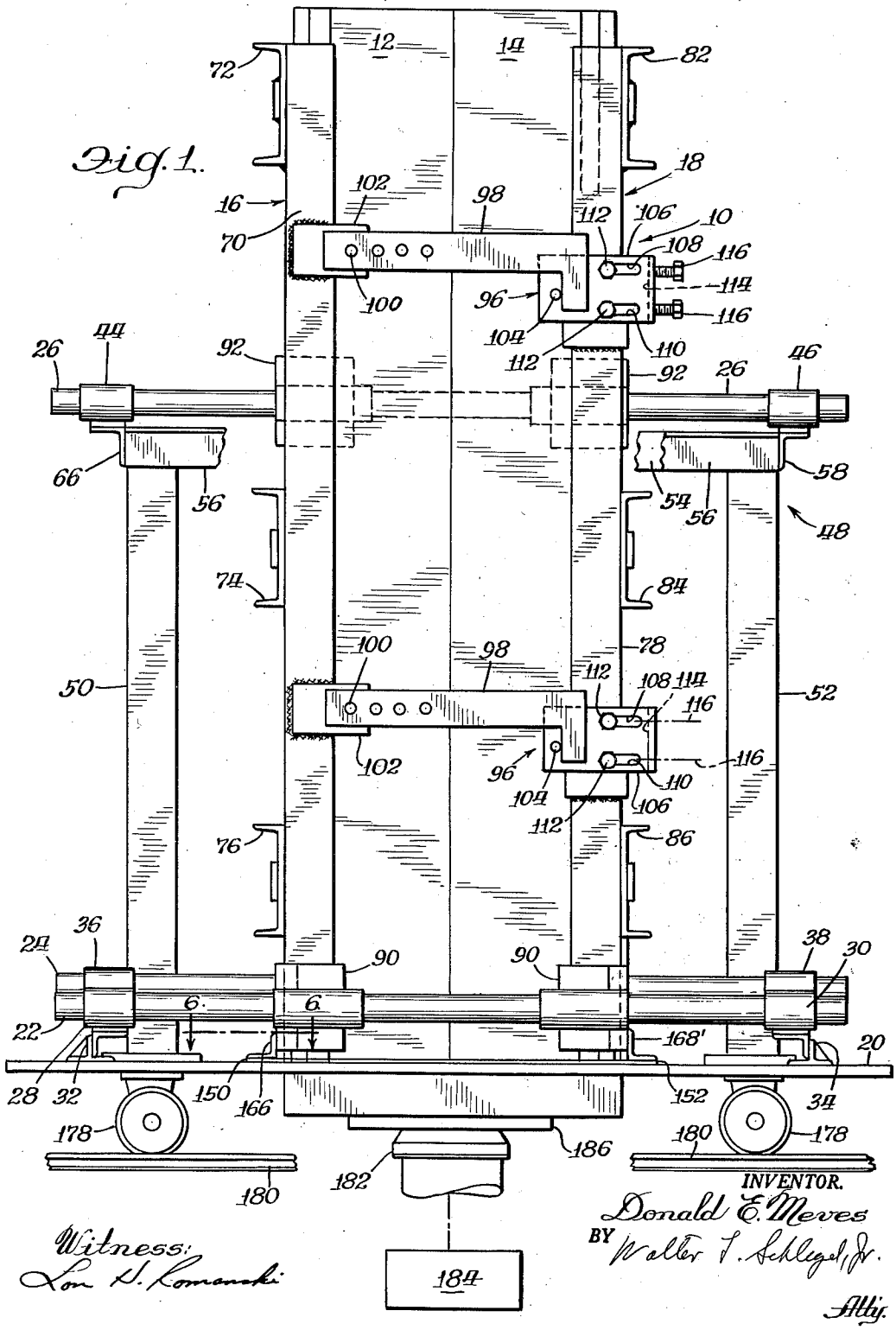
July 26, 1966 D. E. MEVES 3,262,164

MOLD ASSEMBLY

Filed June 14, 1963 3 Sheets-Sheet 1

Fig. 1.



