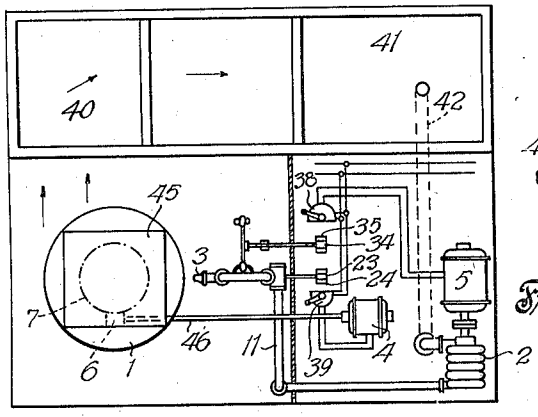


Fig. 1

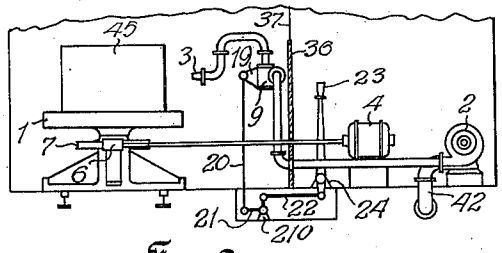


Fig. 2

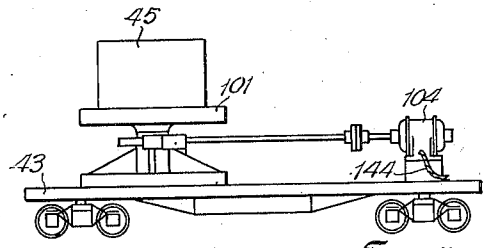


Fig. 5

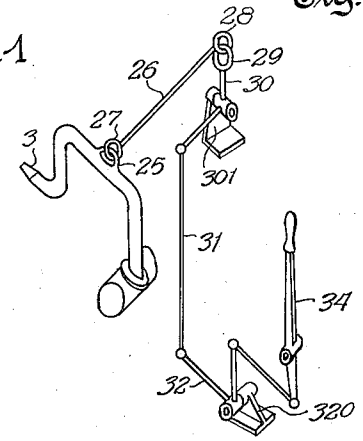


Fig. 6

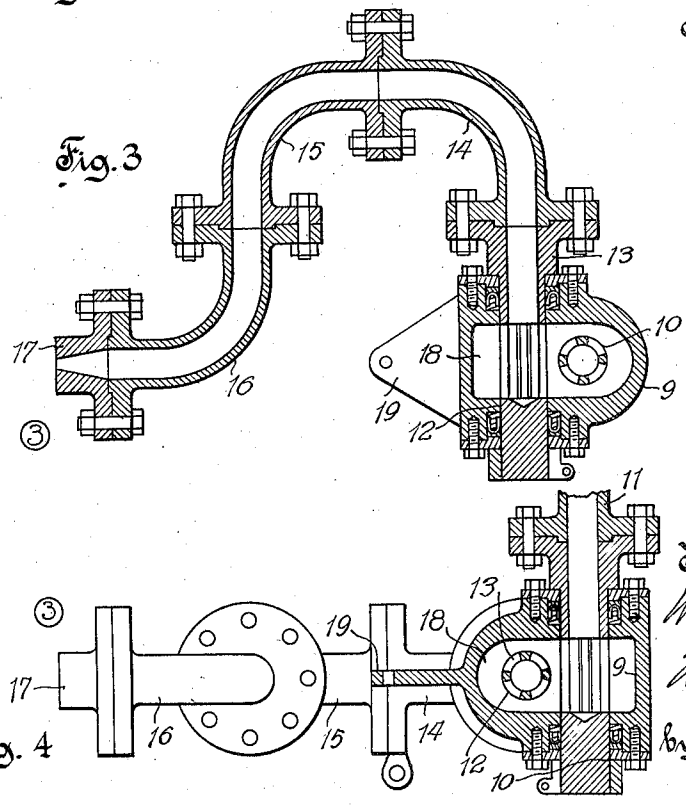


Fig. 3

Fig. 4

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METHOD OF HYDRAULIC CLEANING OF CASTINGS

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Continuation of application Serial No. 759,120, December 31, 1924. This application January 25, 1932, Serial No. 588,800

1 Claim. (Cl. 141—1)

This invention relates to hydraulic cleaning of castings, that is, the method of removal by hydraulic means of the core and core rods from the interior of castings after the making of the castings.

The present application is a continuation of application Serial No. 759,120, filed December 31, 1924.

