March 28, 1944. P. M. MUELLER 2,345,493

MOLD

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Fig. 1.

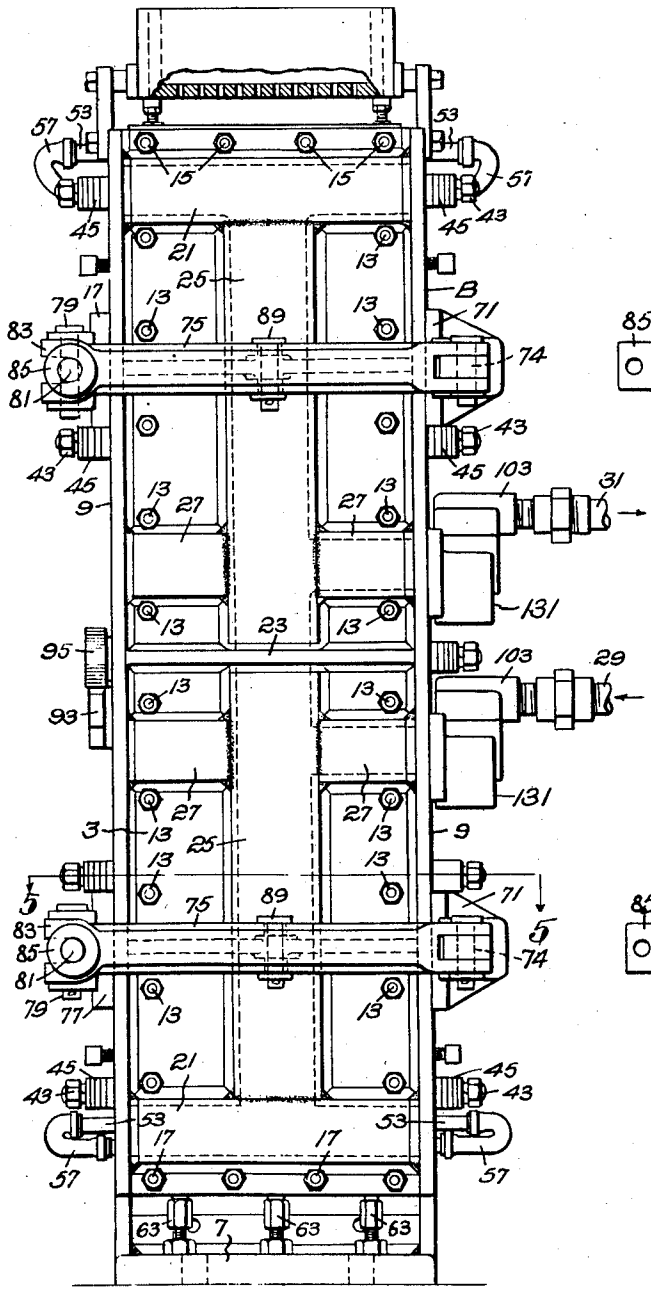
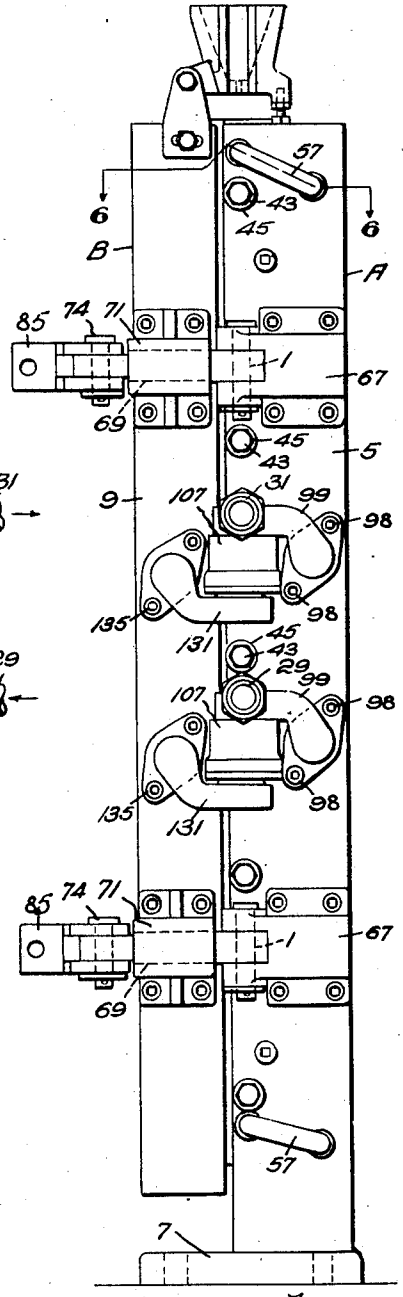


