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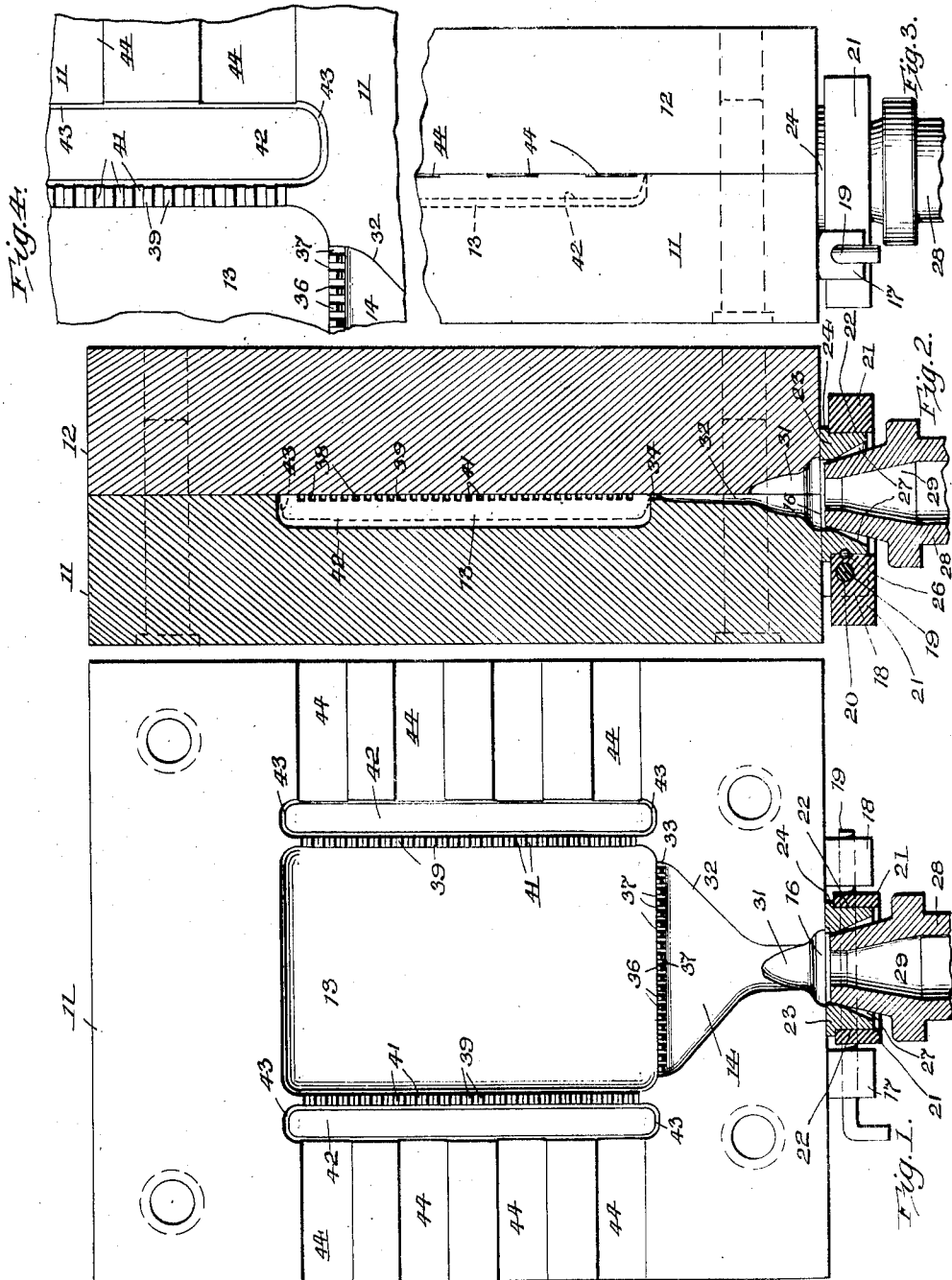
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1,940,173

