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2,308,448

BALL-MOLDING MACHINE

Filed June 25, 1940

2 Sheets-Sheet 1

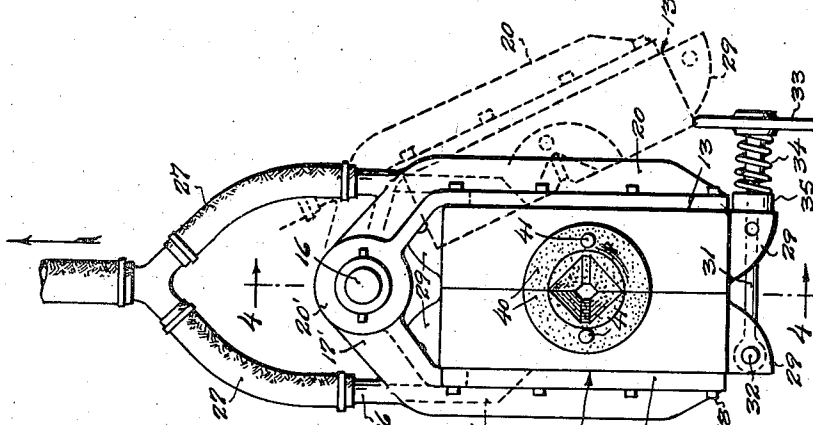


Fig. 1.

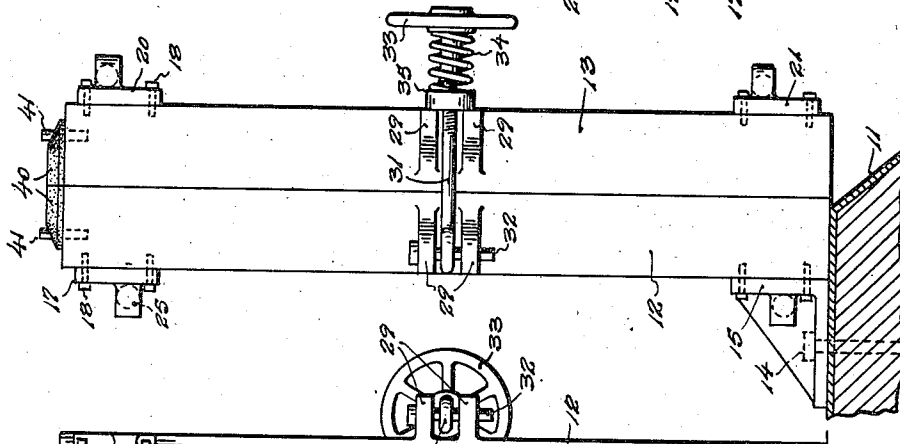


Fig. 2.

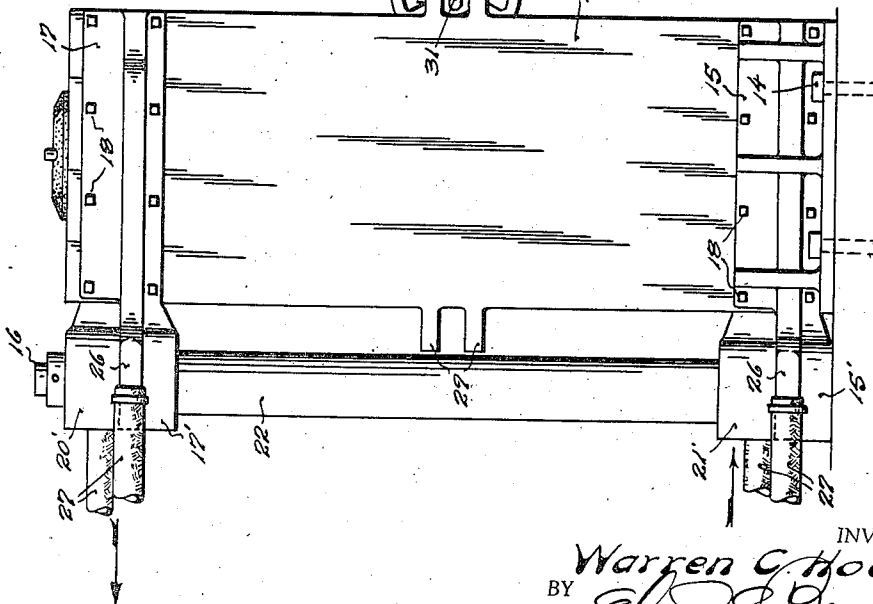


Fig. 3.

