Sept. 25, 1928. 1,685,545

H. S. LEE

PERMANENT MOLD CONSTRUCTION

Filed Oct. 10, 1925

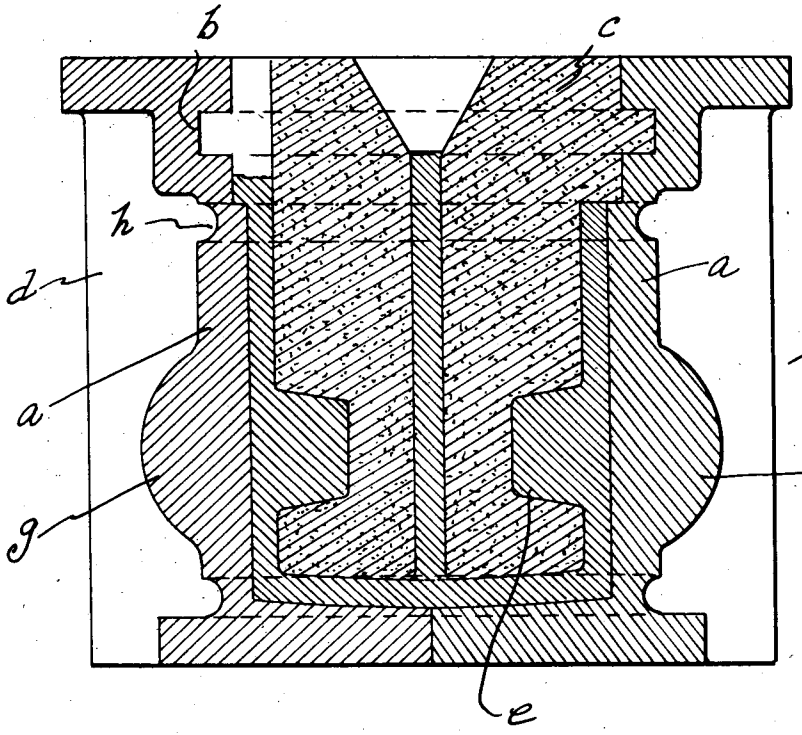


Fig. 1

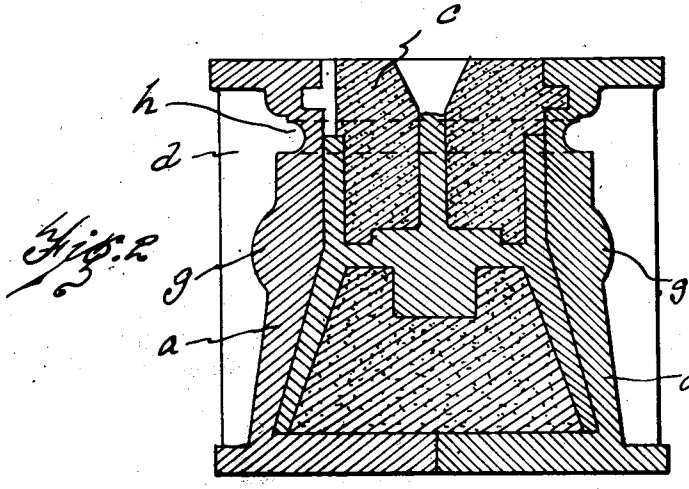


Fig. 2

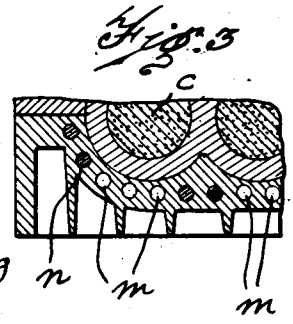


Fig. 3

INVENTOR.
Harry S. Lee
BY
Stuart C. Barnes
ATTORNEY.

Patented Sept. 25, 1928. 1,685,545

UNITED STATES PATENT OFFICE.

HARRY S. LEE, OF PLYMOUTH, MICHIGAN.

PERMANENT MOLD CONSTRUCTION.

Application filed October 10, 1925. Serial No. 61,673.

This invention relates to a mold construction in which the character of the casting is controlled by the construction of the mold.

My construction is very suitable in making metal castings, particularly those which must be controlled very nicely. With some castings it is desirable to obtain a small surface chill of a uniform depth, and where the casting is at all irregular the control of the cooling presents quite a problem. The essential object of this invention is to regulate the cooling by controlling the dissipation of heat.

In the drawings:

Fig. 1 is a vertical section through a mold in which is inserted a sand core and the molten metal poured therein.

Fig. 2 is a vertical section through another form of casting.

Fig. 3 is a sectional view through a mold showing another way in which the cooling of the casting may be controlled.

I have illustrated in Fig. 1 a mold which is preferably formed of a pair of mold sections *a*—*a* which are each provided with the grooves *b* for supporting a sand core *c* within the mold. These mold sections are provided with the cooling fins *d* so as to provide a greater surface area for radiating heat. The molten metal is poured into the mold, and I have illustrated in Fig. 1 a mold for casting an ordinary piston which is provided with the inwardly extending bosses *e*. The mass of metal at this particular point obviously contains a greater number of B. t. u.'s per square inch of surface than there would be contained in the remaining portions of the casting where the wall is relatively thin. The mold sections are preferably made of cast iron, the mold cavities being insulated from the casting so that the casting will not stick thereto. However, these mold sections get real hot in a couple of pourings by absorbing heat out of the casting.