MOLD

Filed June 11, 1932

2 Sheets-Sheet 1



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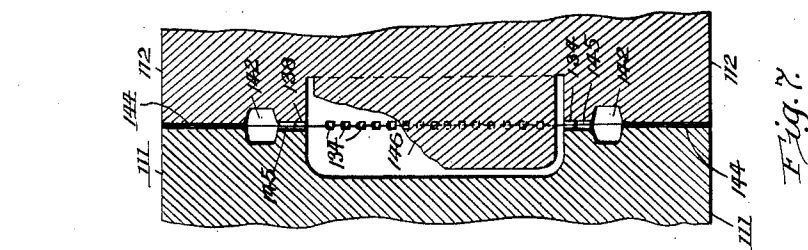


Fig. 5.

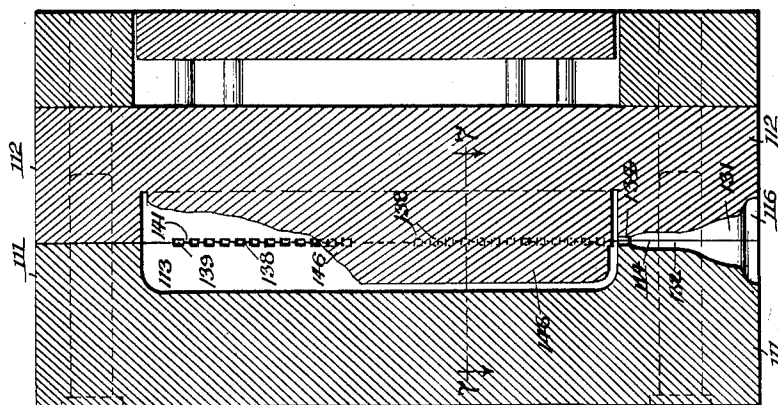


Fig. 6.

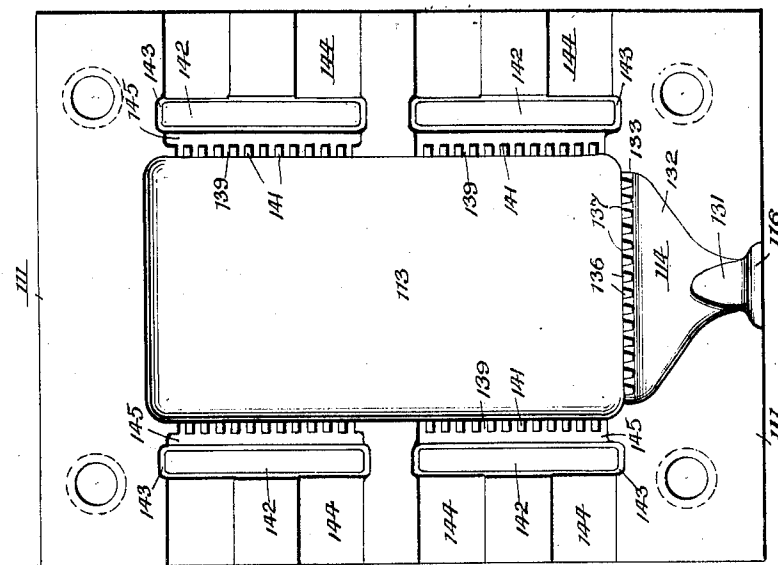


Fig. 7.

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MOLD

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2 Claims. (Cl. 22—153)

This invention relates to molds, and more particularly to molds for casting metals.

In manufacturing die castings, especially those made of magnesium metal, it has been found that successful production of solid, homogeneous castings is due, to a large extent, to the size and shape of the feeding runner or passageway leading from the molten metal inlet to the mold cavity. Production of solid, acceptable
10 castings also depends, to no small degree, upon the efficient and complete manner in which gases in the mold cavity, or gases entrapped in the molten metal, are caused to escape and thereby prevent formation of blow-holes in the
15 castings.

