

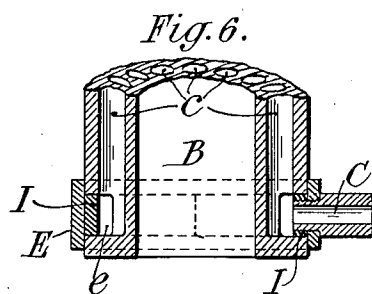
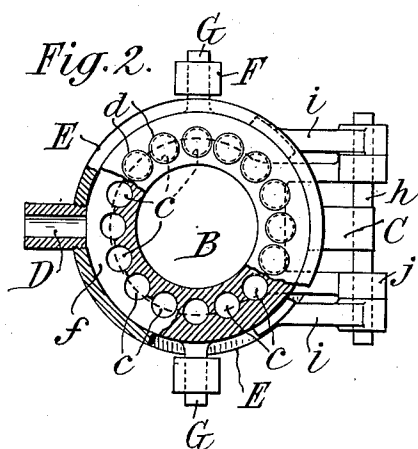
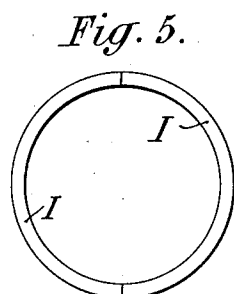
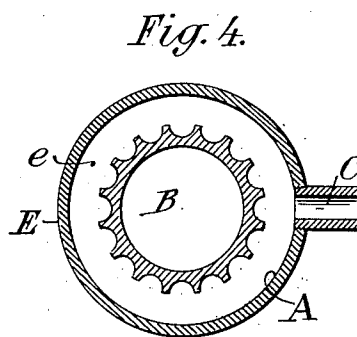
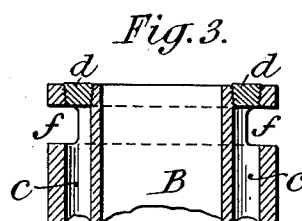
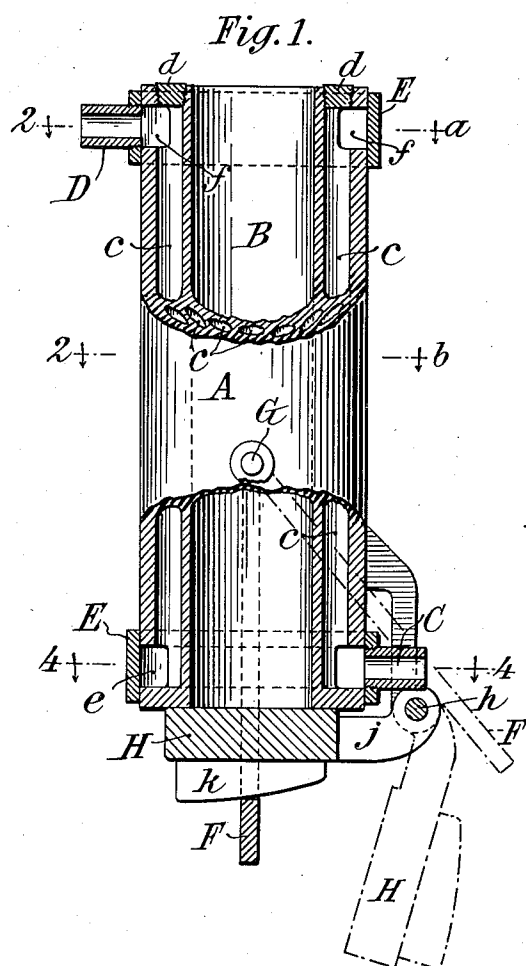
Sept. 23, 1930.

W. F. EPPENSTEINER

1,776,355

MOLD FOR CASTING METALS

Filed March 7, 1929



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UNITED STATES PATENT OFFICE

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MOLD FOR CASTING METALS

Application filed March 7, 1929. Serial No. 345,041.

This invention relates to vertical molds for casting copper or other metals to form billets or other shapes.

The invention will be described with particular reference to the casting of copper, although applicable to the casting of other metals having properties more or less resembling those of copper.

The present invention is related to another invention of improved molds for casting metals, for which I have prepared a companion application filed March 6, 1929, Serial No. 344,672. In that application I have stated fully the difficulties attendant upon the use of the molds heretofore available. Reference is made to that application for a full explanation of the generic features which are common to my two inventions. Specifically, the mold of the companion application is designed for the casting of shapes which are flat or rectangular in horizontal section; the present application relates to the casting of shapes which are cylindrical or otherwise rounded in horizontal section.