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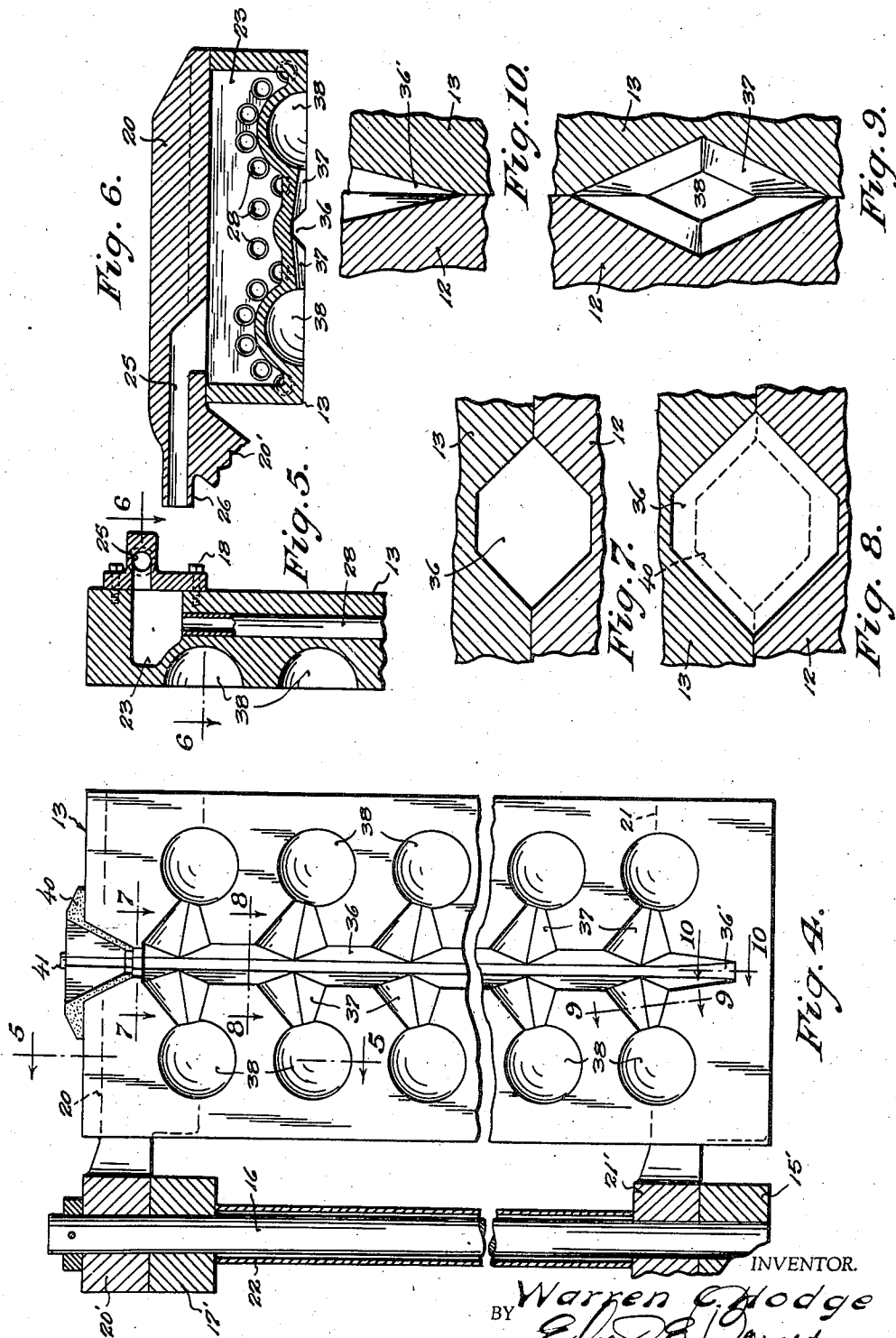
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2 Sheets-Sheet 2



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BALL-MOLDING MACHINE

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Application June 25, 1940, Serial No. 342,261

9 Claims. (Cl. 22—153)

This invention relates to the production of crusher balls, and for its general objects aims to provide a ball-molding machine of more facile operation than hitherto and one in which, by inherent advantages over prior machines, the molding function produces a crusher ball effective to accomplish its crushing end more efficiently than heretofore.

Referring to such general objects in more particularity, the invention is directed to the provision of paired and water-cooled cavitated blocks complementing one another to produce a multiple-ball mold and especially characterized in that the blocks are freely interchangeable through an engineering of the same to a bilateral symmetry.

It is a further and a particular object to provide a water-cooled mold machine embodying novel distributional features effective to govern the cooling function more advantageously than has been heretofore possible.

It is a still further and a particular object to so design main and branch runners, vertebrated in nature, as to free the walls of an erosive action and minimize turbulence of the metal being poured.