The present invention has for its primary object the provision of a mold of improved form, wherein pressure castings may be produced at a rapid rate, while avoiding the danger of blow-holes or like defects forming in the castings. A feature of the mold is the provision of means for insuring separation of entrapped gases from the molten metal as it enters the mold cavity, while another feature includes the use of some-
25 what similar means for restricting or retarding overflow of molten metal from the cavity so as to permit gases therein to escape.

Further objects and features of the invention will appear from the detailed description thereof taken in conjunction with the accompanying
30 drawings, in which:—

Fig. 1 is an elevation, showing the inner face of the stationary part or half of a separable mold embodying one form of my invention;

Fig. 2 is a central, vertical section through the assembled stationary and movable parts of the mold, looking from the left relatively to Fig. 1;

Fig. 3 is a fragmentary elevation of the front edge of the assembled mold, looking from the left relatively to Fig. 1, and showing several of
40 the air vents;

Fig. 4 is an enlarged fragmentary view, similar to Fig. 1, showing the details of the molten metal inlet and overflow ports, and one of the
45 overflow chambers;

Fig. 5 is an elevation, similar to Fig. 1, showing a modified form of the invention;

Fig. 6 is a vertical section through the assembled mold of Fig. 5; and

Fig. 7 is a section on line 7—7 of Fig. 6, which shows both the metal inlet and overflow ports, and a pair of the overflow chambers.

Referring to the form of the mold appearing in Figs. 1-4, 11 represents the stationary half
55 of a mold or die, which is adapted to be suitably

mounted upon a fixed part of a die casting machine, usually the hot plate (not shown). Cooperating with the stationary mold half 11 is a movable mold half 12, which, between them, form a mold cavity 13 in which the desired casting is adapted to be made. A feed runner or passageway 14 leads from an inlet opening 16 at the bottom of the mold to the lower part of mold cavity 13. Feed runner 14, as shown in Figs. 1-4, is formed principally in stationary mold half 11, only the complementary parts of the lower end thereof being formed in both the stationary and movable mold halves.

A pair of perforated lugs 17, 18, on the under side of stationary mold half 11, receives a movable pin 19. As shown in Fig. 2, this pin extends through a suitable opening 20 in a nozzle plate 21, whereby the nozzle plate is pivotally mounted for limited swinging movement toward and from the mold. Another opening 22 in the nozzle plate receives a renewable bushing 23 having an annular flange 24 engaging the upper face of the nozzle plate. Bushing 23 is secured in place by a pin 26.

Opening 27 through bushing 23 is tapered to receive the upper end of a goose neck nozzle 28, when the latter is moved into die charging position, as shown. Thus, nozzle plate 21 is forced against the under side of the closed mold, as appears in Fig. 2. Since opening 27 in the bushing is located in substantial registry with inlet opening 16 of the closed mold, molten metal ejected from nozzle opening 29 is fed directly into feed runner passage 14, and thence into mold cavity 13 in the novel manner now to be described.

It will be noted that mold opening 16 and lower portion 31 of feed runner 14 are substantially circular in cross section, whereas upper portion 32 of runner 14 is flattened out and gradually flares transversely of the mold toward the mold cavity 13. At point 33, where runner 14 opens into the cavity, the runner is of minimum thickness, and substantially the full width of cavity 13. This insures free, rapid feeding
100 of molten metal to the cavity.

In the manufacture of magnesium castings particularly, it has been found highly desirable to break up the opening leading from runner 14 into cavity 13 into a number of small, closely spaced feeders or inlet ports 34. This is accomplished by providing stationary mold half 11 with a transverse series of narrow teeth or ribs 36, thereby forming a series of narrow
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grooves 37 which coact with movable mold half 12 to form inlet ports 34.

With this construction, the molten metal stream entering the mold at opening 16 is first 5 circular in cross section, and then, after being flattened out and flared at 32, is broken up by teeth 36 into a considerable number of fine streams. Hence, when the molten metal enters cavity 13, it is in the form of a series of fine 10 jets flowing from inlet ports 34. This breaking up of the single stream of molten metal entering at 16 into a series of minute streams serves to liberate such gases as have become entrapped in the metal, and which, if permitted to remain 15 in the metal entering cavity 13, would result in the production of a defective casting, because of the formation of blow-holes.