In both instances the mold is made of a single integral billet of suitable metal. In the casting of copper it has been found that the mold may be advantageously formed from a copper billet, although a billet or unitary block of mild steel has been found to give very satisfactory results. The mold cavity extends through vertically from end to end. The walls of the mold thus formed are sufficiently thick to provide for the necessary water jacket. This jacket is formed by drilling longitudinally through the walls of the mold, the successive holes thus drilled serving as vertical water passages and being suitably connected to a water inlet and a water outlet so that the circulating water flows in parallel courses through the drilled holes. In the mold of my other application aforesaid, which is substantially quadrilateral or rectangular in cross-section, the several vertical water passages are connected at top and bottom by horizontally drilled holes at top and bottom, these holes passing through the flat sides of the mold. For a round mold, however, it is impossible to drill

such holes, and accordingly the present invention provides a different construction whereby to conduct the cooling water to and from the series of parallel vertical passages. According to the present invention the solid billet constituting the body of the mold is grooved externally near the top and near the bottom to a depth sufficient to intersect the drilled upright passages; and these grooves are tightly closed on their outer sides as by shrinking bands upon them, the water inlet and outlet being introduced through these respective bands.

The accompanying drawings show suitable constructions according to this invention.

Figure 1 is a side elevation partly in vertical mid-section.

Fig. 2 is a plan partly in horizontal section in the planes of the lines 2^a and 2^b in Fig. 1.

Fig. 3 is a fragmentary vertical section of the upper part of the mold in an unfinished state.

Fig. 4 is a horizontal section in the plane of the line 4—4 in Fig. 1.

Fig. 5 is a plan of a divided ring.

Fig. 6 is a vertical section of the lower part of the mold showing a variant of the construction in Fig. 1.

Referring to the drawings, a solid billet A may, for example, be formed of open-hearth mild steel having not over .25 percent. carbon. The cavity B, which is shown as a cylindrical cavity for casting cylindrical shapes, is best formed by boring or drilling out the solid billet. The internal face of this cavity should be machined in any suitable way to render it substantially smooth. Also, the top and bottom faces of the billet may be advantageously planed off smooth.

To form the water jacket the wall of the billet is drilled with numerous vertical bores or holes *c, c*, which may, as shown in Fig. 2, be as close together as is convenient. These may be drilled through from the top and stop short at the bottom, as indicated in Fig. 1; or they may be drilled entirely through if the open bottoms are afterwards closed by inserting suitable plugs. The open tops of

the holes are closed by means of plugs *d*, which may be of steel, and screwed into tapped holes, or may be a driven fit, and in any case are desirably welded on the exterior. The top and bottom ends of the vertical passages thus formed are united by means of horizontal passages *e* and *f* which serve to connect all of the vertical passages in parallel. To the bottom passage *e* a water inlet C connects for admitting the cooling water, and a water outlet D is applied to discharge the water from the upper passage *f*.

The passages *e, f* are formed by cutting circumferential grooves in the exterior of the mold, as shown with respect to the upper passage in Fig. 3. These grooves are cut to a depth approximating the centers or axes of the vertical bores *c*. They require then to be closed on their outer sides, and this is most conveniently accomplished by shrinking on an outer band E, these bands being alike at top and bottom. The water inlet and outlet C and D are conveniently applied by drilling holes through the bands E to communicate with the respective passages *e, f*, and applying bosses or nipples which may be tapped into the holes and then advantageously also welded to the bands.

In the modified construction shown in Fig. 6, a divided ring I is provided of such dimensions that it will fit into the groove forming the passage *e* so as to close the outer part of this passage; and to hold it concentrically in place therein, a band E is then applied exteriorly by shrinking it on, as shown. This construction has the advantage of affording a thicker wall into which to tap the threaded end of the coupling C.

With this construction of water jacket, the water entering at the inlet C flows around through the horizontal passage *e* and ascends in like parallel streams through the vertical bores *c, c*, to the top of the mold and the streams reunite in the upper annular passage *f* and flow out from the latter through the outlet D. The walls constituting the mold are thus very effectively cooled by the numerous parallel streams of water ascending through these closely drilled passages.