Fig. 2



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Fig. 3

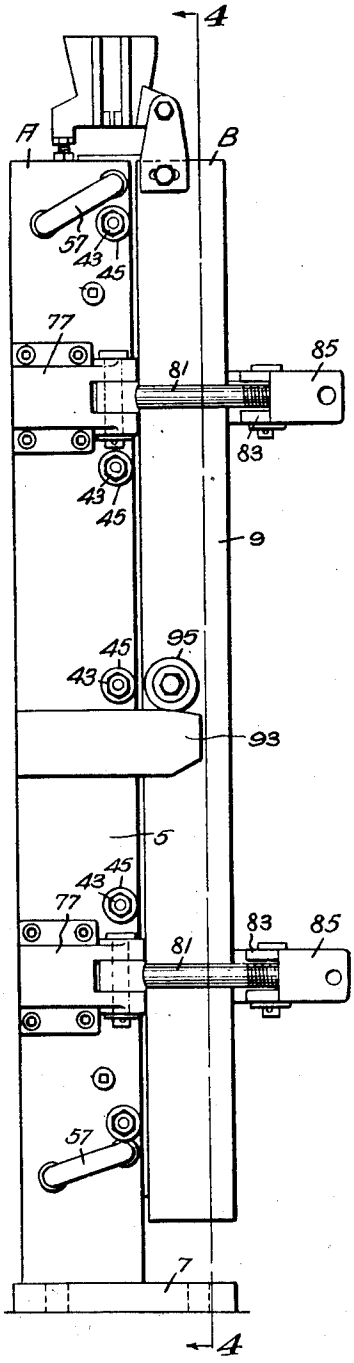
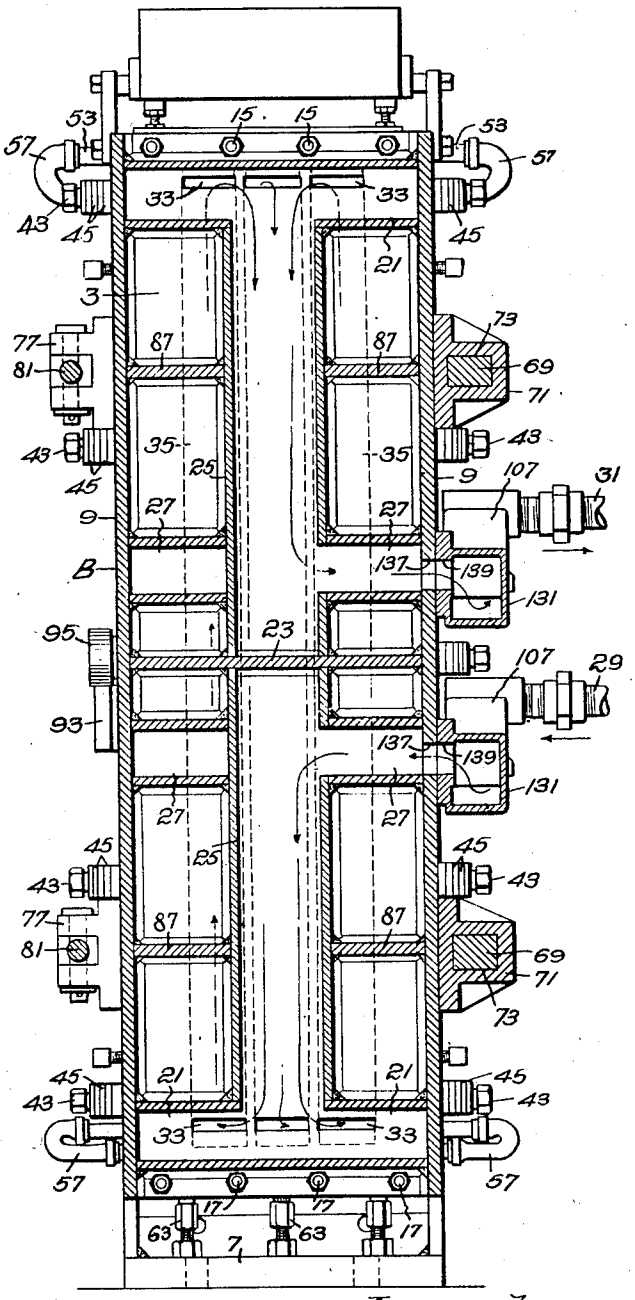


Fig. 4.



