RENEWING MOLDS

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3 Sheets-Sheet 1

Fig. 1.

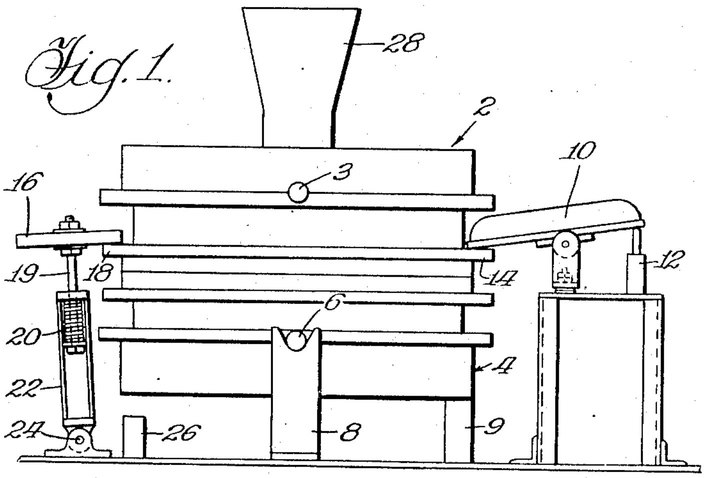


Fig. 4.

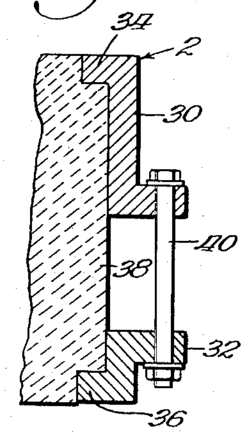
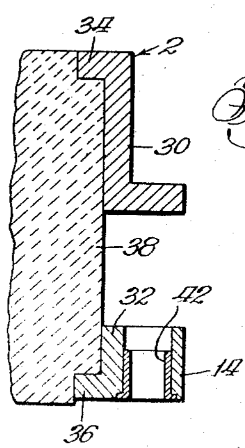


Fig. 3.



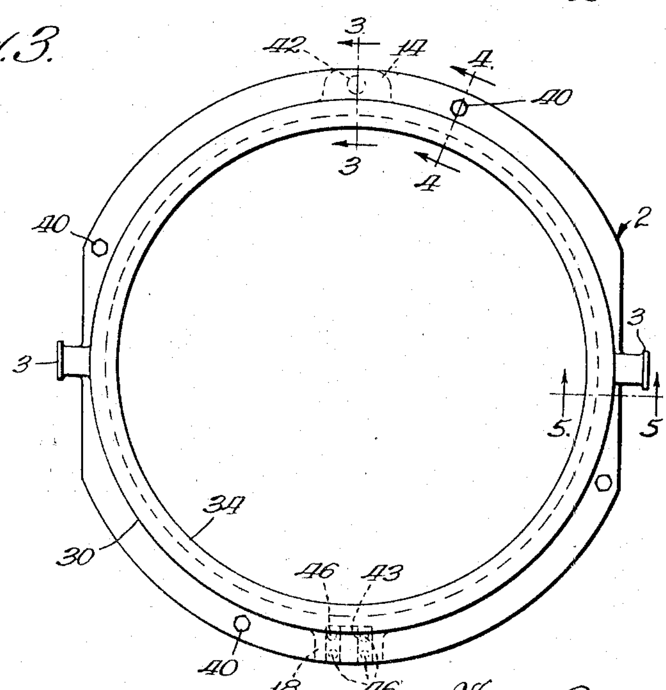


Fig. 2.

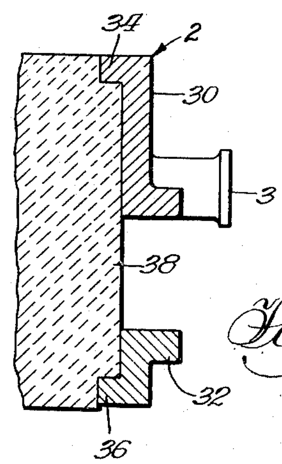


Fig. 5.

