Feb. 24, 1953 R. E. RYAN ET AL 2,629,151

CASTING WHEEL

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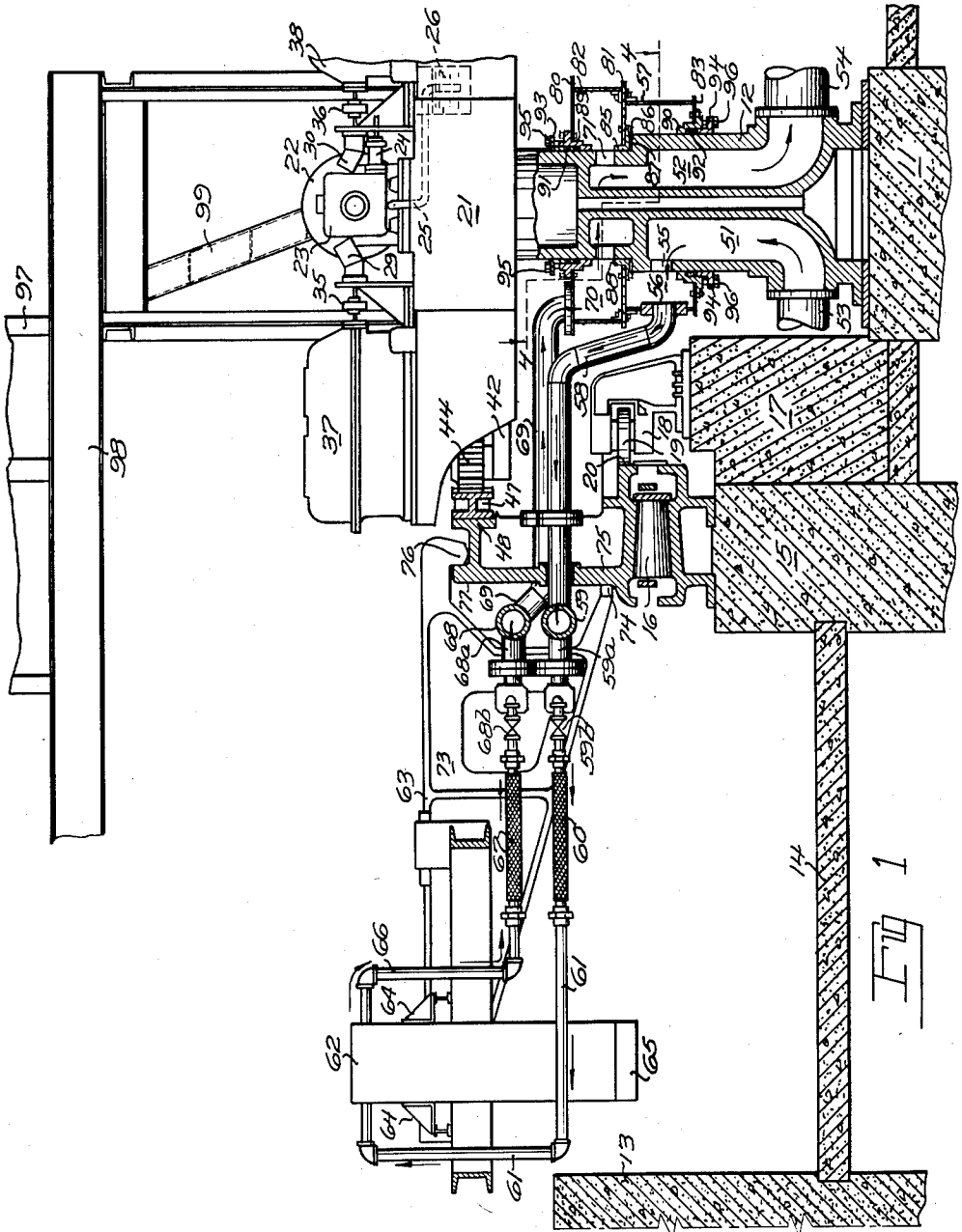