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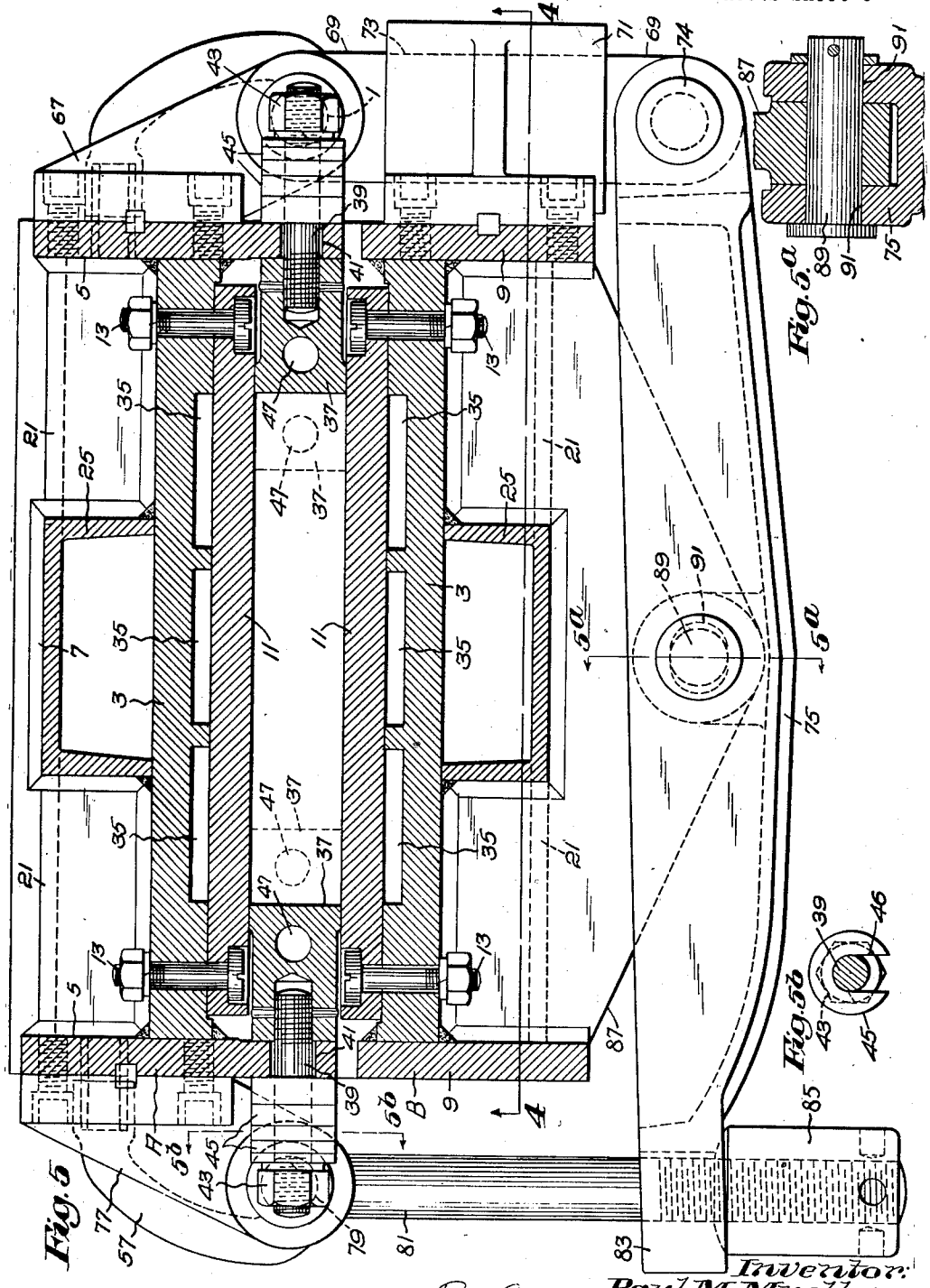