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July 26, 1966 D. E. MEVES 3,262,164

MOLD ASSEMBLY

Filed June 14, 1963 3 Sheets-Sheet 2

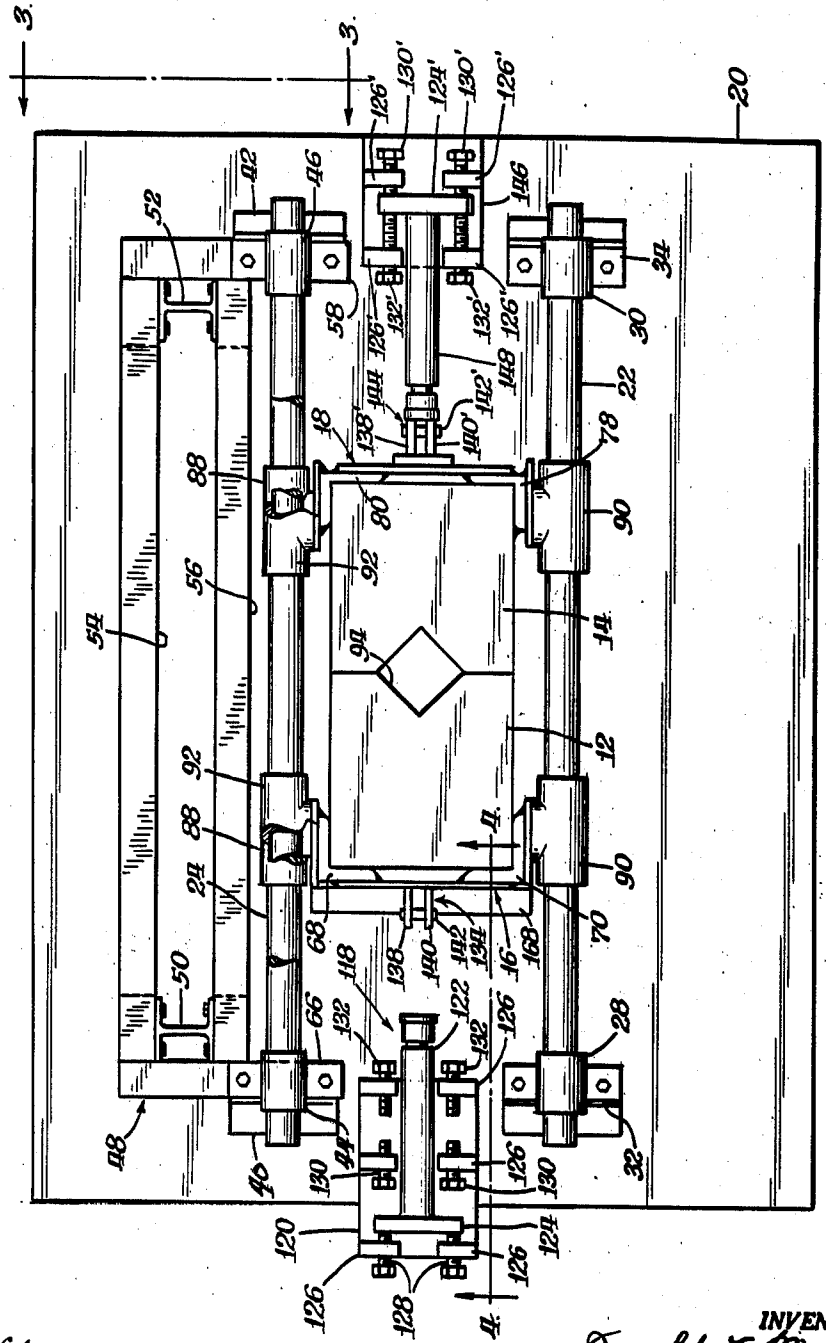


Fig. 2.

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July 26, 1966 D. E. MEVES 3,262,164

MOLD ASSEMBLY

Filed June 14, 1963 3 Sheets-Sheet 3

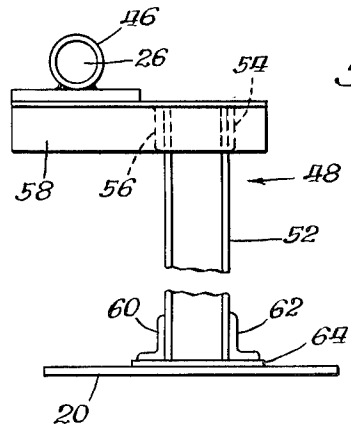


Fig. 3.