It is a further object still to design the runners to a form inherently acting as an aid to the ejection of the set metal from the mold.

The foregoing, with still further objects and advantages, will become apparent in the course of the following detailed description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the drawings:

Figure 1 is a top plan view of a ball-molding machine embodying the present advancements, the delivery hose of the water-circulating system being shown fragmentarily and dotted lines being employed to represent the swinging movement of one of the complementing mold-blocks for ejecting the set metal.

Fig. 2 is a front elevation and Fig. 3 is a side elevation thereof.

Fig. 4 is a longitudinal vertical section taken to an enlarged scale on line 4—4 of Fig. 1.

Fig. 5 is a fragmentary transverse vertical section on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary horizontal section on line 6—6 of Fig. 5; and

Figs. 7, 8, 9 and 10 are, respectively, a fragmentary horizontal, a fragmentary horizontal, a fragmentary transverse vertical, and a fragmentary transverse vertical section on lines 7—7, 8—8, 9—9 and 10—10 of Fig. 4, each detailing the in-

dicated portions of the runners and being taken to an enlarged scale.

Having reference thereto, the numeral 11 indicates a bed on which are mounted a number of upright mold-blocks 12 and 13 employed in pairs, one block 12 of each pair being anchored to the bed through the instrumentality of lag screws 14 which bear against a foot-bracket 15 and the other and complementing block being hingedly supported from the stationary block for swinging movement about a vertical axis. 16 denotes the pintle for the hinge, the pintle being carried by an angular butt-piece 15' produced as an integral part of the foot-bracket, and by a co-axial butt-piece 17' produced as an integral part of an attaching plate 17 which, with the foot-bracket, is secured by bolts 18 in overlying relation to the back face of the block 12. Located in corresponding positions over the back face of the block 13 and similarly bolted are attaching plates 20 and 21 produced with hinge-forming butt-pieces 20' and 21', respectively. 22 denotes a spacer pipe sleeved over the pintle between the butt-pieces 17' and 21' to separate the hinge arms while changing blocks. Excepting for the foot-bracket 15 which is distinguished by a flange for the engagement of the anchoring lag screws 14, said several hinge arms, which is to say 17, 20 and 21, are interchangeable. The boltably applied plates 20 and 21 in addition to their function of a hinging arm serve as covers for water manifolds 23 and 24 and are each cast with manifold-connecting water ducts 25 which terminate in nipples 26, the nipples being coupled to water-circulating hoses 27.

The water manifolds, cast in the back faces of the blocks to extend horizontally for the approximate width thereof, are connected by a plurality of cast-in paralleling vertical pipes 28, the arrangement being one in which the admission ends of selective pipes may be either partially or completely plugged to better control the effective removal of heat from the mold cavities, it being understood that this spot control is in addition to a general control of the removal of heat through the instrumentality of regulating the water flow into and from the manifolds.

Reverting to the hinging movement of the blocks, any suitable means may be employed to clamp the free ends thereof in closed positions. In the illustrated embodiment I produce the blocks with vertically apertured lugs arranged in fork-forming pairs and extending laterally from each side edge at the substantial mid-height of the blocks to permit the same to be selectively

employed according to which side edge of the blocks lies outermost. Received in the fork of one of the lug pairs is a rod 31 pivotally supported by a pin 32 and having its free end threaded and fitted with means such as the indicated hand-wheel 33 working against a compression spring 34, the spring in turn exerting clamping pressure on a collar 35 which bears against the lugs of the other block.

Considering now the mold proper, the meeting faces are conventionally cavitated to provide registering pockets and it will be seen that these mold cavities define, on the substantial vertical center line of the closed blocks, a parallel-sided main-runner 36 feeding laterally from each side through branch-runners 37 to vertically spaced ball pockets 38. The branch-runners converge at a slight declination toward their respective ball pockets and are each sectionally of a diamond shape (Fig. 9) of which the angles formed between the meeting surfaces of each block are obtuse in nature, which is to say that each of the two plane faces (Fig. 10) in a respective block lies in obtuse angular relation to the other face of that block, a form which functions to facilitate ejection by precluding a pinching action on the poured metal. The main-runner is sectionally hexagonal with the angles defined between the several plane faces of each of the complementary blocks are likewise obtuse (Fig. 7). Such main-runner is fitted at its admission end with refractory funnel-shaped cup sections 49 removably held by dowels 41, the refractory cup sections producing a delivery throat dimensionally reduced from the span of the runner to prevent an erosive action of the hot metal being poured. To minimize turbulence, the main-runner is prolonged downwardly below the lowermost branch-runner in a chisel tip 35' (Fig. 10), this chisel tip producing a rapid chill, serving the added office of forming a point fulcrum to facilitate dislodgment and, with the half-diamond shape of the branch-runner cavities, producing a shear surface to aid ejection. While not illustrated, the several ball pockets 39 are provided with air vents leading from the upper limits thereof to the side edges of the blocks.