Fig. 5

Fig. 5a

Fig. 5b

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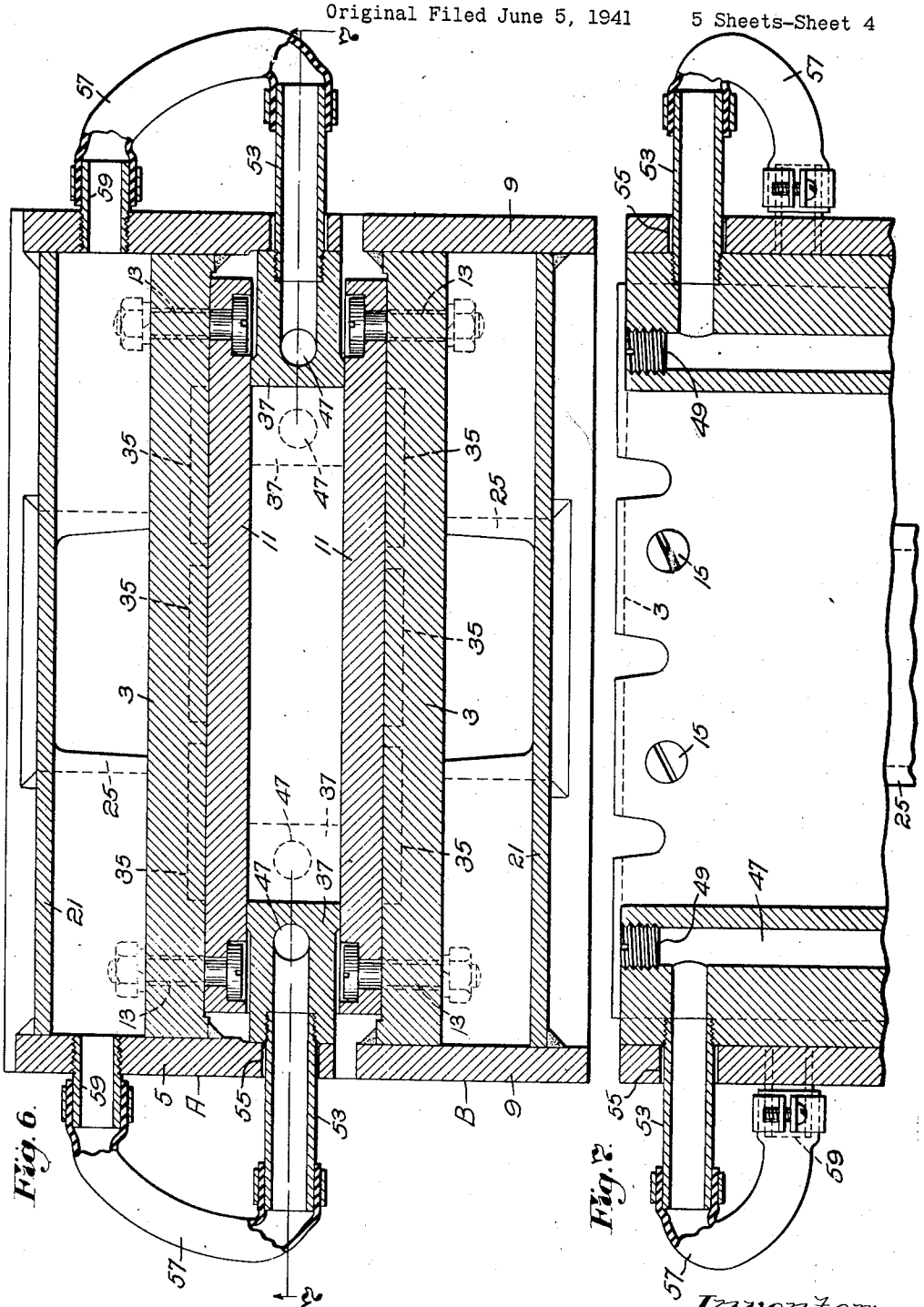


Fig. 6.

Fig. 12.

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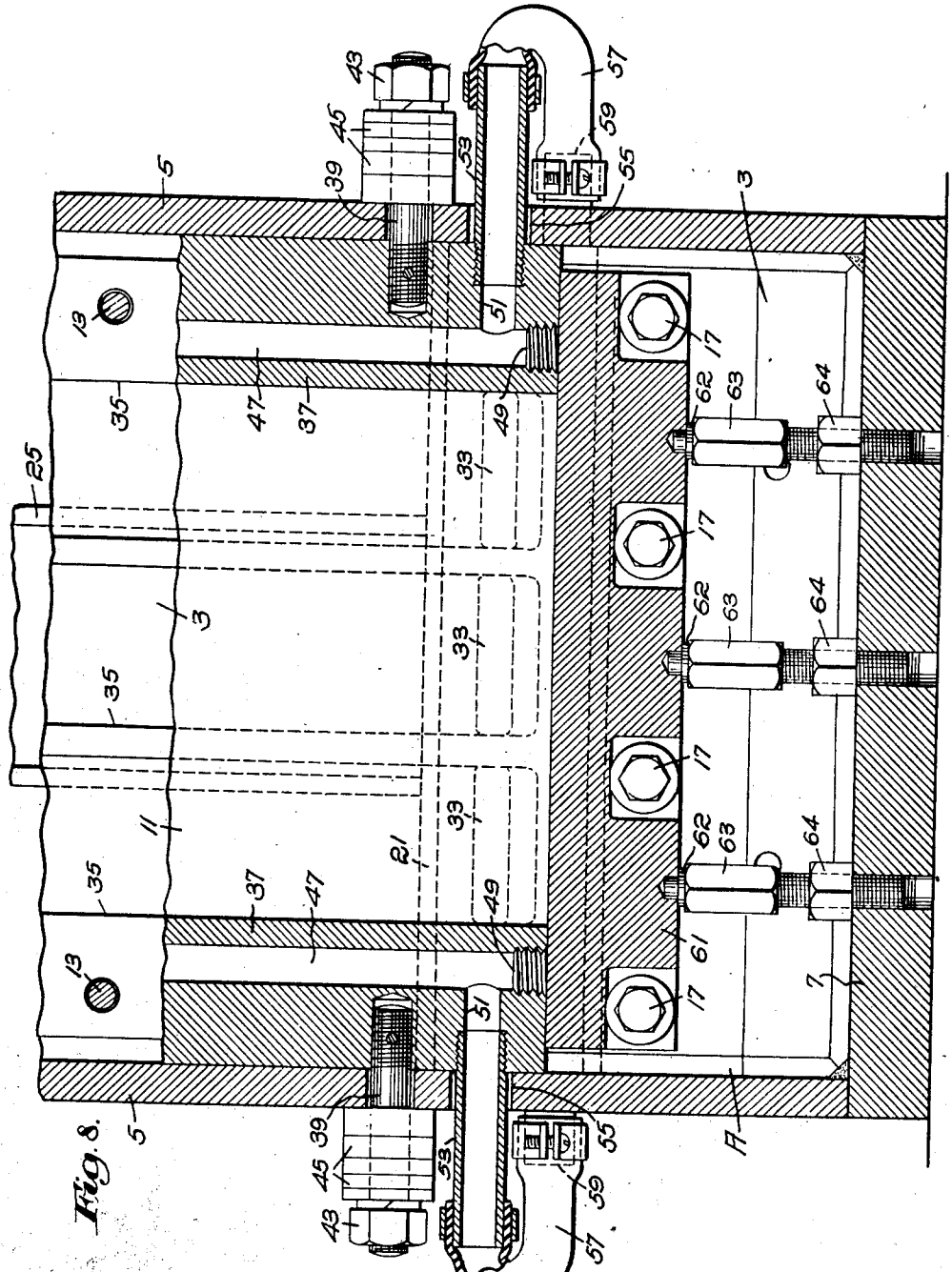