Fig. 1

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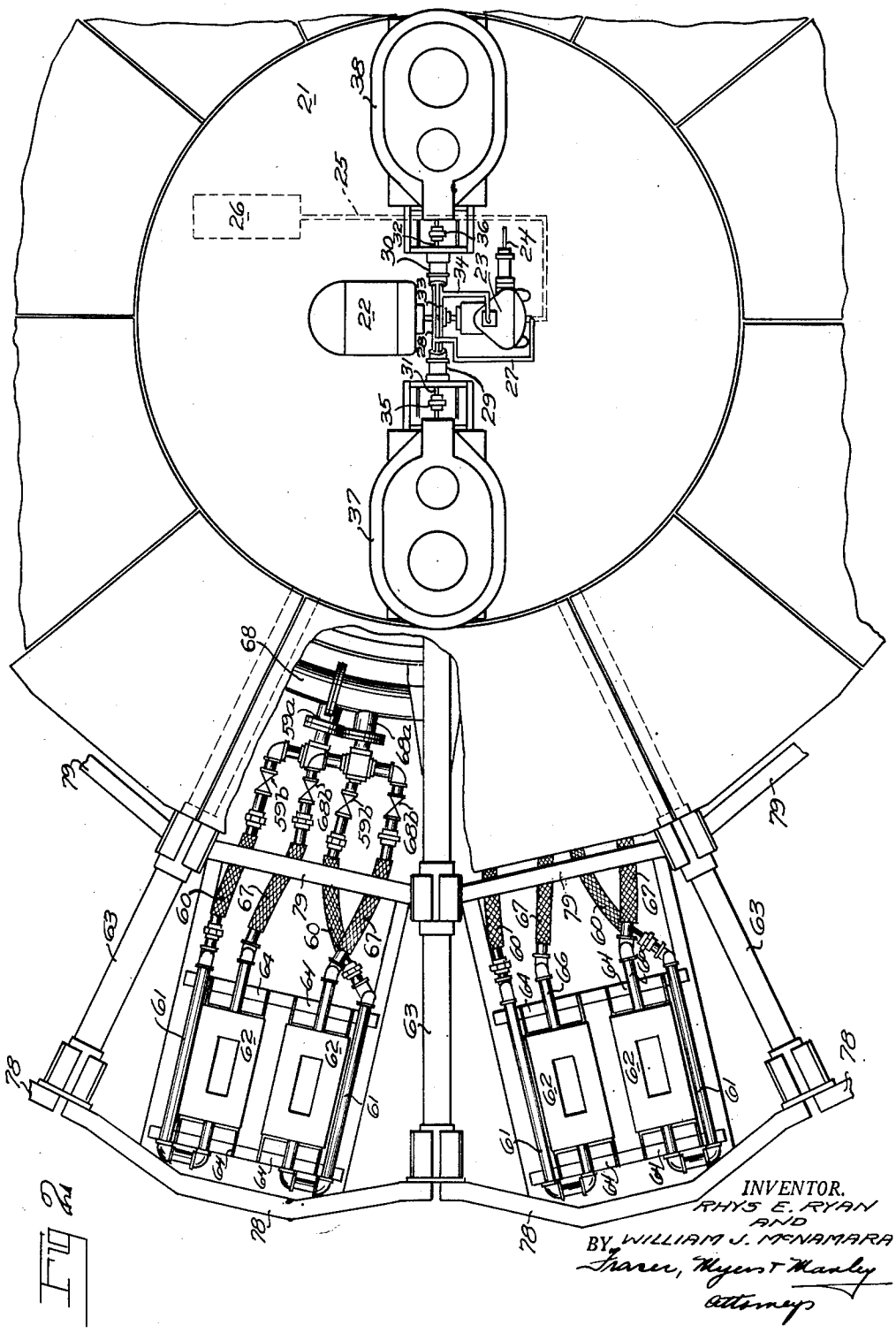