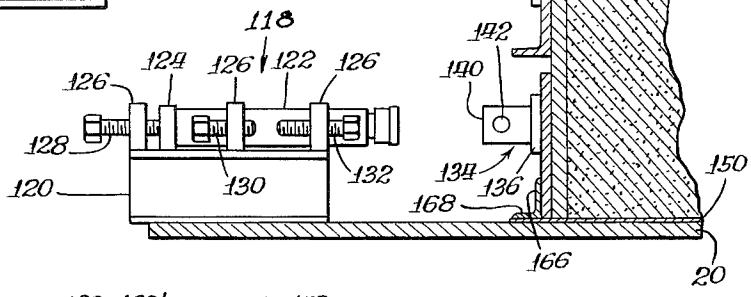


Fig. 4.

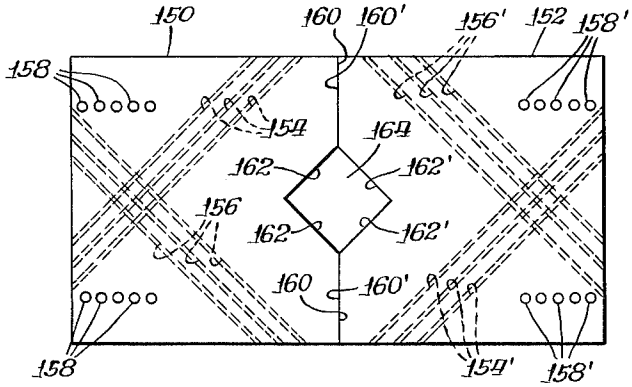


Fig. 5.

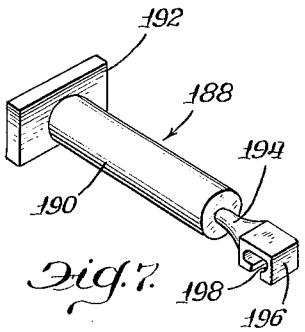


Fig. 7.

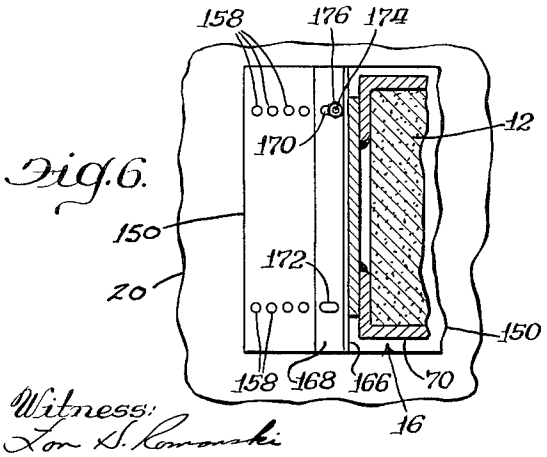


Fig. 6.

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United States Patent Office

3,262,164

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3,262,164

MOLD ASSEMBLY

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Filed June 14, 1963, Ser. No. 287,948
10 Claims. (Cl. 22—69)

This invention relates generally to the art of metal casting and more particularly to mold structures for the pressure casting of molten metals.

Various mold arrangements have been proposed for the pressure casting of molten metals. However, none of those have proven to be entirely satisfactory. For example, some mold assemblies have not been able to tolerate the combined deleterious effect of high temperature and high flow rate of the incoming molten metals while still other mold assemblies have not provided ready access to the cast article once the pressure pouring cycle is completed.

Accordingly, it is a general object of this invention to provide a novel mold assembly which is capable of accommodating the high temperatures and metal flow rates attendant in pressure casting operations.

Another object of this invention is to provide a mold assembly which is not only highly suitable to pressure casting operations but also provides a means of ready access to the cast article.

Still other objects and advantages will become apparent when reference is made to the following description when considered in conjunction with the drawings wherein:

FIGURE 1 is a side elevational view of a mold assembly constructed in accordance with the teachings of this invention;

FIGURE 2 is a top plan view of the mold assembly shown in FIGURE 1;

FIGURE 3 is a fragmentary end elevational view taken generally on the plane of line 3—3 of FIGURE 2 and looking in the direction of the arrows;

FIGURE 4 is a fragmentary sectional view taken generally on the plane of line 4—4 of FIGURE 2 and looking in the direction of the arrows;

FIGURE 5 is a top plan view of a shoe arrangement suitable to the practice of the invention;

FIGURE 6 is a fragmentary sectional view taken on the plane of line 6—6 of FIGURE 1 and looking in the direction of the arrows; and

FIGURE 7 is a perspective view of an actuating assembly adapted for use in the invention.

Certain details are omitted from one or more of the FIGURES for purposes of clarity.