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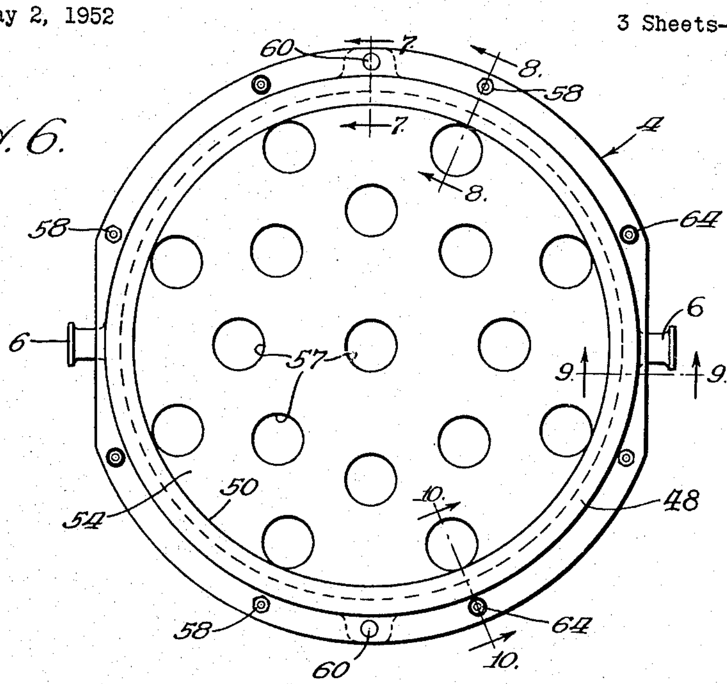
Fig. 6.



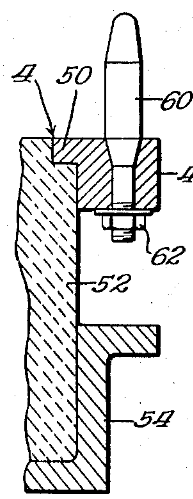
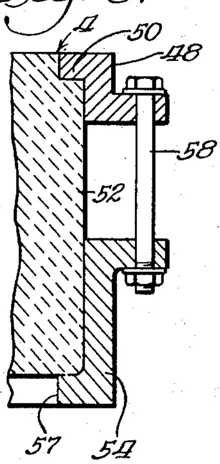


Fig. 7.

Fig. 8.



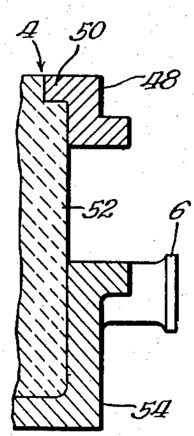
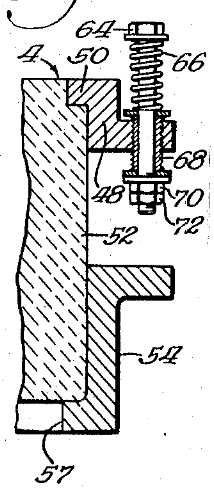


Fig. 9.

Fig. 10.