Fig. 2

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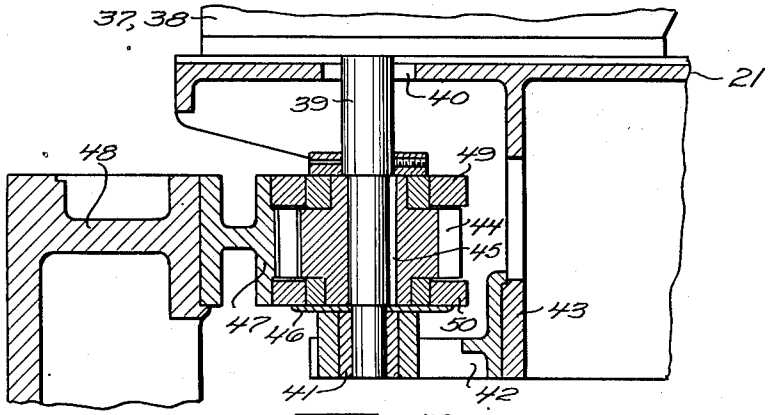

Fig 3

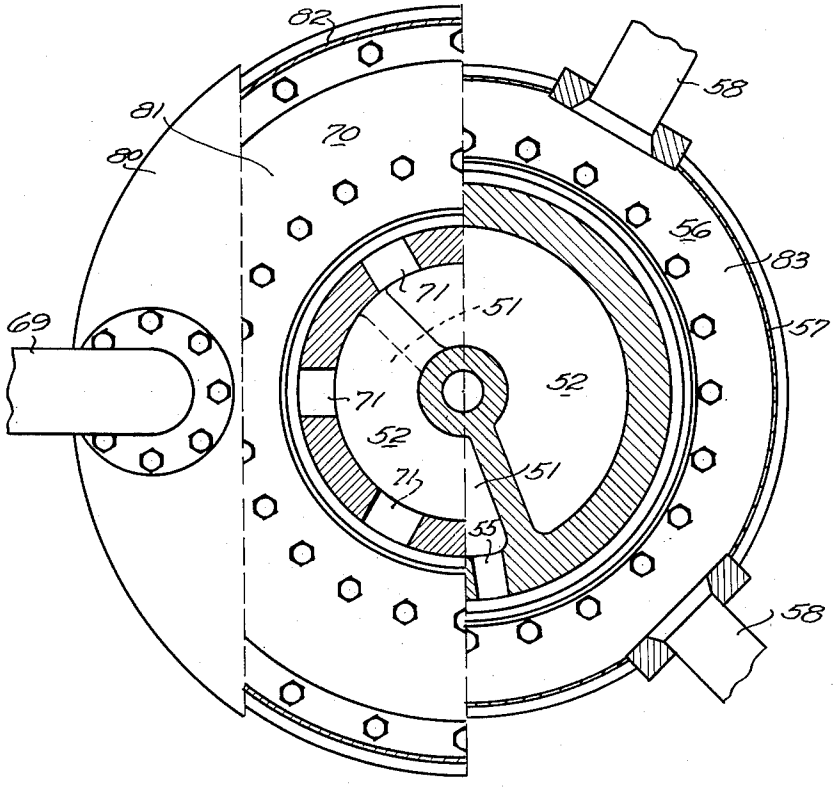

Fig 4

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2,629,151

CASTING WHEEL

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Application March 7, 1950, Serial No. 148,054

2 Claims. (Cl. 22—63)

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This invention relates to improvements in casting apparatus and more particularly to such apparatus which includes a rotatable wheel provided with plural casting molds.

Prior casting wheels have involved approaches to certain problems, particularly the provision of suitable means for driving and rotating the wheel and the provision of means for water cooling the molds carried by the wheel. It has, heretofore, been found desirable to locate the driving means centrally within the wheel thereby saving working space to some extent and simplifying the overall structure with some resultant economy. It has, also, become known to provide a centrally located water distributing standard for distributing cooling water to and from molds carried by the wheel. Up to the present time, however, there has not been developed any practical casting wheel which includes both a centrally located cooling-water distributing standard and centrally located driving means for rotating the wheel.

Accordingly, an important object of the present invention is the provision of a casting wheel embodying both a centrally located water distributing standard and centrally located driving means for turning the wheel.