Referring now in greater detail to the drawings, FIGURES 1 and 2 illustrate a mold assembly 10 as being comprised generally of vertically extending graphite mold blocks 12 and 14 received within frame assemblies 16 and 18, respectively. The entire mold assembly 10 is generally slidably retained to a base 20 by means of a plurality of guide bars 22, 24 and 26. Guide bar 22 is located on the foremost side of frame assemblies 16 and 18, as viewed in FIGURE 1 while guide bars 24 and 26 are disposed on the opposite side of the mold assembly 10.

Guide bar 22 is fixedly retained near its opposite ends within bearing members 28 and 30 which in turn are rigidly supported with respect to the base 20 by means of suitable pedestal arrangements 32 and 34. Guide bar 24 is similarly mounted by means of bearing members 36 and 38 and pedestal arrangements 40 and 42. However, guide bar 26 is supported within elevated retaining bearing members 44 and 46 secured atop a support structure 48 which is comprised generally of vertically extending I-beam members 50 and 52 joined together

at their respective uppermost ends by oppositely disposed girder members 54 and 56 of angular cross-section.

FIGURE 3, a fragmentary elevational view taken on the plane of line 3—3 of FIGURE 2 illustrates the support structure 48 as also being comprised of a laterally extending cantilever member 58 secured at one end generally to girder members 54 and 56 and I-beam 52 and supporting at its other end bearing member 46 which receives one end of guide bar 26. I-beams 50 and 52 may be secured to the base 20 by any suitable means as, for example, oppositely disposed reinforcing members 60 and 62 and a base plate 64. Any means of joining, such as, for example, rivets, bolts or welding, may of course be employed. Similarly a cantilever member 66 is provided at the opposite side of support structure 48 for supporting bearing 44.

Frame assembly 16, as shown in FIGURES 1 and 2, is comprised of vertically extending angular corner members 68 and 70 secured to each other by means of horizontally spanning channel members 72, 74 and 76 in a manner permitting the reception therein of graphite mold block 12. Frame assembly 18 is similarly comprised of corner members 78 and 80 and channels 82, 84 and 86.

Each of the frame assemblies 16 and 18 have secured at their lower portions oppositely disposed bearing members 88 and 90 which are slidably received on guide shafts or bars 24 and 22, respectively. The upper portions of both frame assemblies 16 and 18 are also provided with bearing members 92 secured thereto and slidably received on guide bar 26. Portions of guide bar 26 and bearings 92 are broken away in FIGURE 2 in order to illustrate bearings 88 and shaft 24 which are preferably located directly below.

Whenever mold sections 12 and 14 are brought together to form a mold casting cavity 94, clamping assemblies 96 may be employed for maintaining frame assemblies 16 and 18 and mold sections 12 and 14 together. Clamping assemblies 96 are generally comprised of a clamp arm 98 pivotally mounted, as by a suitable pivot member 100, to a bracket 102 secured to frame assembly 16. The other end of arm 98 is adapted to engage a suitable locking pin 104 which is secured to an adjustable bracket 106 mounted on frame assembly 18. Bracket 106 is provided with elongated slots 108 and 110, which receive suitable clamping bolts 112 therethrough, and a laterally extending tab portion 114 through which are threadably received adjustment screws 116. The purpose of screws 116 is to provide lateral adjustment of bracket 106, in the plane of the drawing, by bearing against corner member 78. After brackets 106 are properly adjusted by means of screws 116, bolts 112 may be tightened in order to secure the brackets to the frame assembly 18. Preferably, two clamping assemblies 96 are also provided on the opposite side of the mold assembly.

FIGURE 4, a fragmentary sectional view taken substantially on the plane of line 4—4 of FIGURE 2, illustrates a left-hand ram arrangement 118, comprised of a ram holder 120 mounted atop the base 20 and loosely receiving a ram 122. The ram 122 may of course be any suitable pressure responsive piston and cylinder assembly. The closed end of the cylinder portion of ram 122 is provided with a laterally extending bar member 124 rigidly secured thereto. Ram holder 120 is provided with a plurality of vertically extending brackets 126, generally oppositely disposed about the ram 122, which threadably receive adjustment screws 128, 130 and 132. A bracket assembly 134, comprised of a base 136 and laterally extending bracket plates 138 and 140 fixedly retaining a pin 142 therein, is suitably secured to frame assembly 16.

A similar bracket assembly 144, ram holder 146 and ram 148 are also provided on the opposite side of the

mold assembly **10**. All details thereof which are like or similar to those of either holder **120**, ram **122** or bracket assembly **134** are identified with like primed reference numbers. Bracket assemblies **134** and **144** are adapted to at times coact with their respective ram assemblies for opening and/or closing the mold sections **12** and **14**.

