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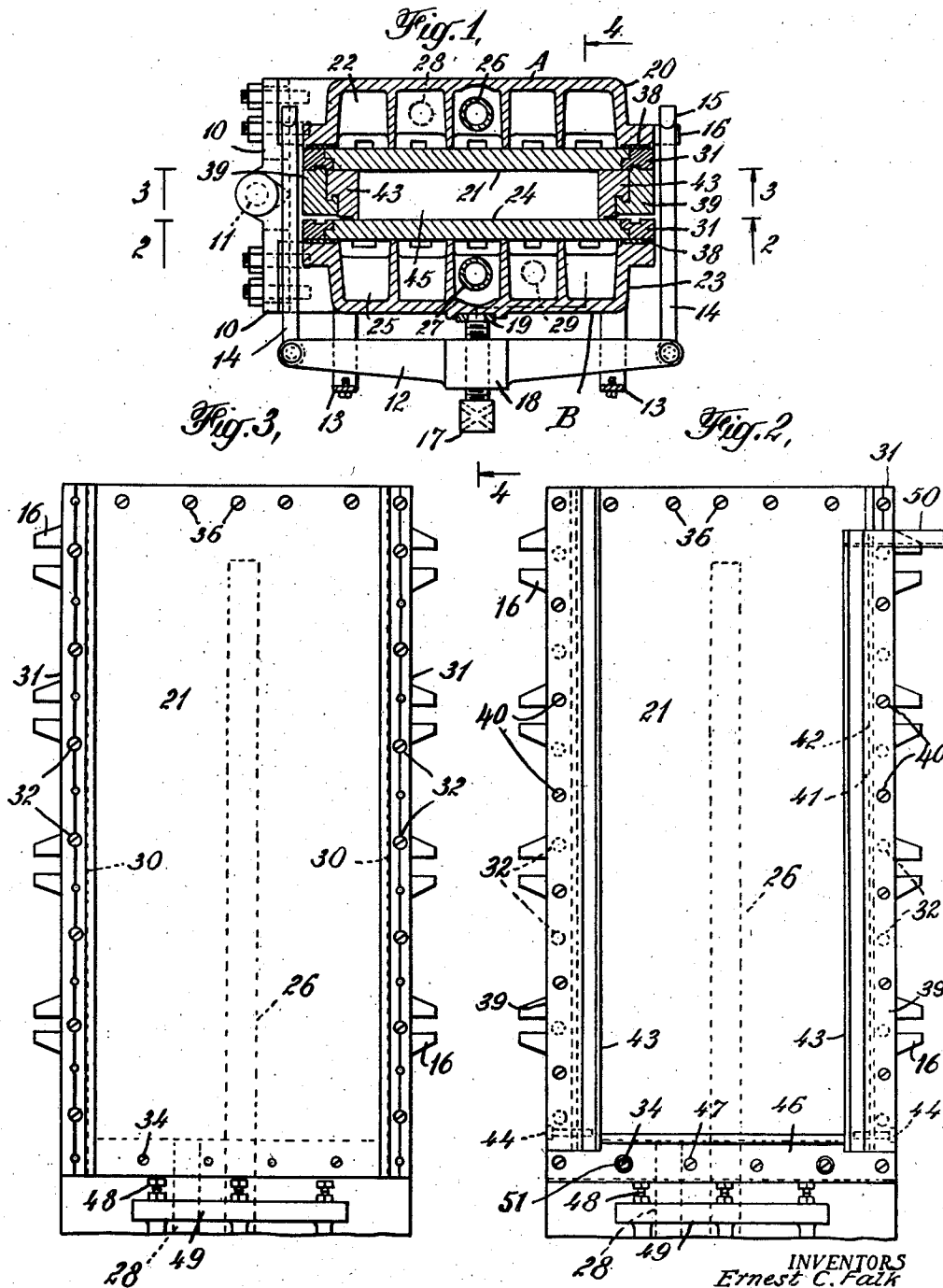
E. C. FALK ET AL