Fig. 8.

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UNITED STATES PATENT OFFICE

2,345,493

MOLD

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Original application June 5, 1941, Serial No. 396,696. Divided and this application June 12, 1942, Serial No. 446,722

14 Claims. (Cl. 22—153)

My invention relates to molds, particularly but not exclusively to those for casting elongated slabs of metal such as copper which are afterward reduced to sheets by rolling, the present application being a division of my co-pending application Serial Number 396,696, filed June 5, 1941, now Patent No. 2,316,180, issued April 13, 1943.

The invention, which has among its objects the provision of improved hinging and clamping means for a split mold, will be best understood from the following description when read in the light of the accompanying drawings of an embodiment of the invention selected for illustrative purposes, the scope of the invention being more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a side elevation of a mold according to the invention;

Fig. 2 is an end elevation of the mold according to Fig. 1 as viewed from the right;

Fig. 3 is an end elevation of the mold according to Fig. 1 as viewed from the left;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a section on the line 5—5 of Fig. 1, with parts omitted;

Fig. 5^a is a fragmentary section on the line 5^a—5^a of Fig. 5, with parts omitted;

Fig. 5^b is a section on the line 5^b—5^b of Fig. 5, showing a detail;

Fig. 6 is a section on the line 6—6 of Fig. 2, with parts omitted;

Fig. 7 is a section on the line 7—7 of Fig. 6, with parts omitted, showing the upper portion of the mold; and

Fig. 8 is a section on the line 7—7 of Fig. 6, with parts omitted and parts broken away, showing the lower portion of the mold.

The mold illustrated in the drawings is a vertical mold which, without limitation thereto, is particularly useful for casting slabs of copper and its alloys.

Referring to the drawings, the mold illustrated comprises a fixed mold part A and a complementary mold part B, the two being connected at one side for relative swinging about the axial line of the spaced vertically aligned pivot pins 1 (Figs. 1 and 2) and being adapted to be releasably clamped together in a manner hereinafter explained.

As illustrated (see particularly Figs. 1, 2 and 5), the mold part A comprises a vertical, longitudinally extending, plate-like member 3, hereinafter for convenience of terminology called a web. Integrally secured as, for example, by welding or casting, to each of the vertical edges of the web 3 is a vertical flange 5 projecting from opposite faces of the web so as to form a member which has approximately the shape of an I-beam in transverse cross-section. The web 3 and flanges 5 of the mold part A at their lower ends are shown integrally joined by welding or casting to a base 7 for supporting the mold and securing it to a suitable support.

The mold part B also comprises a vertical web 3, which in this case is integrally joined with edge flanges 9 to give the part B a cross-sectional shape approximating that of a channel-iron.

As illustrated, detachably secured to the inner face of the web 3 of each mold part A and B is a plate-like member 11 defining a face of the mold chamber. The members 11 are shown as secured to the webs 3 adjacent the edges of the latter by vertical rows of bolts 13, a horizontal row of bolts 15 at the top of the mold, and a horizontal row of bolts 17 at the bottom of the mold.