A split mold shoe comprised of shoe portions **150** and **152** is provided between the mold sections **12** and **14** and base **20** so as to permit relatively smooth sliding motion of the mold assembly **10** with respect to base **20**. Mold shoe **150**, illustrated also in FIGURES 5 and 6, is preferably comprised of a relatively thin copper plate having diagonally formed grooves **154** and **156** in the bottom surface thereof in order to accommodate particles of dirt which may be present on the coacting sliding surface of base **20**. A plurality of clearance holes **158**, arranged in parallel rows, are provided generally at the outer end of the shoe **150**. The clearance holes may be countersunk at the bottom surface in order to receive screws from the underside thereof. The inner surfaces **160** and **162** are formed so as to result in an opening **164** conforming to the mold cavity **94**. Mold shoe **152** is preferably identical to shoe **150** and all details thereof like or similar to mold shoe **150** are identified with like primed reference numbers.

FIGURE 6 illustrates the typical arrangement by which the respective mold shoes are secured to their respective frame assemblies. Mold shoe **150** is shown positioned beneath mold section **12**, corner members **68** and **70** and an angular mounting bracket **166** which is rigidly secured to the frame assembly **16** by any suitable means. The horizontal portion **168** of bracket **166** is provided with elongated slots **170** and **172** for the reception of screws **174**, only one of which is shown. Screw **174**, extending through one of the holes **158** and slot **170**, secures the bracket **166** to shoe **150** by means of a cooperating nut **176**. As surfaces **160** and **162** of the shoe are re-machined screws **174** may be placed in sets of holes **158** which are closer to the outer edge of shoe **150** thereby allowing the re-machined surfaces **160** and **162** to be again placed in proper relationship to the mold assembly.

Base **20** is also preferably provided with a set of railway wheels **178** for cooperation with suitable rails **180**. A section of the rails **180** may also be provided with any suitable elevating mechanism for lowering a portion of the rails, base **20** and mold assembly **10** into cooperative engagement with a pouring tube **182** of a suitable pressure pouring ladle assembly schematically illustrated at **184**. The pressure pouring ladle assembly may be of any well known type such as that disclosed generally by U.S. Patent 2,847,739 issued to E. Q. Sylvester. A pouring tube adapter assembly **186** is provided at the underside of base **20** for functionally engaging the tube **182**.

Operation

Assuming that the mold assembly **10** is in the position illustrated in FIGURE 1, the operation of the invention is as follows. Mold assembly and base **20** are moved along rails **180** until the adapter **186** is in substantial alignment with pouring tube **182** at which time the entire mold assembly is lowered until functional engagement between adapter **186** and tube **182** is completed.

A pressure differential is then created across the metal within the ladle assembly **184** and mold cavity **94** causing the molten metal to flow upwardly through tube **182**, adapter **186** and into the mold cavity **94**. The flow of molten metal is of course continued until cavity **94** is completely filled at which time termination of flow is effected by sliding the entire mold assembly to the right with respect to base **20** thereby placing opening **164** of the mold shoes and cavity **94** out of juxtaposition with the pouring tube **182**. At this time the pressure within the pressure pouring ladle **184** may be relieved thereby allowing the molten metal remaining in the pouring tube **182** to run down into the metal-containing chamber of the ladle.

The sliding of the mold assembly **10** is achieved by ram **122** which when actuated bears against the adjustment screws **128** and bracket assembly **134** in a manner causing the mold assembly **10** to slide along base **20** while being guided by guide bars **22**, **24** and **26**. The guide bars also perform another important function, that being the resilient urging of the mold assembly in a downward direction. Preferably, bearing members **28**, **30**, **36**, **38**, **44** and **46** are so arranged as to cause guide bars **22**, **24** and **26** to experience a slight downward bending moment at their respective extremities. Such bending moments in turn serve to minimize any possible leakage between the sliding surfaces of mold shoes **150** and **152** and base **20**. Although not specifically shown, it will, of course, be understood that rams **122** and **148** are suitably connected to a source of fluid pressure for actuation thereof.

Once further flow of molten metal to cavity **94** is terminated, the mold assembly **10** and base **20** may be elevated to the normal track or rail level and transported to an appropriate area for at least partial solidification of the cast article.