Many schemes have heretofore been attempted with the object in view of removing cores from castings without the great amount of hand labor otherwise necessary and without the production of disagreeable dust developed in the manual removal of such cores. It is a common sight in foundries especially at the clean-up end to where the castings have been transported for the purpose of cleaning same before machining, to barely be able to see objects at a short distance away on account of the fine dust that rises in clouds from the castings during the manual removal of the core. This is because the core sand which has been highly heated during the process of casting, issues as clouds of dust upon hammering and cutting off the free ends of the core rods, and also upon sledging of the casting in order to free same of the core and core rods located therein. On this account it has frequently been difficult to secure the necessary labor for this kind of work. Besides, it is highly objectionable from a health standpoint for the worker whose duty it is to remove these cores and rods as heretofore has been the practice.

This invention has for its object the removal of cores and their supporting rods, by hydraulic means and it has been found that such removal can be efficiently accomplished by means of a high velocity jet of water directed against the core through the necessary casting openings for the support of the cores during casting. Another advantage of this invention is the great saving in regard to the core rods which are saved intact without being cut in any manner as heretofore.

The attempts at core removal referred to, have even gone so far as to make use of hydraulic jets, but, so far as is known, these attempts have resulted in failure for many reasons, chief of which was the lack of means to change the position of the casting during the application of the hydraulic jet. Most of these attempts have merely proceeded so far as to apply a hose nozzle to the casting remaining in a given position, the hose and nozzle being manipulated from various directions and positions. Another reason for the failure of these prior attempts, is the obvious liability of the operator to become drenched.

The present invention obviates difficulties heretofore met in this connection, by providing a turntable as one of the vital elements in the combined apparatus. This invention also provides a means for universally directing a universally dirigible nozzle towards the casting on a turntable, the nozzle being preferably separately horizontally and vertically adjustable. This invention furthermore alternatively makes use of a car upon which the turntable and means for rotating same are mounted, so that the casting may be brought from the foundry to the place of washing with but one handling. This invention furthermore provides a means for returning the water and at the same time settling same so that it may be used over again by the pump and nozzle. This invention further provides controls at the operator's station for the turntable motor, the pump motor, and the nozzle, with a protective wall between the operator and the casting being cleaned.

The present invention also comprises a method of cleaning castings hydraulically by variably (preferably horizontally) adjustably presenting a given casting opening at different angles of reception with respect to the hydraulic jet, and variably (preferably both vertically and horizontally) adjustably directing the hydraulic jet through said casting opening, along different lines of application.

One embodiment of this invention is illustrated in the accompanying drawing forming part of the specification, and in which:

Fig. 1 is a plan view of the combined apparatus;

Fig. 2 is an elevation thereof;

Fig. 3 is a vertical section through the nozzle;

Fig. 4 is a plan view partly in section of the nozzle;

Fig. 5 is a side elevation of a car with a turntable and motor mounted thereon; and,

Fig. 6 is a diagrammatic perspective view of the operating connections for directing the nozzle along various horizontal lines.

Referring to the drawing, one embodiment of this invention comprises apparatus as shown especially in Fig. 1, including a turntable 1, a pump 2, a nozzle 3 and motors 4, 5. The turntable 1 is mounted stationarily as shown in Figs. 1 and 2 and the turntable motor 4 drives a shaft 46 carrying a worm 6 meshing with a worm wheel 7 mounted upon the shaft of the turntable 1.

The nozzle 3, which is shown in detail in Figs. 3 and 4, comprises a body portion 9 which has a horizontal bore 10 formed therein for mounting the nozzle upon a stationary horizontal supporting pipe 11, forming the discharge pipe of pump 2. The body portion 9 also has a vertical bore 12 within which is mounted a short piece of pipe 13 which connects to elbow pipe portions 14, 15, 16. A nozzle tip 17 is connected to the elbow portion 16 to be in line with the axes of both vertical pipe 13 and horizontal pipe 11, so as to balance the thrust at all times. The stationary horizontal pipe 11 and the vertical pipe 13 have lantern portions formed therein connecting to their interiors for the purpose of registering with a chamber 18 formed within the nozzle body portion 9. Suitable shoulder and collar means are provided to prevent disengagement of the horizontal pipe 11 and vertical pipe 13 from the nozzle body portion 9.

The operating means for the nozzle is separated into two kinds, one for operating the nozzle vertically and the other for operating same horizontally.

The means for operating the nozzle vertically is shown clearly in Fig. 2. The body portion 9 of of the nozzle has a lug 19 projecting in the same direction as the nozzle, to which lug 19 is pivotally attached a vertical link 20 extending downwardly below the floor line where it pivotally connects to the horizontal portion of a bellcrank lever 21 mounted on a bracket 210. To the upwardly extending other end of the bellcrank lever 21 is pivotally attached a horizontal link 22 which is pivotally connected at its other end to the lower end of a vertically extending operating lever 23 which is pivotally mounted to a bracket 24 on the floor.