It is the object of this invention to so construct this mold as to absorb more heat from the casting at certain determined areas where the casting is thicker, so as to uniformly withdraw the heat from the casting over the entire surface. To obtain this uniform distribution of the heat, I build up on the mold sections a large mass of metal, which is designated *g*, and it is obvious that this thicker portion of the mold or large mass is capable of absorbing a greater amount of heat than the remaining portions of the mold, thereby cooling the entire casting uniformly. It is the object in casting a piston, to not permit any, or practically no chill to take place. This mold is designed to withdraw the heat slowly so as to not permit the casting to become chilled.

In mold construction it is the general practice to provide flanges at the top or bottom, or both, and it may be seen from viewing Fig. 1 how these flanges form a relatively large metal mass at or near the top of the mold. It has been found that in ordinary mold construction, this mass of metal absorbs an excess amount of heat units from the casting, and we have a chill on the casting adjacent this mass of metal. To prevent this mass of metal from abstracting an excess amount of heat from the casting at this point, I provide a circumferential groove *h* about the mold, which reduces the cross sectional area of the cross section of the mold between this relatively large mass of metal near the top and the casting. This serves to choke back the heat by restricting the cross-section of the conducting material. The heat must pass through the mold adjacent the casting before it enters the large mass of metal at the top of the mold, and this groove merely reduces the cross-sectional area of the passageway. This passageway with a reduced cross-sectional area does not permit the heat to be withdrawn from the casting fast enough to chill the casting at this point. The fins carried by the mold sections for radiating heat, provide plenty of radiating surface area, and we are enabled to control the heat of the molds by controlling the radiation of heat therefrom. In my copending application, Serial No. 51,973, I show an automatic means for regulating the flow of cool air past the mold sections, and adjacent to these fins, this being so regulated as to maintain a constant temperature of the mold sections. The casting gives up its heat at a certain rate of speed, this heat being absorbed from the mold section, and this heat is then radiated from the mold and dissipated.

Fig. 2 shows a mold for a different shaped casting. This mold is so designed as to provide a slight surface chill about the exterior of the casting by withdrawing the heat from the casting at a fairly rapid rate. This chilled casting cannot be readily machined, but it may be smoothed down by putting

the same into a grinding machine. It is highly desirable, of course, to have a uniform depth of chill so that no soft spots in the casting will be left uncovered after the casting has been ground. To chill the casting at a uniform depth it is necessary to cool the casting all over uniformly. Every casting presents a different problem in mold design which will either prevent a chill from taking place, or is arranged to chill a certain determined area only, or to provide a uniform chill over the entire surface.

Fig. 3 shows a modified form of a means for cutting down the cross-sectional area of the conducting material so as to choke back the heat. This is obtained by drilling a number of holes *m* in the mold section, the heat being caused to pass around these holes, and obviously there is not as much room for the heat to pass through as there was without these holes. This will achieve the same result as the circumferential grooves *h* by choking back the heat and preventing the mold from absorbing an excess amount of heat from the casting. These holes may, or may not, be filled with an insulating material *n* such as kieselguhr, fire clay, or like products. It is preferable however, to fill these with kieselguhr, as then the kieselguhr, which is one of the best known heat insulating materials known, prevents the heat from jumping across the hole. The more holes we have, of course, the more choking action we get, and it is possible to so figure and design the mold that the heat is choked back just the right amount so as to withdraw the heat from the casting uniformly.

What I claim is:

1. In a permanent mold for casting bodies, a mold section having walls contacting with a cast body for conducting heat away from said casting, a portion of the wall sections reduced in cross sectional area at determined points to choke back the heat and reduce the heat conductivity through said wall sections.

2. In a permanent mold for casting bodies, a mold section having a mass of metal which tends to absorb an excess amount of heat from a determined area of a cast body, and means for restricting the flow of heat from the casting to such mass.

3. In a permanent mold for casting bodies, a mold section having a mass of metal which tends to absorb an excess amount of heat from a determined area of a cast body and a portion having a reduced mass of metal for restricting the flow of heat from the casting to such mass to prevent the mass from absorbing an excess amount of heat from said casting at that point.

4. In a permanent mold for casting bodies, a mold section having a mass of metal which tends to absorb an excess amount of heat from a determined area of a cast body, the wall of said mold section reduced in thickness at a point adjacent such mass of metal and between the mass and the casting to choke back some of the heat and prevent the mass of metal carried by said mold section from absorbing an excess amount of heat from said casting.

5. In a permanent mold for casting bodies, a mold section having walls contacting with a cast body for conducting heat away from the body, said walls provided with holes running parallel to the face of the walls to reduce the cross sectional area thereof at determined points to choke back the heat and reduce the heat conductivity through said wall sections.

6. A permanent mold for casting an article having variant masses at different points in its body, the said mold having variant masses arranged relative to the variant masses of the article so that the heat of the casting is dissipated substantially uniformly.

7. A permanent mold which comprises a molding member in which the cross section of the metal is varied to conduct the heat away from the casting faster at some parts than the others to get the predetermined effects in the casting.

8. In the art of casting metal in permanent molds, the method of getting predetermined conditions in the cast metal, which comprises controlling the dissipation of heat from the cast metal by utilizing a mold having walls in which the material forming the walls is arranged to give the walls variant masses so as to dissipate the heat with variant degrees of rapidity.

In testimony whereof I affix my signature.

HARRY S. LEE.