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WATER-COOLED SLAB MOLD

Filed Feb. 15, 1944

2 Sheets-Sheet 1



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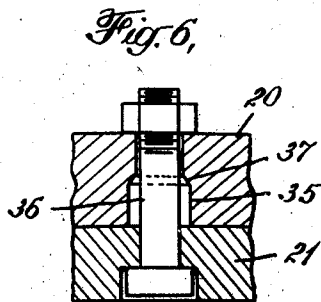
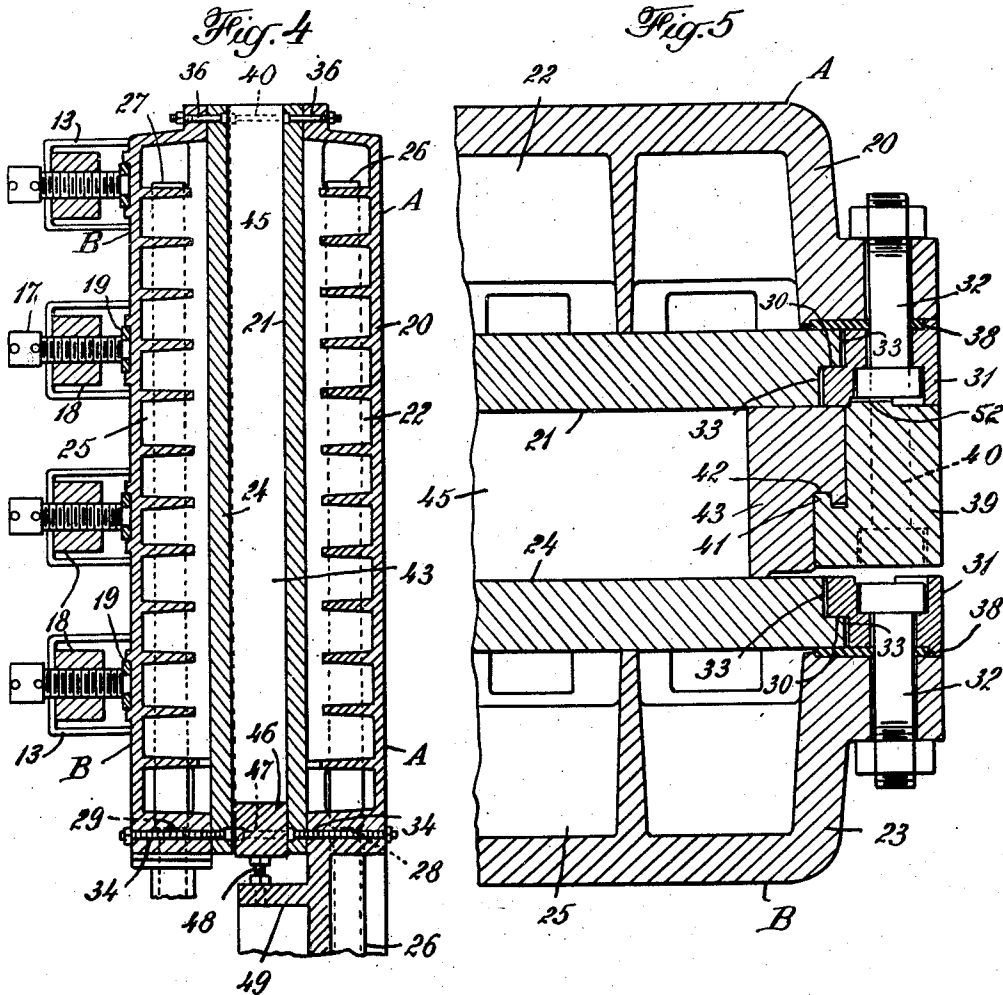
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WATER-COOLED SLAB MOLD

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7 Claims. (Cl. 22-144)

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This invention relates to water-cooled or chill slab molds, and more particularly to molds of the type described in Junker U. S. Patent No. 1,615,086. Molds of this type are extensively used for casting slabs of metal, such as copper-bearing alloys, which are subsequently reduced to sheets by rolling.