Grooves 37 are made comparatively short, and preferably of uniform size throughout their 20 length, thereby accelerating flow of the fine metal streams therethrough and precluding any chance of the metal freezing in ports 34. The square cross sectional form of ports 34 tends to create a certain amount of turbulence in the 25 metal entering cavity 13, and thus aids in the liberation of any gases.

As the many fine jets of molten metal continue to flow from inlet ports 34, mold cavity 13 gradually fills from the bottom upwardly. 30 In order to provide for rapid and complete exhausting of all gases from the cavity ahead of the molten metal, so as to insure filling of every portion of the cavity with solid metal, there is provided, at each edge of cavity 13, a long series 35 of small gas-exhaust and metal-overflow ports 38. This is accomplished by forming stationary mold half 11 with a number of narrow, closely spaced teeth 39, similar to teeth 36, thereby providing a series of narrow grooves 41 which coact 40 with the movable mold half 12 to form ports 38. At their outer ends, ports 38 open into a metal overflow chamber 42, which chamber is formed in mold half 11 and is closed at its open side by mold half 12. Preferably, overflow chamber 45 42 extends substantially the full length of the mold cavity 13 and is provided around its periphery with a draft or taper 43 to facilitate removal of the casting, as will appear later.

Along its outer edge overflow chamber 42 is 50 provided with a series of spaced air or gas vents 44. Vent passages 44 are formed in mold half 11 and have their open sides closed by the other mold half 12, as appears clearly from Fig. 3. These vent passages are made rather wide in 55 order to permit ready escape of gases. They are, however, quite shallow in order to quickly freeze any molten metal which tends to pass therethrough, thereby preventing spurting of the metal from the mold.

The series of metal overflow ports 38 extends 60 substantially the full length of mold cavity 13, as shown in Fig. 1. This provides for rapid escape of the liberated gases from mold cavity 13 as the cavity fills up with the molten metal 65 flowing in from ports 34. The gases pass out of ports 38 into overflow chambers 42 and quickly escape to the atmosphere by way of vents 44. Outlet ducts 38 serve to restrict and retard the escape of molten metal from mold cavity 13, so 70 as to permit complete exhausting of the gases from the cavity ahead of the molten metal, and thereby permit the forming of solid, homogeneous castings free from blow-holes. In this manner, the entire mold cavity is filled with molten metal, while the excess molten metal forced into

the cavity overflows through outlet ports 38 into chambers 42, thereby forcing any liberated gases ahead of it and out through vent passages 44.

Preferably, overflow ducts 38, similarly to inlet ducts 34, are made square in cross section and of uniform size throughout their length. This 80 formation of the ducts has been found most effective in providing for complete exhausting of the gases from the mold cavity. Outlet ducts 38 also are preferably larger in cross section than 85 inlet ducts 34, in order to facilitate free escape of the gases ahead of the molten metal. The outlet ducts also are made somewhat longer than the inlet ducts, so as to increase the tendency of the metal to freeze at this point. This has 90 been found to result in the production of more solid castings than is the case where provision is made for too free an overflow of the metal from the mold cavity.

In producing castings with the above-described 95 mold, the comb form given runner passageway 14 at 33 breaks the metal stream up into a series of jets which operates to agitate such molten metal as has already flowed into the bottom of the mold cavity. This serves further to liberate 100 gases contained in the body of metal. The comb form given the overflow outlets for cavity 13 by the presence of teeth 41 also operates, as explained, as additional means serving to insure 105 complete liberation of all gases from the metal in the cavity. As evidence of this, castings made in molds of this construction have been found to contain substantially no blow-holes in that portion of the casting formed by mold cavity 13. Any blow holes present were all located in the 110 integral portions of the casting formed by overflow chambers 42.