Opposite the plates 11 each of the webs 3 adjacent its upper and lower end is provided with a transverse stiffening rib 21 (Figs. 1, 4 and 5), these ribs being integrally formed, by welding or otherwise, with the web 3 and edge flanges 5 or 9. As shown, the ribs 21 are in the form of channel-irons, the flanges of which are integral with the web 3. At about the mid point of the length of each mold part A and B is a transverse partition rib 23 in the form of a plate integral with the web 3 and edge flanges 5 or 9, and extending between this rib 23 and the ribs 21 are vertical ribs 25 also in the form of channel-irons integrally joined to the web 3 and likewise to the rib 23 and ribs 21. The interior spaces of the channels formed by the ribs 21 and 25 are in communication, as clearly shown by Fig. 4, the rib 23 serving as a partition to divide the channel formed by the upper rib 25 from the lower rib 25. At opposite sides of the partition rib 23 and extending between the ribs 25 and the edge flanges 5 or 9 are transverse ribs 27 also in the form of channel-irons and integrally joined with the ribs 25, the webs 3, and edge flanges 5 or 9. Each of the ribs 27 at the right of the ribs 25, as viewed in Figs. 1 and 4, communicates with the adjacent rib 25. In a manner hereinafter explained, the lower ribs 27 at the right of the ribs 25, as viewed in Figs. 1 and 4, of each mold part communicate with a common inlet connection 29, carried by the mold

part A, for water or other cooling medium, while the upper ribs 27 at the right of the ribs 25 communicate with a common outlet connection 31 carried by the mold part A.

Interiorly of the cooling medium passages afforded by the channel-shaped ribs 21, each web 3 is provided with perforations 33 (Fig. 4) which communicate with vertical longitudinal grooves 35 formed on the face of the web 3 adjacent the plate 11. These grooves are closed by the plates 11 and provide channels for the cooling medium. The water or other cooling medium from the inlet connection 29, as clearly indicated by the arrows in Fig. 4, enters the passages formed by the adjacent right hand rib 27 and flows downwardly through the communicating channel formed by the lower rib 25 and enters the channel formed by the lower rib 21. From this latter channel it is distributed by the adjacent perforations 33 to the channels 35, and flowing upwardly through these channels discharges through the upper perforations 33 into the channel formed by the upper rib 21, whence it flows downwardly through the upper rib 25 and from there through the communicating channel formed by the upper rib 27 at the right of this rib 25 to the outlet or discharge connection 31. In this way the plates 11, which preferably are formed of good conducting material such as copper, are effectively cooled. The approximate I-beam and channel-iron constructions of the body portions of the mold parts A and B in conjunction with their stiffening ribs form very rigid supports for the plates 11, which latter are permitted to expand and contract by reason of the clearance in the bolt holes for the bolts securing the plates to the webs 3, yet without warping on account of the rigidity of the stiffened webs 3 against which the plates are tightly held by the clamping means hereinafter described.

In the construction illustrated bars 37 defining the sides of the mold chamber are detachably secured to the edge flanges 5. As shown, these bars are provided with studs 39 (Figs. 1 and 5) projecting through perforations 41 in the adjacent edge flanges 5, and are rigidly clamped to the bars by nuts 43 carried by the studs. As illustrated in Fig. 5, a series of washers 45 of different thickness are placed between the nuts 43 and the adjacent side of each flange 5. One or more of these washers, or all of them, may be placed at the opposite side of the flange so as to lie between the flange and the adjacent bar 37, and by so positioning them the width of the mold chamber may be varied say, for example, by moving either or both bars 37 to their dotted line positions shown in Fig. 5. So that the washers 45 may be readily removed and replaced without the necessity of detaching the side bars from the edge flanges 5, the washers are preferably formed with radial slots 46 of width the diameters of the studs 39, which slots open into the stud receiving bores of the washers to give the latter a U-shape as shown in Fig. 5b. This construction provides a rigid support for the side bars 37, the bars being permitted to expand and contract longitudinally by reason of the clearance between the stud bolts 39 and the walls of the perforations 41, yet the bars are strongly held against the flanges 5 by the nuts 43 and are strongly clamped between the plates 11 to prevent warping of the bars.

As shown, the side bars 37 are provided adjacent their surfaces defining the sides of the mold chamber with longitudinal bores 47 for the cooling medium, which construction acts to keep the bars cool and to prevent transfer of heat to the flanges 5 so that the latter will not tend to warp. As shown in Figs. 7 and 8, the upper and lower ends of the bores 47 are closed by plugs 49, and are provided with lateral bores 51 communicating with short lengths of pipe 53. These pipes slidably extend through perforations 55 in the flanges 5 so that the side bars may be adjusted by use of the washers 45 on the studs 39 in the manner hereinbefore explained, the upper perforations at least having considerable clearance with the pipes to permit the bars freely to expand and contract longitudinally. To the outer ends of the pipes 53 are secured short lengths of flexible hose 57 leading to pipe nipples 59 carried by the edge flanges 5. These nipples place the hose in communication with the channels formed by the adjacent upper and lower channel-shaped ribs 21, as shown in Fig. 6, so that the cooling medium from the inlet connection 29 may enter the lower ends of the bores 47 and flow upwardly and discharge from the upper ends of the bores and be carried off by the outlet connection 31 for the cooling medium.