The foregoing and other objects and advantages of this invention are accomplished by providing a non-rotatable central standard which, preferably, has separate, rotatable water chambers in encircling association with an intermediate or lower portion thereof, in constant liquid communication separately with a water supply chamber and a water return chamber in the central standard and with water passages in the molds; and by providing further, that driving means for turning the wheel are mounted directly upon said standard, preferably upon a platform provided on the latter, with transmission means directly connecting the driving means to an inner portion of the wheel for rotating the latter. Further details of the invention are hereinafter more fully described.

Although the present invention may be embodied in a variety of structures, nevertheless for the purpose of illustration, and without limiting the invention thereto, a single embodiment of the invention is shown in the accompanying drawings in which:

Figure 1 is a view of one of two substantially similar halves of casting wheel apparatus according to this invention, some of the parts being shown in side elevation and other parts being shown in vertical radial section.

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Fig. 2 is a plan view of the central standard and a portion of the wheel.

Fig. 3 is an enlarged fragmentary vertical sectional view of a portion of wheel driving mechanism shown in Fig. 1.

Fig. 4 is an enlarged horizontal sectional view through the central standard substantially on the irregular line 4—4 of Fig. 1.

Casting apparatus as illustrated may be mounted within a circular concrete pit of slightly greater diameter than the over all diameter of the casting wheel. The pit may have bottom portions thereof at various heights as for example, a central pit portion 11 which supports a central fixed standard 12, an outer wall portion 13 defining the outer confines of the pit, a floor portion 14 extending underneath the outer marginal portion of the casting wheel, a circular upright portion 15 serving as a rigid support for anti-friction bearings 16 which carry the weight of the casting wheel, and plural circumferentially spaced concrete blocks 17 which support thrust bearings 18, each of which includes a bearing wheel 19 mounted for rotation about a vertical axis and rolling upon an inner cylindrical surface 20 of the casting wheel to aid, at a lower level of the latter, in maintaining the wheel concentric with the central standard.

The central standard 12 includes a top platform 21 which carries driving means for turning the casting wheel. As illustrated in the drawings and best seen in Fig. 2, the driving means include an electric motor 22 which, when the apparatus is in use, continuously drives a hydraulic pump 23. The pump 23 preferably is reversible and includes a control member 24 which may be operated under the control of an operator of the casting wheel for adjusting the pump from zero fluid delivery to full fluid delivery in opposite directions. The pump is connected by a suitable duct 25 to a tank 26 from which it draws fluid, preferably oil, as needed. The oil is pumped, in a circuit, through pipes 27 and 28, to two similar hydraulic motors 29, 30 to rotate shafts 31, 32 of the latter. Pipes 33, 34 carry the pumped fluid from the hydraulic motors 29, 30 back to the pump 23 to complete a pumping circuit. The described circuit of the hydraulic fluid may be reversed by operation of control member 24, thereby reversing the operation of the hydraulic motors 29, 30. If desired, other driving means, such as, for example, electro-mechanical means, may be employed within this invention in place of the described hydraulic means.

As the hydraulic motor and pump system per

se is not of the essence of the present invention it is described and disclosed only in elementary form and may and usually would include accessory devices such as a relief valve, a replenishing valve, an oil filter, a leakage pump accessory to the pump 23 and, possibly, cooling means for cooling the fluid employed in the hydraulic system. All of these accessories and their purposes are well known in the art and, hence, are not shown in the drawings.

The shafts 31, 32 are connected by similar couplings 35, 36, respectively, to similar, more or less conventional speed reducing mechanisms 37, 38. Each of the speed reducing mechanisms affords a very substantial speed reduction as between its related coupling 35 or 36 and a slow speed vertical shaft 39 (Fig. 3) which extends downwardly from the speed reducer through an opening 40 in the platform 21. The lower end of the vertical shaft is carried within a bearing 41 supported in a bracket 42 suitably fixed to a depending web 43 which is integral with the platform 21.