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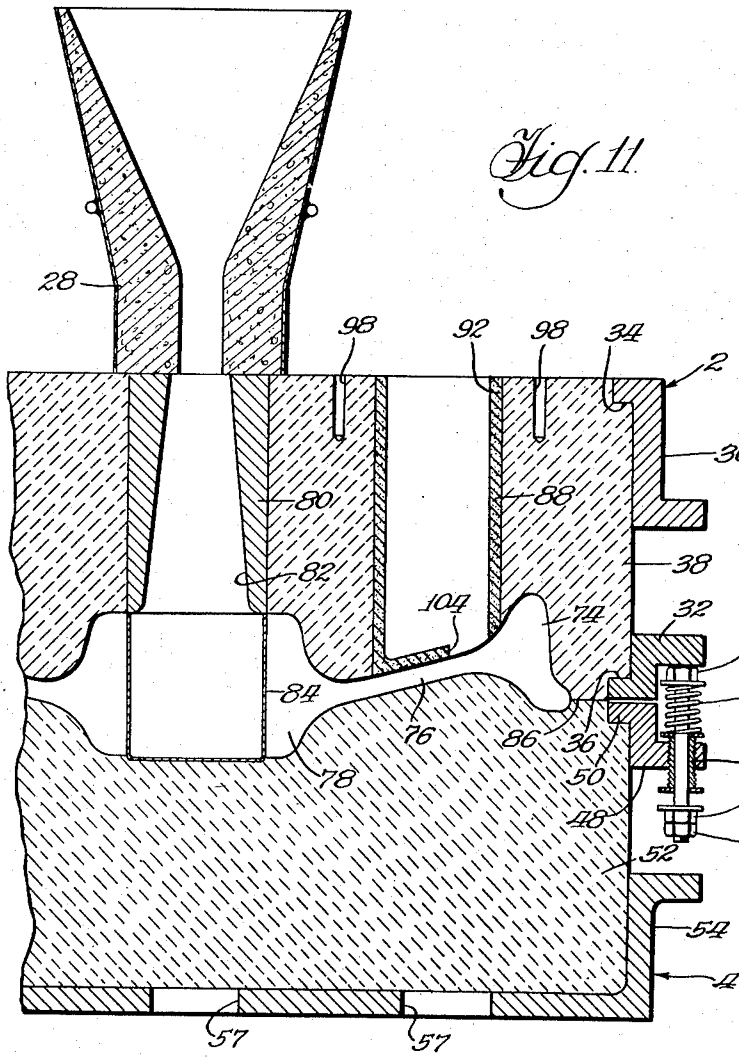

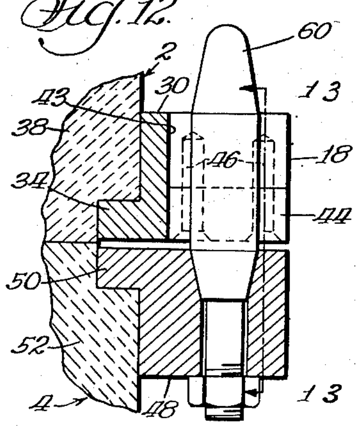

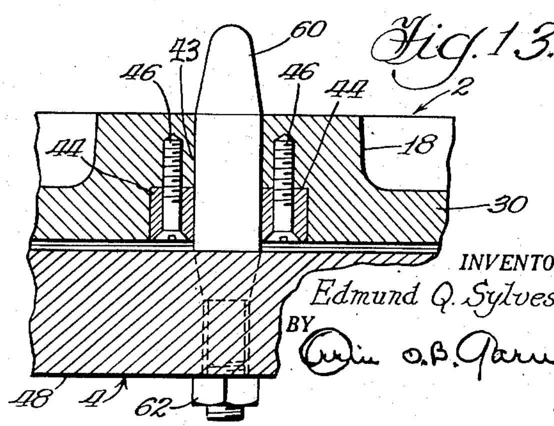

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United States Patent Office

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RENEWING MOLDS

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Application May 2, 1952, Serial No. 285,589

2 Claims. (Cl. 29—401)

This invention relates to the art of casting in permanent molds, and more particularly to a novel method of renewing such molds as may become necessary due to erosion, oxidation, or other damage to the mold surfaces which define the casting cavity. The present application is a continuation-in-part of my application, Serial No. 189,961, filed October 13, 1950.

As is well known in the art, the mold surfaces which define the casting cavity of a permanent mold such as, for example, a refractory mold utilized in the casting of metals frequently erode or oxidize whether the metal is poured under the action of gravity or is forced into the mold by a vacuum or pressure system. Such erosion or oxidation of the mold surfaces ultimately results in defective castings or in castings which require excessive finishing. According to the present invention, I have discovered that these mold surfaces may be quickly and economically restored by removing a uniform increment of the mold material from the surfaces which define the mold cavity and from the mutually seating mold surfaces around the mold cavity.

I have further discovered that a convenient method of removing a uniform increment from these mold surfaces may be practiced by machining the surfaces as, for example, in a conventional boring mill.