As illustrated, the bottom of the mold chamber is defined by the upper surface of a bar 61 (Fig. 8) carried by the mold part A. This bar, which preferably is of cast iron, is secured against the adjacent side of the plate 11 of the mold part A by the bolts 17 which secure that plate to the adjacent web 3. The bar 61 is of such length as to extend under the opposite side bars 37, and is adapted to be strongly forced against the lower ends of the latter by screw jacks 63, which jacks are adjustably screwed into the base 7 of the mold part A and have lock nuts 64 to prevent them from accidentally backing off. The clearance about the bolt holes for the bolts 17 permit sufficient movement of the bar 61 to permit it to be so forced by the jacks 63, and permits longitudinal expansion and contraction of the bar, yet the jacks 63 prevent warping of the bar, and, by forcing them against the lower ends of the side bars 37, insures against entrance of metal between the upper face of the bar 61 and the ends of the side bars.

The means for pivotally supporting the mold parts A and B is best shown by Figs. 1 to 5. As illustrated, to one of the flanges 5 of the mold part A are rigidly secured spaced brackets 67 which carry the vertically positioned pivot pins 1 hereinbefore referred to. These pins serve pivotally to secure links 69 to the ends of the brackets, which links, as shown, are of rectangular cross-section (Fig. 4). Preferably the construction is such that no lateral lost motion exists in the hinged joints so formed, the pins making tight joints with the perforations in the brackets and links which receive them. Rigidly secured to the flange 9 of the mold part B adjacent the links 69 are blocks 71 having perforations 73 through which the links slidably extend and in which they fit. At the outer ends of the links are pins 74 which pivotally secure thereto yoke bars 75 extending across the mold part B to the opposite side of the mold. To the edge flange 5 of the mold part A at that side are secured spaced brackets 77 to the outer ends of which at 79 are pivotally secured the ends of links 81, the latter removably extending through the openings formed by the bifurcated adjacent ends 83 of the yoke bars 75 and adjustably carrying nuts

85 resting against the outer surfaces of the yoke bars at those ends so that the yoke bars may be forcibly drawn toward the mold part A to clamp the mold part B between it and the yoke bars.

As shown, the mold part B is provided with a plate 87 beneath each yoke bar, the plate being notched to permit the ribs 25 to pass through it and fitting the exterior of those ribs at the outer surface of the web 3 and adjacent parts of the edge flanges 9 and being welded thereto or being otherwise integrally formed with the body of the mold part B. As illustrated (see Fig. 5a), the intermediate portion of each yoke bar is channel-shaped in cross-section, the adjacent plate 87 fitting within this channel and being pivoted to the yoke bar by a pin 89, the aligned holes 91 in the yoke bars for receiving the pins being elongated in the direction of the lengths of the yoke bars, as shown in Fig. 5, so that the mold part B may move longitudinally of those bars.

The combined structure for pivotally securing the mold part B to the mold part A and for clamping the two together permits the mold part B to adjust itself toward the mold part A and transversely thereof, while forcing the mold part B to swing around the aligned axes of the pivot pins 1. This permits slight variations in the thickness of the side bars 37 and bottom bar 61 so that the thickness of the casting may be varied, and permits the surfaces of the plates 11 defining the faces of the mold chamber to be finished from time to time and takes care of discrepancies in manufacture of the parts.

As illustrated (see Figs. 1, 3 and 4), the outer side of the edge flange 5 of the mold part A opposite the flange 5 thereof which carries the aligned pivot pins 1 carries a bar which provides a lug 93 projecting toward the mold part B. The adjacent edge flange 9 of the mold part B carries a roller 95 adapted to ride on the upper surface of the lug 93. In this way the mold part B is brought into proper position in a vertical direction with the mold part A to take care of wear and discrepancies in manufacture in the hinged support for the mold part B. The lug 93, as clearly shown in Fig. 4, has a slight clearance with the adjacent web flange 5 of the mold part B, and this clearance and the sliding contact of the plate 11 of the mold part B with the side bars 37 permit any slight transverse sliding of the mold part B relative to the mold part A necessary to bring the two properly together.

The water conducting means between the water inlet and outlet connections 29 and 31 of the mold parts A and B is such as to permit the above described relative swinging of these parts and their relative movement transverse to the hinge axis. As this water conducting means forms the subject of a further divisional application based on the same parent application of which the present application is a division it need not be described herein with any more particularity than is necessary to explain how it it coacts with the hinge and clamping means above described. Briefly, to the flanges 5 and 9 of the mold parts A and B are bolted at 98 and 135 (Fig. 2) pipe sections 99 and 131, respectively, the free ends of these pipe sections being vertically spaced from each other and horizontally overlapping, as clearly illustrated in Fig. 2. These overlapping free ends in each instance are hingedly connected about a vertical axis coaxial with the hinge pin 1 by a joint (not shown) within the housing 107 depending from the pipe section 99, which joint is connected to the pipe section 131 by a longitudinally extensible and laterally yieldable conduit (not shown) approximately coaxial with the hinge pin and also within the housing 107. Each pipe section 99 and 131 in its base is provided with an opening in communication with an aligned opening in the flange 5 or 9 to which the pipe section is bolted, this last mentioned opening being in communication with the passage afforded by the adjacent hollow rib 27 as, for example, as illustrated in Fig. 4 wherein the pipe section 131 is provided in its base with an opening 139 in communication with an aligned opening 137 in the flange 9, this opening 137 being in communication with the passage formed by the adjacent hollow rib 27.