A pinion 44 is suitably secured, as by a key 45, to the shaft 39 just above the bearing 41, a suitable thrust washer 46 being provided between the pinion and the bearing. The teeth of the pinion mesh with internal teeth of a ring gear 47 fixed by bolts (not shown), or other suitable means, to a traveling ring 48 which constitutes a part of the casting wheel structure. Upper and lower shroud rings 49, 50 are suitably supported at opposite hub portions of the pinion to overlie opposite ends of the pinion teeth and adjacent ends of the teeth of the ring gear to maintain the pitch lines of the teeth of the pinion and ring gear in substantial alignment and to aid, at an upper level of the wheel, in maintaining the latter concentric with the central standard. The drive communicated to the ring gear by the pinion serves to rotate the casting wheel.

The central standard 12 may be substantially hollow and formed to provide separate, generally segmental chambers 51 and 52 therein which respectively are suitably connected, toward the bottom of the standard, to a water supply pipe 53, to which water may be pumped or otherwise supplied under pressure, and a water return or discharge pipe 54. The chamber 51 communicates, at its upper end, through plural ports 55, with a lower annular water distribution chamber 56, having a cylindrical wall 57 from which extend plural radial branch conduits 58 through which cooling water may pass to a circular manifold pipe 59. Further radial branch conduits 59*a* conduct cooling water from the manifold pipe 59, through connections 59*b*, to flexible water pipes 60 which are connected by pipes 61 to molds 62 to supply cooling water to the latter.

The molds 62 are arranged in a circumferential series toward outer ends of arms 63 which are provided with mold supports 64 upon which the molds are suitably mounted. The molds illustrated in the drawings are not necessarily tiltable as they are designed for use in so-called vertical casting and each is provided at its lower end with a cap 65 which closes the bottom of the mold passage or passages, but may be swung aside, after the cast metal has sufficiently hardened, to permit the casting to drop from the mold. As the means for supporting and operating the cap 65 does not constitute any essential part of this invention, such means have not been shown in the drawing.

Cooling water, after circulating through suitable passages (not shown) in the molds, is carried off from each mold by pipes 66, flexible discharge pipe 67, connections 68*b* and a radial branch conduit 68*a*, to a circular discharge manifold 68, these water conducting means being substantially similar to supply pipes, conduits and connections, already described, between the manifold 59 and the mold. Plural radial branch discharge conduits 69 serve to carry water from the manifold 68 to an upper annular water chamber 70, whence the discharged water may pass by plural ports 71 into the return chamber 52 in the central standard from which the water from the molds may be conducted by discharge pipe 54 to waste or to a suitable water reservoir for reuse. The course of flow of the pumped cooling water is indicated by directional arrows in Fig. 1.

The casting wheel may be such that different types of molds may be employed with it and readily substituted therein. For example, the molds may be of a character which require them to be tilted sufficiently to discharge the casting therefrom. In that event the molds would be pivotally mounted on suitable trunnions to enable them to be tilted sufficiently to discharge the casting. If such tiltable molds are provided, the flexible water pipes 60, 67 permit such rotation of the molds while nevertheless maintaining the flow of cooling water therethrough, or, if desired, rigid pipes with rotary or swivel points may be employed for that purpose instead of the described flexible pipes.

The arms 63 as illustrated are triangular in shape and preferably are formed with webs 73 to straighten them. They each have a lower inner extremity 74 which abuts the lower end of a generally cylindrical wall 75 of the traveling ring 48, and the arms 63 are each formed also with an upper inner extremity in the form of a hook 76 which hooks over an upwardly extending flange 77 of the traveling ring. Thus, the rigid arms 63 afford adequate support for the molds carried at their outer ends. The wheel structure also preferably includes a series of outer circumferentially extending spacing bars 78 and a series of inner circumferentially extending spacing bars 79, the bars in these two series being rigidly interconnected between the several arms 63 to provide circumferential rigidity therebetween and to maintain them in their proper radial positions.