The foregoing and other objects and advantages of my invention will become apparent from a consideration of the following specification and the accompanying drawings, wherein:

Figure 1 is a side elevational view of a preferred embodiment of apparatus utilized in the practice of the invention;

Figure 2 is a plan view of the cope with its graphite portion removed;

Figures 3, 4 and 5 are sectional views taken, respectively, on the lines 3—3, 4—4 and 5—5 of Figure 2;

Figure 6 is a plan view of the drag with its graphite portion removed;

Figures 7, 8, 9 and 10 are sectional views taken, respectively, on the lines 7—7, 8—8, 9—9 and 10—10 of Figure 6;

Figure 11 is a fragmentary central, vertical, sectional view through the mold;

Figure 12 is a fragmentary vertical, radial sectional view through the mold illustrating one of the aligning pins for the cope and drag sections thereof, and

Figure 13 is a sectional view on the line 13—13 of Figure 12.

Describing the invention in detail and referring first to Figure 1, the mold comprises a composite top section or cope, which is generally designated **2** and is provided with a trunnion **3**, at each side thereof for convenient handling as by a crane or hoist (not shown). The mold also comprises a bottom section or drag **4** having at each side thereof a trunnion **6** carried by a pedestal **8** to support the mold and accommodate tilting thereof, as hereinafter described in connection with the pouring of a casting.

The mold is illustrated in the pouring position with the cope **2** clamped against the drag **4**, and the latter clamped against a stop **9**, as, for example, by a lever **10** actuated by a hydraulic jack **12**. The lever **10** engages a lug **14** of the cope **2**; and a resiliently actuated clamp bar **16** engages an opposed lug **18** of the cope, the bar **16** being connected by a bolt **19** to a compression spring **20** contained within a frame or casing **22** pivotally mounted at **24** adjacent a stop **26**, against which the spring **20** urges the drag **4** upon release of the lever **10** after molten metal, such as steel, has been poured into the cope **2** through a pouring cup **28** in the gravity pouring arrangement illustrated. It will be understood that, if desired, the metal may be poured into the mold, with the latter in tilted position during the pouring step; and furthermore, if desired the pouring may be accomplished by forcing the molten metal into the mold drag **4** as, for example, by a vacuum of pressure casting apparatus (not shown).

Referring now to Figures 2 to 5 and 11, it will be seen that the cope **2** preferably comprises top and bottom annular rings **30** and **32** having annular flanges **34** and **36**, respectively, seated against machined top and bottom shoulders of an annular graphite block **38**. As hereinafter noted, these rings may, if desired, be eliminated.

The rings **30** and **32** are preferably clamped together as, for example, by bolt and nut assemblies **40** (Figures 2 and 4), and the ring **32** is formed with the before mentioned lugs **14** and **18**. The lug **14** is provided with a precision machine ground bushing **42**, as best seen in Figures 2 and 3, and the lug **18** is provided with a precisioned, machined slot **43**, as best seen in Figures 12 and 13. The slot **43** is preferably defined in part by spaced steel bars **44**, secured as by screws **46** to the lug **18**. The bushing **42** and slot **43** are preferably diametrically opposed to each other so that a vertical plane bisecting them is approximately perpendicular to the axis of the coaxial drag trunnions **6**, for a purpose hereinafter described.

The drag **4**, as shown in Figures 6 and 11, preferably comprises a top ring **48** having an annular flange **30** seated against a complementary machined shoulder of a graphite block **52**, the bottom of which is preferably supported within a complementary cylindrical tray **54**, which is preferably perforated as at **57** (Figures 6 and 11) and is provided with the above mentioned drag trunnion **6**, as shown in Figure 9. It may be noted that, if desired, the ring **48** and tray **54** may be eliminated.

The ring **48**, as best seen in Figures 6, 10 and 11 also may comprise a plurality of resiliently actuated plungers **64**, each of which is supported by a compression spring **66** mounted on a bushing **68** threaded through the ring **48**. The spring **66** is adjustably compressed by a nut **70** and a lock nut **72**, and the vertical position of the plunger **64** is adjustable by the threaded bushings **68**. The plungers **64**, as shown in Figure 11, are adapted to support all or a predetermined part of the weight of the cope **2** to accommodate uniform contraction of the wheel casting, as hereinafter described. It may be noted that if this feature is not desired, the plungers and their supports may be eliminated.

