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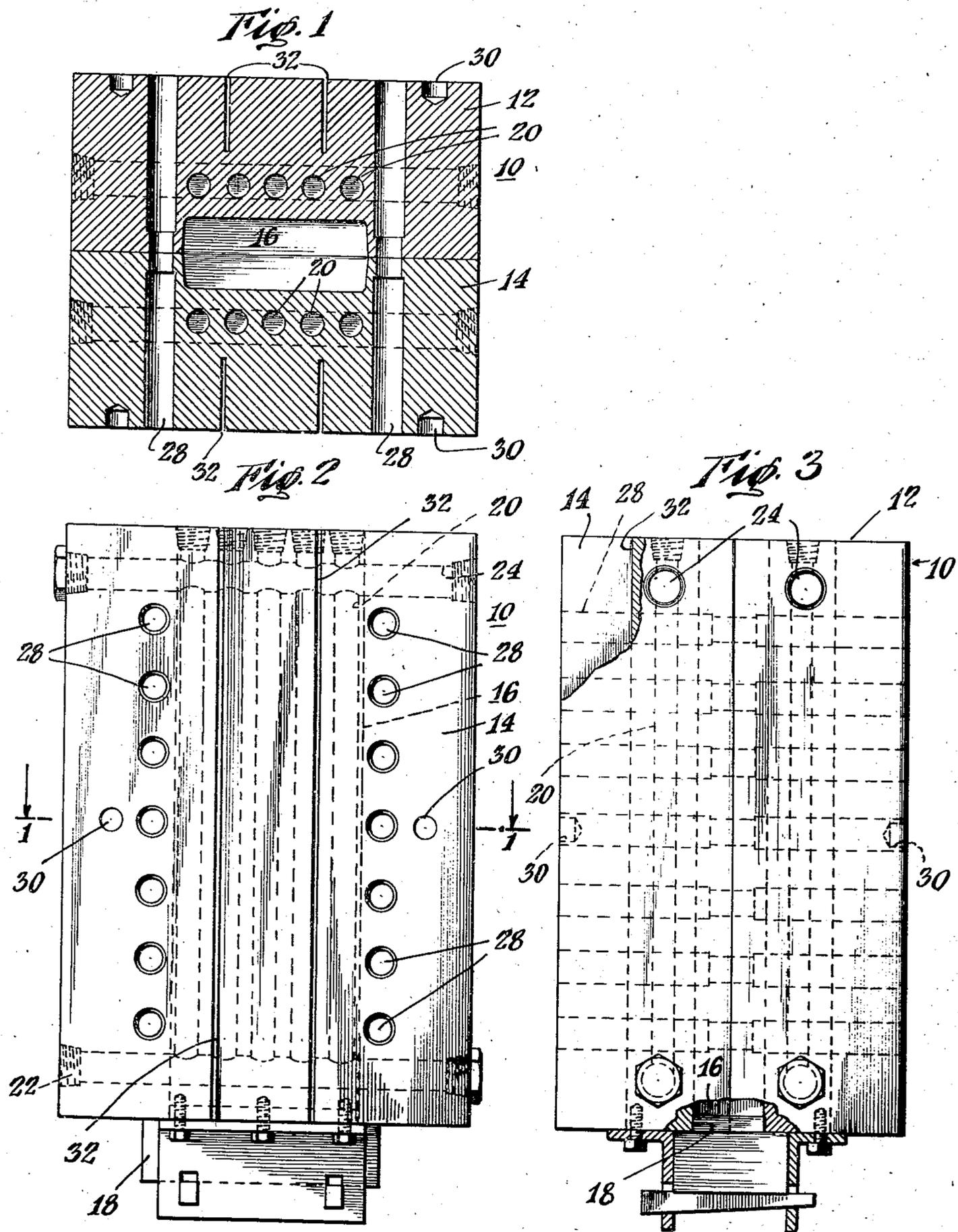
K. A. LINDNER