It is my intention, and I wish it to be so understood, in each of the several instances where the term "ball cavities" is employed in the description and claims to denote the mold chamber for the objective product, that such term includes mold chambers for the casting of other products as well.

The several advanced features of the invention will, it is believed, be apparent from the foregoing description taken with the illustrated embodiment of the drawings. I intend to imply no unnecessary limitations by reason of having specifically described my preferred form of ball-molding machine, and expect that the hereto annexed claims be given an interpretation commensurate with the state of the advance in the art.

What I claim, is:

1. A ball-molding machine providing separable complementary mold-blocks supported in upright position and formed in their meeting faces with a vertebrated system of bilaterally symmetrical runner and ball cavities, said runner cavities comprising a substantially perpendicular main runner located on the median vertical line of each block and extending for the approximate length thereof and laterally extending branch runners leading from said main runners to the

ball cavities, said branch runners being formed to have the same contract in the direction of travel of the metal being poured with the lower extreme and the upper extreme wall of each of said contracting runners being disposed to lead upwardly and downwardly in the respective instance from the main runner to the related cavity, the angle of said upper extreme wall being relatively steep.

2. A ball-molding machine providing separable complementary upright mold-blocks supported in upright position and formed in their meeting faces with a vertebrated system of runner and ball cavities, said runner cavities comprising a substantially perpendicular main runner located on the median vertical line of the respective block and extending for the approximate length thereof and branch runners leading laterally from said main runner to the ball cavities, said branch runners being formed to have the same contract in the direction of travel of the metal being poured with the lower extreme wall and the upper extreme wall of each of said contracting runners being disposed to lead upwardly in the instance of the former and downwardly in the instance of the latter wall from the main runner to the related ball cavity, the angle of declination of said upper extreme wall being relatively steep.

3. A ball-molding machine providing separable complementary mold-blocks formed in the meeting faces with registering main and branch runners of which said main runners occupy a substantially perpendicular position and the branch runners lead laterally therefrom, said main runners being prolonged downwardly for a material distance below the lowermost branch runner and forming, in complement, a relatively sharp wedge-shaped basal tip.

4. A ball-molding machine providing separable complementary mold-blocks supported in upright position and formed in their meeting faces with registering runner and ball cavities, said runner cavities comprising a substantially perpendicular main runner and a plurality of branch runners leading laterally to the ball cavities, said main runner being prolonged downwardly for a material distance below the lowermost branch runner and terminating in a relatively sharp wedge-shaped basal tip; and refractory cup sections removably supported by the respective blocks at the admission end of the main runner to collectively form a funnel characterized in that the delivery throat produced thereby is dimensionally of a span reduced from the transverse span of the main runner.

5. A ball-molding machine providing separable complementary mold-blocks supported in upright positions with each block produced to substantial bilateral symmetry including, in the meeting faces of the mold-forming blocks, a vertebrated system of registering runner and ball cavities, one of said runner cavities being disposed perpendicularly and functioning as a main for the system; and refractory cup sections removably supported by the respective blocks at the upper end of said main runner to produce a funnel, said funnel at its discharge end being reduced from the transverse dimensions of the main runner whereby, in the pouring of the metal through said funnel into the main runner, the descending stream is isolated from the side walls of said runner.

6. A ball-molding machine providing separable complementary water-cooled mold-blocks sup-

ported in upright positions and produced to a corresponding bilateral symmetry including water cavities extending the approximate width of the blocks at the upper and lower ends thereof, said cavities being exposed to the back face of the respective block and having communication, one with the other water cavity of each block; and hinge-forming arms providing attachment plates fitting over the water cavities to act as closures therefor, said plates being cored to form ducts for supplying water to one and withdrawing water from the other of said communicating water cavities.

7. A ball-molding machine according to claim 6, said water cavities functioning as manifolds and the communication between the same comprising a plurality of cast-in paralleling pipes extending longitudinally of the blocks, the pipes

permitting selective partial or complete plugging to govern the removal of heat from the blocks.

8. A ball-molding machine according to claim 6 in which the closure plates for the water cavities are provided externally with hose-engaging nipples communicating with the water ducts.

9. A ball-molding machine providing separable complementary mold-blocks supported in upright position and formed in their meeting faces with registering runner and ball cavities, said runner cavities comprising a main runner and a plurality of branch runners leading laterally from the main runner to the ball cavities, both the main and the branch runners, considered in transverse section, being straight-sided and characterized in that, in each block, the meeting walls thereof lie in obtuse-angular relation.

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