As best seen in Figure 11, the graphite blocks **30** and **32** are machined or otherwise formed with substantially flat mating surfaces **86** around the perimeter of a mold cavity machined or otherwise formed to the shape of a standard wheel, said cavity comprising a rim section **74**, a plate section **76** and a hub section **78** for the corresponding parts of a steel wheel to be cast therein, as hereinafter described. It may be noted, that although the surfaces of the graphite blocks **30** and **32** defining the mold cavity **74**, **76** and **78** are preferably machined to the configuration illustrated in Figure 11, these surfaces may be provided in the graphite blocks during formation thereof. Furthermore, the flat mating surfaces of the graphite blocks at 86 may be initially formed on the blocks or may be machined, if desired, to insure a positive fluid-tight seat at 86 between the surfaces of the graphite blocks which surround the mold cavity 74, 76 and 78.

Also, as best seen in Figure 11, the downwardly facing shoulder of the graphite block 38, against which the flange 36 of the ring 32 is seated, and the upwardly facing surface of the graphite block 52, against which the flange 50 of the ring 48 is seated, are so machined that the rings 32 and 48 are spaced from each other when the graphite blocks are seated against each other as at 86.

The graphite block 38 of the cope 2 is also provided with a readily removable graphite sleeve 80 (Figure 11) which may, if desired, be secured in any convenient manner, as by a suitable cement, within a complementary hole or opening of the block 38, said sleeve having a gate opening 82 tapering upwardly to communicate with the pouring cup 28. Beneath the gage opening 80 is a fusible, preferably metallic anti-splash cup 84 which, in the illustrated embodiment shown in Figure 11, is formed of thin sheet steel. The anti-splash cup 84 is inserted into the cope cavity 78, prior to assembly of the sleeve 80; and the bottom of the cup 84 is seated on the block 52. The cup 84 is adapted to receive the molten metal from the gate 82, and after the molten metal has filled the cup 84, the latter melts providing a pool of molten metal beneath the gate 82 so that additional molten metal flowing therefrom into the mold cavity does not splash but flows smoothly into the pool which enlarges until the casting cavity is filled with molten metal. This novel arrangement prevents splashing of the molten metal and also prevents rapid erosion and pitting of the graphite surfaces defining the mold cavity, a difficulty which has heretofore rendered maintenance of such molds unduly expensive for the production of large steel castings such as railway wheels.

It may be noted that some erosion of the graphite surfaces defining the mold cavity occurs even with the present arrangement, and I have discovered that by arranging the mold parts as above described, these surfaces and the mating surfaces 86 of the graphite blocks 38 and 52 around the periphery of the mold cavity may be machined to remove a substantially uniform increment of, for example, $\frac{1}{32}$ of an inch, thereby quickly and economically renewing the mold cavity.

It may be noted that, if desired, the rings 32 and 48 may be removed and the shoulders of the graphite blocks 30 and 52, which seat against the flanges 36 and 50 of these rings, respectively, may also be machined to remove the same increment therefrom, as is removed from the surfaces 86 and the surfaces which define the mold cavity 74, 76, 78; however, as above noted, these rings may be eliminated, if desired, thereby eliminating the necessity of machining the engaged shoulders of the graphite blocks.

The graphite block 38 of the cope 2 comprises one or more riser cups or sleeves 88 communicating with the plate section 76 of the mold cavity radially inwardly of the rim section 74.

I claim:

1. In a method of renewing a mold having a casting cavity defined by recesses in mutually engaged flat surfaces of mold blocks, which recesses are disposed inwardly of the perimeters of said surfaces and are aligned by positioning means of spaced rings seated against mutually facing shoulders of respective blocks, said method comprising separating the block surfaces, and then removing the ring of each block and machining an equal increment from the flat surface thereof, the shoulder thereof, and a surface thereof which defines its recess, whereby when the rings are reseated and the flat surfaces are reengaged with each other, said cavity is of the same dimensions as the original dimensions thereof.

2. In a method of renewing a casting cavity defined by recesses in mutually engaged planar surfaces of mold blocks, the surfaces lying in a single plane and extending in said plane from the said cavity to the outer perimeter of said blocks; the steps of separating said surfaces from each other and then machining a uniform increment from said surfaces of said blocks and from surfaces thereof which define said recesses, whereby when said planar surfaces are again interengaged said cavity is of the same dimensions as the original dimensions thereof.

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