Nov. 18, 1958 J. M. McCRACKEN 2,860,392

GATE BRICK

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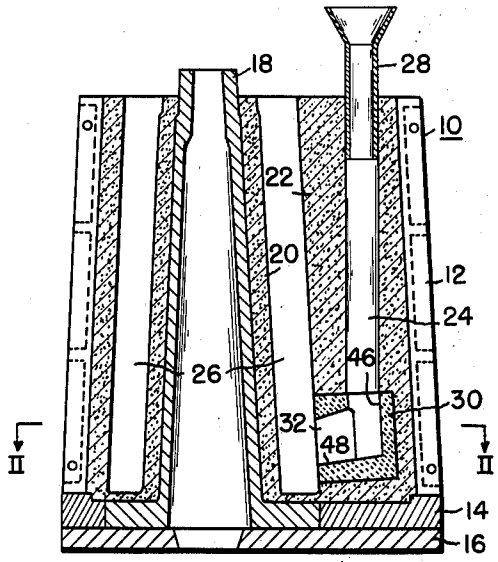


Fig. 1

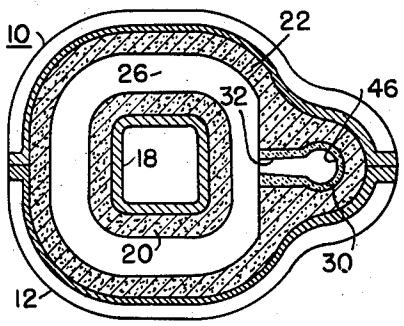


Fig. 2

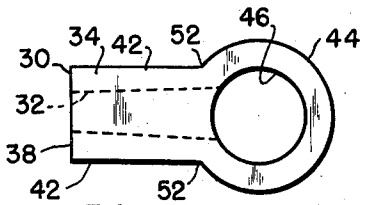


Fig. 4

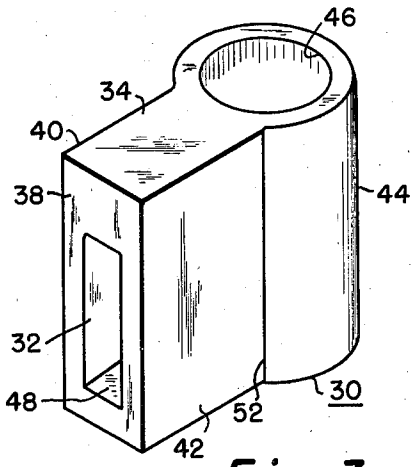


Fig. 3

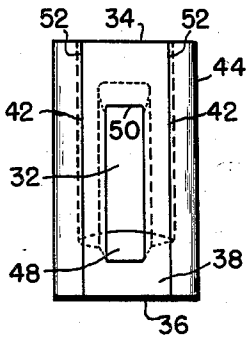


Fig. 5

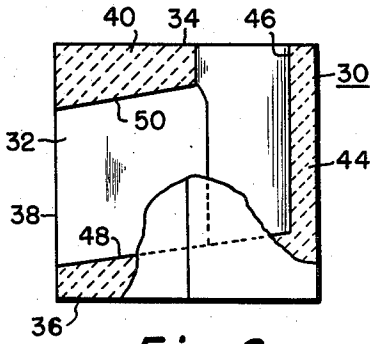


Fig. 6

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GATE BRICK

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1 Claim. (Cl. 22—129)

This invention relates generally to sand molds of the type having a mold cavity, a vertically directed sprue, and a gate connecting the mold cavity and sprue, and more particularly relates to a novel form of gate brick which forms the gate between the cavity and the sprue.