Obviously, when the mold is opened and the casting removed, it has several integral extensions thereon, which are adapted to be removed. 115 These comprise a sprue on the lower edge which is connected to the casting proper by a number of small sprues formed by inlet ports 34; also extensions on either side of the casting formed by overflow chambers 42 and connected to the 120 casting proper by a multiplicity of narrow necks formed by overflow ports 38.

A modified form of my improvement, as applied to a two-part mold, is shown in Figs. 5-7. This form is quite similar to that shown in Figs. 125 1-4. Therefore, the same reference numerals will be used on corresponding parts, except that in each instance the numeral is increased by 100.

In the modified form of mold, feed runner or passageway 114 is formed partially in both stationary mold half 111 and movable mold half 130 112. Likewise, ribs or teeth 136 and intervening grooves 137, which together go to make up metal inlet ports 134, have their complementary parts formed in both of the mold parts, as shown 135 in Fig. 6. It will be noted in Fig. 5, that inlet ducts 134 are tapered inwardly toward mold cavity 113. This serves to accelerate the flow of the molten metal when it is broken up into the numerous fine streams, and thereby aids in 140 liberation of the gases contained therein.

Similarly to runner 114 and inlet ducts 134, grooves 139 and the cavities which form overflow chambers 142 and gas vents 144, instead of being formed entirely in the stationary mold 145 half, have their complementary parts formed in both of the mold parts 111, 112. This appears most clearly in Figs. 6 and 7.

From Figs. 5 and 7 it will be noted that inlet ducts 134 and overflow ducts 138 are substan- 150

tionally the same length. However, the desired additional distance at this point between mold cavity 113 and overflow chambers 142 is provided for by a reduced passageway 145 into which overflow ports 138 open, and which, at its opposite side, opens into overflow chamber 142. This affords the additional mold surface necessary to accomplish the desired relatively rapid freezing of the escaping metal at this point.

It is not essential that the outlet ports 38 and overflow chambers 42 extend the full length of the mold cavity, as shown in the mold of Figs. 1-4. As appears in Figs. 5 and 6, the outlet ports 138 and overflow chambers 142 may be formed in closely arranged pairs, or in greater numbers, on either side of the mold cavity. In any case, each overflow chamber 142 is provided with a sufficient number of vents 144 to insure rapid escape of gases therefrom to the atmosphere.

With the last described form of the improved mold, solid, homogeneous castings may be rapidly manufactured, equally as well as with the preferred form shown in Figs. 1-4. Attention is called to the fact that in the mold of Figs. 1-4, the form of the mold cavity 13 is such as to produce a solid casting, that is, one without recesses or depressions therein. In the mold of Figs. 5-7, a hollow casting is produced by reason of portion 146 on movable mold half 112 which projects in spaced relation into the corresponding depression in stationary mold half 111.

While in both forms of the mold shown and

described, the mold is of the two part separable type, it will be understood that the invention is not limited to any particular type of mold. It may be utilized in molds made of any number of parts. Likewise, in using the terms "stationary" and "movable" in describing the mold parts, these terms are used only relatively and it is not intended to restrict the invention to the location of the various ports and passages in these parts as specifically described. They may be located in either mold part, and either or both mold parts may be stationary or movable, and yet obtain the same satisfactory results. Obviously, other changes may be made in the mold without departing from the scope and spirit of the invention, except as the same may be limited by the appended claims.

What is claimed is:—

1. The combination in a die casting die of a die body having a cavity, a molten metal overflow chamber having restricted communication with the atmosphere, and a series of relatively small, closely spaced molten metal outlet ducts connecting the cavity to the overflow chamber.

2. The combination in a die casting die of a die body having a cavity, a molten metal overflow chamber, and a series of relatively small, closely spaced ducts connecting said cavity to the overflow chamber, said series extending substantially the length of the mold cavity and of the overflow chamber, the overflow chamber being provided with shallow gas vents leading therefrom to the atmosphere.

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