2,106,614

METAL MOLD

Filed Jan. 30, 1936

2 Sheets-Sheet 1



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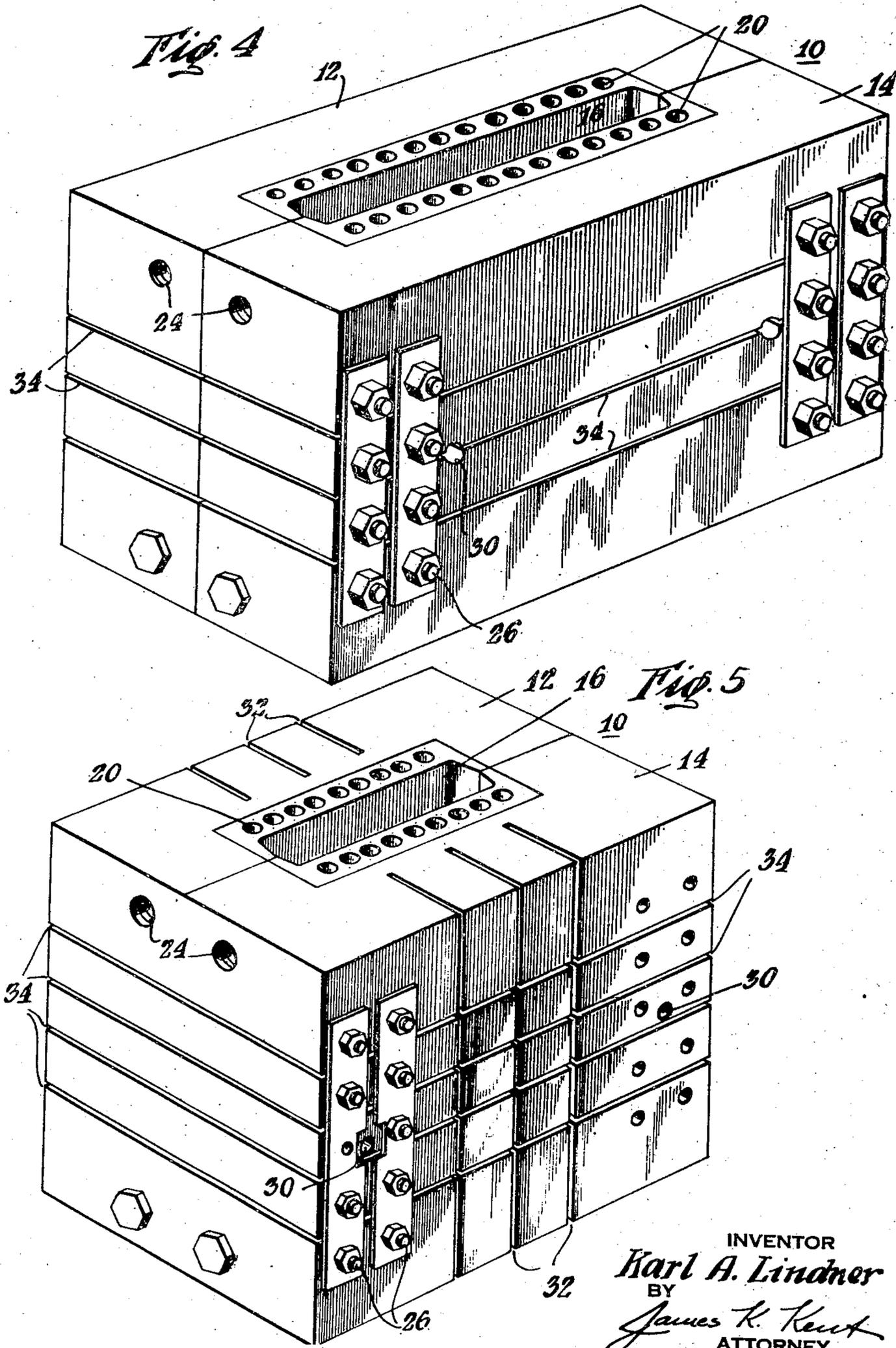
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## METAL MOLD

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5 Claims. (Cl. 22—139)

This invention relates to metal molds for casting metals and particularly concerns certain improvements in the construction of such molds for inhibiting or preventing deformation thereof in use.

In the production of vertical cast copper cakes, for example, it is customary to pour the molten copper into a copper mold provided with a vertically disposed cavity and having relatively thick walls which are cooled by circulating a stream of water through conduits disposed therein. However, notwithstanding the presence of the cooling water, the high temperature of the molten copper introduced into the mold causes strains and stresses to be set up in the mold walls which, in the case of the ordinary copper mold, exceeds the elastic limits of the mold to such an extent that the mold ultimately becomes so warped or deformed that imperfect cakes result.

In accordance with the present invention, it has been found that the warping or deformation of the mold is minimized by providing open spaces or areas in the mold walls which allow free expansion thereof thus providing relief from the distortional forces accompanying the casting operation. These open areas also facilitate cooling of the mold and tend to maintain same at lower operating temperatures by reason of the increased surface area of the mold which they provide.

Various other features of the invention, which embrace new and original features of construction, arrangements of elements and combinations of parts, will be apparent from the following particular description and from an inspection of the accompanying drawings.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, and the manner in which it may be carried out, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a sectional plan view of one form of mold embodying the present invention, taken along the line 1—1 of Fig. 2;

Fig. 2 is a side elevation of the mold;

Fig. 3 is an end elevation thereof with portions broken away;

Fig. 4 is a perspective view of a somewhat modified form of mold; and

Fig. 5 is a perspective view of another modified form of mold.