In one form of sand casting procedure, molten metal is poured vertically downwardly through a sprue and then flows laterally through a gate and enters into a mold cavity formed in the sand. Despite the extent to which the sand is rammed and compacted prior to metal pouring, the sand sometimes lacks the firmness with which to withstand the forces of the stream of metal at the point of turning laterally from the sprue and the metal tends to wash away the sand beyond or at this point or in both places. More permanent bodies such as refractory gate bricks have been proposed as a substitute for sand at these places to withstand the abrading and loosening effect of the right-angled turning of the stream of metal as it pours into the cavity, but these gate bricks are necessarily unsupported and exposed along an entire side adjacent and facing the mold cavity and in some cases they may have a disadvantageous tendency to topple into the cavity or else loosen during one stage of pouring and be unable to conduct the metal stream properly throughout the entire pouring process. Moreover, being relatively impervious to liquids used to form suspensions of refractory materials for coating the sprue and mold cavity prior to metal pouring, the prior known gate bricks have the disadvantage of sometimes tending to collect pools of unabsorbed solution therein which, if the drying of the mold is not sufficient to eliminate all the moisture from them, are likely to flash and cause an explosion when they subsequently undergo the thermal shock due to the direct contact with the molten stream of metal being poured.

Due to its novel form the present gate brick materially reduces or largely eliminates the foregoing disadvantages and, as a result of its improved key-hole shape as viewed in outline from the top or bottom it has positive provision for locking the same in place in a mold to prevent dislocation toward or lateral dislodgement of the brick into the mold cavity. My gate brick, moreover, provides a downwardly directed ramp for directing flow which slopes toward the mold cavity at a readily apparent angle of depression below the horizontal and therefore no sand coating suspension poured down the sprue onto the ramp tends to stand or collect in a pool but runs off the surface thereof.

Further features, objects and advantages will hereby be specifically pointed out or become apparent when for a better understanding of the invention, reference is made to the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is a vertical longitudinal section through a sand mold embodying the present gate brick invention,

Figure 2 is a horizontal section in top plan view taken along the section line II—II of Figure 1,

Figure 3 is a perspective view of the gate brick,

Figures 4, 5, 6 are top plan, front face, and side elevational views respectively of the gate brick with certain portions in Figure 6 broken away for the sake of clarity.

In particular in the drawing, Figures 1–6 show a sand mold **10** having conventional flask **12** and a pair of base or stool plates **14** and **16** supporting the flask and the mold. A conventional type of core barrel **18** carries a portion **20** of a body **22** of molding sand. The portion **20** constitutes the inner core of the mold. The remainder **22** of the body of sand has an upright sprue **24** formed therein and cooperates with the inner core **20** to define an included mold cavity **26**. The particular cavity shown at **26** is for the production of ingot molds although it is to be understood that the present invention is applicable to molds generally. The sprue **24** carries a pouring funnel **28** at the upper end thereof through which molten metal is introduced into the sprue. From the sprue **24** the downwardly flowing stream of metal passes through a gate brick **30** of refractory material and in so doing turns laterally inwardly to pass through a gate opening **32** into the mold cavity **26**. The technique employed is more commonly referred to as bottom pouring in view of the fact that the molten metal is introduced adjacent the bottom of the mold cavity **26**.

The gate brick **30** has a flat top surface **34**, a flat bottom surface **36** and a flat front surface **38** which is vertically disposed between the two and in which the generally vertically oblong gate opening **32** is formed. The opening **32** registers with the interior of a rectangularly shaped hollow body portion **40** of the brick having parallel vertically disposed opposite cheeks **42**. The brick **30** has a generally cylindrical rear portion **44** formed with a cylindrical vertical passageway **46** termed a downcomer and communicating directly at its upper end with the sprue **24** in the mold. The passage **46** communicates at the other end with the gate opening **32** and the mold cavity **26** through the hollow interior of the body portion **40**.

The hollow interior of the body portion **40** has a sloping bottom or floor **48** which forms an angle of approximately 82° with the plane of the vertical front face **32** and which in the particular position of Figure 6 slopes downwardly and to the left at an angle of approximately 8° from the horizontal. The top or ceiling **50** of the hollow interior has a similar downward slope although the presence of a slope in the latter is not essential to the present invention.