The structure constituting the annular water chambers 56 and 70 must, of course, rotate with the wheel because of their fixed association with the several radial water conduits 58 and 69 which turn with the wheel and also the mentioned chamber structure must be so devised as to isolate those two water chambers against direct fluid intercommunication while at the same time both said chambers must be maintained in rotary sealing engagement with the stationary central standard 12. To afford such characteristics to the mentioned chambers, the chamber structure may advantageously comprise a top annular plate 80 defining the top of the upper chamber 70, an intermediate annular plate 81 defining the bottom of the upper chamber 70 and the top of the lower chamber 56, an upper cylindrical wall plate 82 fluid-tightly interconnecting the plates 80, 81 toward their outer margins, a bottom annular plate 83 defining the bottom of chamber 56, and the lower cylindrical wall plate 57 which fluid-tightly interconnects the outer marginal portions of the plates 81 and 83. The several radial branch supply conduits 58 communicate with the chamber 56 through suitable ports formed in the cylin-

drical wall plate 57 and the several radial branch discharge conduits 69 communicate with the chamber 70 through suitable ports in the annular plate 68.

Vertical support of the described water chamber structure is derived or aided from the fact that a bearing ring 85, bolted or otherwise suitably fixed to the inner periphery of the plate 81, rests upon and rotates upon a thrust washer 86 supported upon an annular shoulder 87 formed in the wall of the central standard 12; thus the bearing ring 85, or the inner marginal portion of the plate 81 (if no bearing ring is employed) not only serves to aid in rotatably supporting the described chamber structure, but also effects a rotary seal with the central standard, whereby to isolate the chambers 56 and 70 from each other. If an additional sealing effect is desired, the bearing ring 85 may have an inner cylindrical flange 88, the inner surface of the said flange being formed to fit quite accurately and form a rotary seal with an adjacent outer cylindrical surface of the standard 12.

The plates 89, 83 respectively are fluid-tightly fitted at their inner peripheries with gland rings 89, 90 which encircle the standard 12 and which are formed with packing spaces containing suitable packings 91, 92 which are held in place and suitably compressed within their respective gland rings by follower rings 93, 94 which may be tightened upon their related packings by bolts 95, 96 in a well understood manner.

Instead of utilizing valuable additional floor or work space for the purpose, an operator's booth 97 of which only a broken-away lower portion appears in Fig. 1, may be supported directly above the casting apparatus upon girders 98. The girders 98 may be floor beams of an upper floor of the building which houses the casting apparatus or may be specially provided for supporting the booth 97; said girders, in the latter situation, being hung from the roof or from floor beams of an upper floor of the building by hangers (not shown). Suitable means (not shown) may afford initial access of the operator to the booth 97, and access between the latter and the platform 21 may be provided by a ladder 99 to enable the described driving mechanism to be serviced as necessary.

It may be observed from the foregoing that the present invention gives, to the casting apparatus, all the advantages of both a water distributing central standard and centrally located wheel driving means; and also yields other advantages as hereinbefore set forth.

It will undoubtedly be clear that the concepts of the present invention may be utilized in casting apparatus structures other than those which are disclosed and described herein for illustrative purposes, hence, the present invention is not to be considered as limited to such disclosed and described srtuctures, but is to be considered as of a scope corresponding to the invention as defined in the following claims.

What we claim is:

1. Casting apparatus comprising a mold-carrying casting wheel adapted for rotation about a vertical axis, a stationary, chambered standard disposed at the center of rotation of said wheel, a circular platform atop said standard, motor means carried upon said platform, transmission means cooperating with the motor means and the casting wheel below the top level of said platform for rotating said wheel, a connection at the bottom of the standard for passing cooling liquid into a chamber in the latter, plural, circumferentially arranged casting molds carried by said wheel at the latter's outer margin, an annular platform rigidly associated with said wheel between said molds and said circular platform, a rotary liquid connection associated with the standard between the latter's bottom and said motor means and in liquid connection with such a chamber in the standard, and separate radial liquid ducts connecting each of said molds with said rotary connection; the said ducts being disposed below said annular platform and said transmission means whereby to leave the top of the annular platform clear for activities of casting attendants during rotation of the wheel.

2. Casting apparatus according to claim 1, further characterized in having separate inlet and outlet liquid chambers in said standard, inlet and outlet connections at the bottom of the standard for passing cooling liquid to and from said inlet and outlet chambers respectively, and separate radial supply and discharge ducts, and the said rotary liquid connection including separate annular supply and discharge chambers in constant liquid communication respectively between the said inlet chamber and the radial supply duct and between the said discharge duct and the outlet chamber.

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