It will be understood that, within the scope of the appended claims, wide deviations may be made from the forms of the invention described without departing from its spirit.

I claim:

1. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a supporting member for the movable part, which member is mounted for swinging movement, and means connecting the part so supported to said member for movement relative to said member toward and away from the plane of the split of the mold.

2. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a member mounted for swinging movement, and a lost motion connection between said member and part so mounted having provision for movement of said part relative to said member toward and away from the plane of the split of the mold.

3. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a supporting member for the movable part mounted for swinging movement, and means slidably connecting the part so supported to said member for sliding movement relative to the latter toward and away from the plane of the split of the mold.

4. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a plurality of spaced supporting members for said part, which members are coaxially mounted for swinging about an axis parallel to the plane of the split of the mold, and means connecting the part so supported to each of said members for movement relative thereto toward and away from said plane.

5. A mold according to claim 4 in which the means connecting the movable mold part to each of the swinging members is a lost motion connection having provision for movement of that part relative to said members toward and away from the plane of the split of the mold.

6. A mold according to claim 4 in which the means connecting the movable mold part to each of the swinging members is a sliding connection between that part and said members permitting the mold part to slide relative to said members toward and away from the plane of the split of the mold.

7. A mold having separable parts coacting to

form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a plurality of spaced supporting members for said part, which members are separately carried by the other of said parts for swinging about a substantially common axis parallel to the plane of the split of the mold, the part so mounted having perforations through which said supporting members severally extend for slidably connecting said part to said members for movement relative thereto toward and away from the plane of the split of the mold.

8. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a supporting member for the movable part, which member is mounted for swinging movement, means connecting the part so supported to said member for movement relative to said member toward and away from the plane of the split of the mold, and means for releasably clamping said mold parts together to hold the mold chamber closed.

9. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said parts for opening and closing the mold chamber comprising a supporting member for the movable part, which member is mounted for swinging movement, means connecting the part so supported to said member for movement relative to said member toward and away from the plane of the split of the mold, and means including said member for releasably clamping said mold parts together to hold the mold chamber closed.

10. A mold according to claim 8 in which the means for clamping the mold parts together comprises means operatively engaging the movable mold part and movably connected to the swinging supporting member.

11. A mold according to claim 8 in which the swinging supporting member is positioned at one side of the movable mold part and is swingingly connected to the other of said parts, the means for clamping the mold parts together comprising a further member extending across the movable mold part, means being provided for connecting said further member to said swinging member and to said other of said mold parts at the side of the latter opposite said swinging member.

12. A mold according to claim 8 in which the swinging supporting member is positioned at one side of the movable mold part and is swingingly connected to the other of said parts, the means for clamping the mold parts together comprising a further member extending across the movable mold part, said further member intermediate the sides of said movable mold part operatively bearing against the latter, and means providing connections between said further member and swinging member and between the former and the said other of the mold parts, one of which connections comprises means for forcing said further member toward said other of the mold parts.

13. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said mold parts for opening and closing the mold chamber comprising a supporting member for the movable mold part mounted on the other of said mold parts at one side thereof for swinging about an axis parallel to the plane of the split of the mold, means forming a connection between said movable mold part and supporting member for sliding of the former relative to the latter toward and away from the other of said mold parts, a yoke member extending across the movable mold part from one side thereof to the other, means forming a pivotal connection between said yoke member and movable mold part intermediate the width of the latter, means for connecting said yoke member to said supporting member at one side of the mold, and means for connecting said yoke member at the opposite side of the mold to the mold part on which said supporting member is mounted, one of which two last mentioned means comprises a screw for drawing said yoke member toward the last mentioned mold part.

14. A mold having separable parts coacting to form a split mold chamber, means movably mounting one of said mold parts for opening and closing the mold chamber comprising a plurality of spaced supporting members mounted on the other of said mold parts at one side thereof for swinging about a common axis parallel to the plane of the split of the mold, perforations formed in the movable mold part at one side thereof through which said supporting members slidably extend whereby said movable mold part may slide relative to said supporting members toward and away from the other mold part, yoke members severally pivotally connected to said supporting members, which yoke members extend across the movable mold part from one side thereof to the other and operatively have a bearing on the movable mold part intermediate its width, and clamping screws severally connecting said yoke members to the mold part to which said supporting members are connected for drawing said yoke members toward the last mentioned mold part.

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