In one physically constructed embodiment the invention was key-hole shaped as viewed in outline from the top with the outside diameter of the rear portion **44** of the brick **30** approximately 25% greater than the width of the hollow body portion **40** as measured by the transverse distance between its opposite cheeks **42**. Therefore, at the resulting juncture at **52** between body portion and the cylindrical rear portion **44** the latter extended laterally in both opposite directions beyond the straight cheeks **42** with the result that the rammed sand portion **22**, Figure 1 takes a corresponding keyhole shape as viewed in outline (Figure 2) causing the gate brick **30** to be locked in place in the mold. That is to say, the sides of the cylindrical portion **44** bulge into the sand at the rear of the brick **30** and thus form widened shoulders preventing the brick **30** from toppling face forward into the mold cavity **26** even when the walls of the cavity incline inwardly as shown in Figure 1. It is to be noted that the hollow interior of the body portion **40** of the brick tapers and narrows as it approaches the oblong gate opening **32**.

In operation following ramming of the sand into the mold at **22** and **20** within the flask **10**, a water suspension of carbon blacking or graphite is used to paint the wall

of the mold cavity **26** and another portion of the suspension is poured down the funnel **28** and sprue **24** and thereafter the whole assembly is dried. Due to the sloping floor **48** of the hollow interior of the refractory brick **30**, no blacking tends to collect in a pool therein, but is discharged inwardly, towards the mold cavity **26**. Then following drying and assembly of the mold with the core **18** and stool plate **16**, molten metal is poured down the funnel and sprue **28**, **24** and is discharged through the locked-in refractory gate brick **30** into the mold cavity **26**. Regardless of whether or not the mold is dried sufficiently to eliminate all moisture therefrom, there is no possibility of blacking being present and collecting in the downcomer passage **46** or upon the floor **48**, which if present would be likely to cause an explosion when molten metal is subsequently poured down the sprue **24**.

Pouring is continued until, in conventional bottom-pour fashion, the mold cavity **26** and the sprue **24** are completely filled with metal whereupon the metal is allowed to cool and solidify to form the desired metal casting, being an ingot mold in the case illustrated. The casting is removed from the mold, the adhering sand is removed from the casting, and finally the excess metal and waste pieces which were present in the sprue and gate brick and elsewhere are chipped away from the casting. Chipping away the waste metal at the juncture defined by the plane of the gate opening **32** is facilitated owing to the vertically oblong shape of opening **32** and the consequent narrowed or thin cross section of the waste metal occupying the hollow interior of the gate brick **30**. Preferably, this waste metal is freed from the frangible brick by chipping away the latter prior to chipping away the metal from the resulting rough casting.

Variations within the spirit and scope of the invention described are equally comprehended by the foregoing description.

I claim:

In a bottom-pour sand mold having a gate brick at the bottom for establishing communication laterally between a vertical sprue and the mold cavity, a one-piece refractory gate brick of generally keyhole shape as viewed in outline from the top to fit in a correspondingly key-hole shaped void formed thereby in the sand mold material, said brick having a block-like hollow body portion with a front face arranged to form part of a major wall in the mold cavity, a vertically oblong gate opening formed in said face for connecting the mold cavity with the hollow interior of said block-like body portion, and a cylindrical portion joined to the rear of the block-like body portion in a manner to complete said general key-hole shape and defining a vertical passage communicatively connected to said hollow interior of the latter portion to form substantially a right-angled intersection therewith, said block-like body and cylindrical portions mutually defining a passage floor of generally key-hole shape in outline and generally sloping at least approximately 8° from the horizontal toward said gate opening, said cylindrical rear portion having an outside diametrical width at least approximately 25% greater than the sidewise span between both cheeks of the block-like body portion so as to bulge into said void for locking the brick laterally against falling face-forward into the mold cavity.

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