When the necessary degree of solidification has been achieved, clamping arms **98** are swung open thereby permitting the subsequent separation of the mold sections **12** and **14**. At this time, since rams **122** and **148** are loosely received within their respective holders **120** and **146**, rams **122** and, **148** may be replaced by rams **188** one of which is generally illustrated in FIGURE 7. Rams **188** comprised of a cylinder portion **190** and a laterally extending plate **192** secured thereto have a coupling portion **196** secured to or formed on the outer end of the piston rod **194**. Coupling portion **196** is provided with an opening **198** for at times engaging pins **142** and **142'**.

Rams **188** are then placed within the holders **120** and **146** in a manner engaging pins **142** and **142'**, respectively. At this time the plate **192** of the right-hand ram will be abutting against screws **132'** while the left-hand ram **188** will have its backing plate **192** abutting screws **132**. Left-hand ram **188**, while in its extended position, is actuated causing mold section **12** to move towards the left away from mold section **14** which is restrained by the non-actuated right-hand ram **188**. The separation of the mold sections then provides ready access to the cast article.

After removal of the cast article, both the left-hand and right-hand rams **188** may again be replaced with rams **122** and **148** with which mold sections **12** and **14** are moved to the position shown by FIGURES 1 and 2. Mold sections **12** and **14** are then secured to each other by means of clamping arms **98** and the casting process repeated.

One of the important features of the invention is its adaptability to a highly repetitive production schedule. For example, the mobility of the entire mold assembly and base make it suitable for incorporation in a continuous type of production line wherein the mold and base travel from station to station having predetermined operations performed at each of such stations. Further, the provision of removable rams enables the removal, placement and replacement of the various rams at particular stations thereby avoiding the necessity of providing rams for each mold assembly and base in the production line.

Although only one embodiment of the invention has been disclosed and described, it is apparent that other embodiments and modifications of the invention are possible within the scope of the appended claims.

I claim:

1. Pressure casting mold apparatus comprising a base, a mold assembly including a pair of mold blocks mounted on the base for movement horizontally toward each other into interengagement and away from each other, the mold blocks forming therebetween a vertically extending mold cavity opening through the bottom thereof, said base hav-

ing a pouring aperture therein communicating with said mold cavity in a predetermined pouring position of the mold assembly, means supporting said base in position for cooperation with a pouring tube therebelow in communication with said pouring aperture, means for releasably locking the mold blocks together in assembly, and means for moving the mold blocks into and out of interengagement, and the mold assembly into pouring position and out of that position and into a position in which said cavity is closed by a solid portion of the base.

2. The invention set out in claim 1 wherein plate means is fitted to the bottom of the mold blocks and movable therewith along the base, said plate means has an aperture registering with said cavity and with said pouring aperture in the base when the mold assembly is in pouring position.

3. The invention set out in claim 2 wherein said plate means is provided with grooves in its under surface inclined to the direction of movement of the mold blocks.

4. The invention set out in claim 3 wherein the mold blocks are of graphite, frame members are incorporated in the mold assembly for supporting the mold blocks, said plate means includes a plate element under each mold block, and means for securing said plate elements to respective frame members for relative adjustment therebetween in directions of movement of the mold blocks to accommodate changes in dimensions of the mold blocks in those directions due to refinishing the blocks after successive molding operations.

5. The invention set out in claim 4 wherein the means for releasably locking the mold blocks together includes clamp arms pivotally mounted on the frame members on one mold block and brackets mounted on the frame members on the other mold block cooperable with and adjustable toward and from the clamp arms.

6. The invention set out in claim 1 wherein guide bars

are provided on the base, and the mold blocks have sliding and guiding engagement therewith, and the guide bars are inclined downwardly at the ends whereby to provide increased pressure between the mold blocks and base when the mold assembly is out of molding position relative to that when it is in molding position.

7. The invention set out in claim 1 wherein the moving means includes power cylinder-ram means.

8. The invention set out in claim 7 wherein said power cylinder-ram means includes such means at each end of the mold assembly for moving the mold assembly as a unit and moving the mold blocks individually.

9. The invention set out in claim 1 wherein the base is mounted on a wheeled carriage for movement of the mold apparatus along rails, said power cylinder-ram means includes such means at each end of the mold assembly and detachably mounted on the apparatus whereby to utilize the same power means for a plurality of mold assemblies.

10. The invention set out in claim 9 wherein the power cylinder-ram means includes one such means for each pulling and pushing at each end of the mold assembly, the mold assembly has means for operative engagement by the power means, and means is provided on the base for operative engagement by the power means in selective position corresponding to the individual power means.

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