Like reference characters denote like parts in the several figures of the drawings.

Referring more particularly to the drawings, 10 designates generally a relatively thick-walled copper mold comprising two corresponding pieces or halves 12 and 14 defining a vertical mold cavity 16 which is closed at the bottom by a removable gate 18. Passageways 20 communicating with inlets 22 and outlets 24 are provided in the mold walls for the circulation of the cooling fluid. In the two-piece mold shown, the two halves, after accurate and true machining of the abutting surfaces, are held in assembled position by bolts 26 fitted through holes 28. Recesses 30 are provided for securing the assembled mold in the usual cradle.

During the casting operation, the molten metal induces expansion of the mold walls which is followed by contraction as the cakes cool and as a result of these repeated strains and stress the ordinary mold soon becomes deformed and produces irregularities and imperfections in the cakes. In casting substantially parallel-sided cakes particularly, the warping of the mold may become so pronounced as to cause the cakes to become lodged in the mold from which they are removed only with difficulty.

The present invention overcomes these disadvantages by insuring freedom of expansion which, it has been found, may be readily provided by open spaces in the mold wall. These open spaces or areas are shown as vertical slots or grooves 32 in Figs. 1, 2 and 3, as horizontal slots or grooves 34 in Fig. 4; and as both horizontal and vertical slots in Fig. 5.

The number and spacing of the slots or grooves will to a large extent depend upon the size of the mold. In general the slots may extend to a depth of approximately one half the thickness of the mold wall although a greater or lesser depth may be provided as desired.

In the mold shown in Figs. 1-3 two slots in either half of the mold body are shown and in a mold for casting a 600 lb. copper cake with a cavity measuring 12" x 4 $\frac{5}{8}$ " x 35" the slots may be 4 $\frac{7}{8}$ " deep and  $\frac{1}{4}$ " wide.

In Fig. 4 the mold is shown provided with three horizontal slots extending completely around the mold body, the slots being approximately 6 $\frac{1}{2}$ " deep in the ends, and 8" deep in the sides, leaving a metal thickness of about 3" between the bottoms of the slots and the mold cavity. A mold of this type with the slots spaced at 4" intervals has given excellent results in casting

800 lb. copper cake in a mold with a cavity of 29" x 4" x 22½".

In the modified mold shown in Fig. 5, the slots are both vertical and horizontal, three of the former and four of the latter being provided in the particular mold shown in which the depth of the vertical slots is 4⅞" and that of the horizontal slots 6" on the sides and 6½" on the ends of the mold.

The specific constructions above described are, of course, to be regarded only as illustrative as the invention is capable of embodiment in various other forms and modifications.

From the foregoing description it will be apparent that the invention, in a sense, provides an improved thin-walled mold in that a substantial reduction in thickness of the mold wall is effected at intervals while between the intervals of reduction in thickness the requisite reinforcement to prevent deformation of the mold under the weight of the metal cast is present.

While certain features and embodiments of the invention have been described and referred to in detail for purposes of explanation and illustration, it will be understood that it is intended to embrace within the scope of the invention such modifications and changes as may be made by those skilled in the art to adapt it to varying conditions and uses.

What is claimed is:

1. A multiple piece copper mold comprising two side pieces joined together, said side pieces having recesses machined therein forming a mold cavity having uninterrupted walls, and slots in the outside surfaces only of the side pieces extending to a substantial depth therein to form expansion spaces for the relief of distortional

strains produced in the metal incident to casting operations.

2. A copper mold comprising a body defining a mold cavity therein having uninterrupted walls, said body being provided with expansion slots or grooves extending from the outside of the mold into the body to a depth of more than half of the thickness of the body and of sufficient width to allow for free expansion of the body for the relief of distortional strains produced in the metal incident to casting operations.

3. A copper mold comprising a body defining a vertical mold cavity therein for producing vertically cast copper cakes, the said body being provided on its outside only with vertically extending slots or grooves of substantial depth and of sufficient width to allow for free expansion of the body for the relief of distortional strains produced in the metal incident to casting operations.

4. A copper mold comprising a body defining a vertical mold cavity therein for producing vertically cast copper cakes, the said body being provided but only on the outside thereof with horizontally extending slots or grooves of substantial depth and of sufficient width to allow for free expansion of the body for the relief of distortional strains produced in the metal incident to casting operations.

5. A copper mold comprising a body enclosing a mold cavity having uninterrupted surfaces, and having intersecting slots or grooves on its outer surfaces and extending to a substantial depth in the mold body to provide free expansion spaces for accommodating expansion of the mold and alleviating distortional stresses in the mold.

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