The bottom of the mold is closed during casting by a bottom cover H which is best constructed as a drop bottom by suitably hinging it to the lower part of the mold, so that when released it will fall out of the way, so as to permit the free discharge of the casting. For this purpose it may be hinged or pivoted on a rod *h* at one side of the mold, which may be hung in brackets *i* suitably fastened to the side of the mold, as shown in Figs. 1 and 2. The most convenient way of holding the bottom closed during casting is to confine it by a swinging bale F hung upon trunnions G, G, projecting from the mold. The bottom H is conveniently formed with hinge ears *j* engaging the

hinge rod *h*, and with ribs *k*, these latter having eccentric underfaces which may be wedgingly engaged by the bale F. When the bottom is closed, the bale swings under it by gravity, and a slight tap will cause it to wedge the bottom up tightly in place against the bottom of the mold; when after casting the metal has solidified, the bale is easily driven back by a light blow, whereupon the bottom opens by gravity, so that the bottom and bale occupy approximately the positions shown in dotted lines in Fig. 1. The trunnions G may conveniently be screwed into tapped holes in the sides of the mold and welded in place.

The mold is preferably made with a parallel-sided cavity B, so as to cast a cake which has no taper. The water cooling of the mold so chills the casting that it shrinks sufficiently to drop out freely upon the opening of the bottom.

Molds thus constructed have been demonstrated to outlast the best construction of previously-made molds fully ten times; their cost per casting unit is less than one-fifth that of the best previous molds.

While the cavity B is best made parallel, yet it may be slightly tapered to facilitate the dumping of the casting. With copper the cooling effect of the water jacket shrinks the casting enough so that it readily drops out; but with some other metals or alloys a slight taper may be desirable. For a mold say 30 inches long, the taper may be such that the bottom diameter is .25 inch greater than the top. This very slight taper is to be regarded as substantially parallel, being not over one-sixth the taper heretofore used with non-dividing molds.

While it is preferable to form the mold with an open bottom closed by a door which opens for dumping, yet the invention is not limited to this construction but is applicable to the old type of molds with a closed bottom which are inverted to dump out the casting.

For copper casting the mold may advantageously be made of copper instead of steel, it being perfectly feasible to cast copper in a water-cooled copper mold. To make a mold of copper according to the present invention it is cast in the form of a billet, either solid or, by using a metal core to displace the metal occupying the mold cavity B, it may be cast as an open frame. In either case the metal is continuous, so that all welding and joints are avoided. The inner surface of the mold cavity should be smoothed by machining, as before described, and the water-jacketing holes *c, c*, are drilled, and all these holes are plugged by tapping and putting in tight-fitting screw plugs. The annular passages *d, e* are formed by grooving the mold from the exterior, as already described, and are closed by shrinking on bands E, E, in the same manner as with a steel mold. The water inlet and outlet nipples or couplings C, D, are applied in the

same manner already described, except that with copper there is no welding. Or the bosses for these couplings may be formed integrally as a part of the original casting.

5 The trunnions G, G, may be applied as already described, or be cast on.

The copper mold thus formed is very effectively cooled and will considerably outlast copper molds as heretofore made. One of its
10 advantages over the steel mold is that when no longer usable as a mold, its metal may be utilized by melting down.

The present invention is also applicable to the construction of molds for casting other
15 shapes of copper, and for making castings of other metals or alloys having more or less the same properties as copper.

What I claim is:

1. An integral weldless mold comprising
20 solid walls enclosing a parallel casting cavity of curved cross-section, and having parallel passages through the mold wall and communicating annular passages, with a water inlet and outlet communicating with said annular
25 passages.

2. An integral weldless mold comprising solid walls enclosing a parallel casting cavity of curved cross-section, and having parallel
30 passages through the mold wall and communicating annular external grooves, and means for closing said grooves on the exterior to form annular passages, with a water inlet and outlet communicating with said annular passages.

35 3. A mold according to claim 2, the means for closing said grooves being external bands shrunk upon the outside of the mold.

4. A mold according to claim 2, with external bands shrunk upon the outside of the
0 mold to close said grooves, and a water inlet and outlet entering through said bands into communication with said annular passages.

In witness whereof, I have hereunto signed
my name.

15 WILLIAM F. EPPENSTEINER.

CERTIFICATE OF CORRECTION.

Patent No. 1,776,355.

Granted September 23, 1930, to

WILLIAM F. EPPENSTEINER.

It is hereby certified that the assignee in the above numbered patent was erroneously described and specified as "The American Metal Company", whereas said assignee should have been described and specified as The American Metal Company (Limited), as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of October, A. D. 1930.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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