The means for operating the nozzle horizontally is shown clearly in Figs. 1 and 6. At one side of the nozzle 3 is formed or secured a horizontal ring 25. A horizontal link 26 has a vertical loop 27 at one end looped into ring 25 and at the other end a vertical loop 28 into which is looped a vertical loop 29 at the upper end of the bellcrank lever 30 having a supporting bracket 301. The horizontal arm of the bellcrank lever is pivotally connected to a vertical link 31 extending downwardly and having its lower end pivotally connected to the horizontal arm of a bellcrank lever 32 having a supporting bracket 320. The other arm of the bellcrank lever 32 is pivotally connected by a horizontal link to the lower end of a vertical operating lever 34 which is pivoted near its lower end to a bracket 35 on the floor. It will be observed from the showing in Fig. 6 that bellcranks 30 and 32 are located in planes at right angles to each other.

It will also be observed that the linkage for operating the nozzle extends from the nozzle downwardly and underneath wall 36 and up again on the opposite side of the wall from the location of the nozzle. The wall moreover has a window 37 suitably protected by wire glass or a grating. This then brings the operating ends of the operating levers 23, 34 on the operator's side of the wall 36 directly in front of the window 37. Facing the window, to the right of the operating levers 23, 34, is located a controller 38 electrically controlling the pump motor 5. To the left of the levers 23, 34, is located another controller 39 electrically controlling the rotation of the turntable motor 4 in either direction. The pump 2 and motor 5 therefor could, of course, be located at a distance in a pump house, if desired. A plurality of nozzles and controls could at times be advantagously employed located at different levels so as to apply a jet at different angles vertically.

In the present embodiment the pump 2 and motor 5 are located comparatively near the turntable 1, and the floor near the turntable is graded downwardly, to drain water towards one end of a tailrace 40 the other end of which forms a sump 41 from which leads a suction pipe 42 to the pump 2.

A modified form of the invention comprises a car 43, Fig. 5, on which a turntable 101 is located together with its motor 104 and operating shaft. The electrical leads 144 of the motor 104 are suitably arranged for plugging into an electrical supply line, of course, in series with the controller, not shown.

In the operation of this invention a casting 45 is placed upon the turntable 1 and the nozzle is directed towards any selected one of the openings in the same, not shown. The pump is then started by suitably operating the pump motor controller 38, and by manipulating the operating levers 23, 34, the nozzle is directed in any suitable direction toward the openings in the casting 45 to loosen and wash out the core rods and cores. From time to time as may be necessary, the turntable motor controller 39 is suitably intermittently operated to rotate the turntable in either direction, that is, reversely, to bring any desired casting opening opposite the nozzle to facilitate loosening and washing of the core rods and core from the casting.

The water from the jet drains to an end of the tailrace and flowing slowly therethrough to the other end, deposits what sand is carried thereby and the clear water is then taken back to the pump and used again. The tailrace and sump may be cleared of sand whenever necessary thus saving core sand.

It has been found with the practice of this invention that the core is entirely washed from within the casting and the core rods are not spoiled so that they may easily be removed from the casting afterwards, if they have not already been washed out with the sand.

In the operation of the modified form shown in Fig. 5, it is obvious that castings may be placed directly on the turntable on the car from their location in the clean-up end of the foundry. The car is then drawn to the washing station and so positioned as to locate the casting directly in front of the nozzle as before. This saves at least one handling of the casting.

The limits of the size of the jet are from about ¼ inch to about 1½ inches. For small castings the jet should be small, say from ¼ inch to ¾ inch, using a pressure of about 1500 to about 500 pounds per square inch. For large castings the jet should be large, say from ¾ inch to 1½ inches, using a pressure of about 500 to about 300 pounds per square inch. An existing plant uses two ¾ inch nozzles or one 1⅛ inch nozzle, at a pressure of 510 pounds per square inch, with very satisfactory results.

It should be understood that it is not desired to limit the invention to the exact steps of the process or to the details of construction of the apparatus herein shown and described, for various modifications may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

The method of hydraulically cleaning a hollow casting having a cored opening formed by and

containing sand core material and reinforcing rods constituting a complementary core body, that comprises loosening and removing the core material and its reinforcing rods from the interior of the casting by directing a high velocity jet of water against the core body within the casting opening from a fixed position at a distance from the casting, and from time to time varying the angular position of the casting in both directions by intermittently causing the casting to rotate in either direction in a horizontal plane to so adjustably present the casting opening and the contained core body to the jet at different angles of reception and variably adjusting the angular direction of the water jet both horizontally and vertically to so adjustably direct it through said opening in the casting in any suitable direction to effect different angles of application against the core body within the opening as to effectively loosen and wash out the core material and reinforcing rods from within the casting.

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