In general, water-cooled slab molds of this type comprise a stationary mold back and a complementary or mating mold front hinged or pivoted at one side of the mold back and capable of being swung through an arc of 90° or more. When closed, the mold back and front provide a rectangular mold cavity having faces and sides of good heat conductivity, such as plates of rolled copper. The mold faces are in contact with circulating water or other suitable cooling medium flowing through appropriately provided compartments.

The aim of our present invention is to provide a cooled slab mold of improved construction, and more particularly to provide an improved construction for attaching the copper plates or mold faces to their respective supporting frames, and also for attaching the mold sides to the mold back whereby the plates and sides may expand and contract during the casting cycle without setting up undue stresses.

The novel features of the invention will be best understood from the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a transverse section of the improved mold of the invention,

Fig. 2 is a front elevation of the mold back (section 2-2 of Fig. 1).

Fig. 3 is a front elevation of the mold back with the mold sides and mold bottom removed (section 3-3 of Fig. 1).

Fig. 4 is a sectional side elevation of the mold on the section line 4-4 of Fig. 1,

Fig. 5 is an enlarged detail on the right end of the transverse section of Fig. 1, and

Fig. 6 is an enlarged sectional detail of the top bolted connection of the copper plate to its supporting frame.

The mold comprises a stationary mold member A (mold back) and a complementary mold member B (mold front) pivotally connected together by links 10 and pins 11 so that the member B can be swung to and fro to close and open the mold. Thus, the mold front is pivotally mounted at one side of the mold back. Transverse spaced yokes 12 are mounted in brackets 13 on the outer face of the movable mold member B. A link 14 is

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pivoted to each end of each yoke. The outer or free end of each link 14 has a head 15 adapted to operatively engage slotted lugs 16 on the sides of the stationary mold member A. When the mold is closed and the heads 15 operatively engage their respective slotted lugs 16, the mold members A and B are clamped or locked together by turning the bolts 17, screw-threaded in central bosses 18 of each yoke and pressing against aligning seats 19 on the outer face of the mold member B.

The stationary mold member A comprises a rectangular cast metal (e. g. iron) frame 20 and a rolled copper plate or mold face 21 appropriately secured thereto. The frame 20 is recessed or hollow to provide with the plate 21 a cooling compartment 22. The movable mold member B similarly comprises a rectangular cast metal frame 23, a rolled copper plate or mold face 24 and cooling compartment 25. Enclosed conduits or standpipes 26 and 27 for the discharge of cooling medium are positioned within the compartments 22 and 25, and extend from the bottom to near the top of the respective compartments. Cooling medium is admitted to the bottom of the compartments 22 and 25 through inlet pipes 28 and 29 respectively, and is withdrawn from the top of the compartments through the conduits 26 and 27. The frames 20 and 23 may be, and preferably are, provided with the longitudinal and transverse ribbing described and claimed in our copending application for Letters Patent Ser. No. 522,459 filed February 15, 1944.

In cooled slab molds of the heretofore customary construction, the copper plate (21 and 24) is attached to its mating frame (20 and 23) by a series of round head bolts fitted in counter-bored holes in the plate and registering drilled holes in the frame. The copper plates expand and contract during a casting cycle whereas the mating frames are little, if at all, affected. This expansion and contraction of the copper plates causes stresses at the bolt holes which eventually fracture the plates making it necessary to discard them.

Our present invention overcomes the aforementioned difficulty by eliminating all bolt holes at each side of each copper plate. Thus, in accordance with the invention, the copper plate is attached to its mating frame by clamp bars permitting expansion and contraction of the plate. The construction will be best understood by reference to Fig. 5 of the drawings. Each longitudinal side of the copper plates 21 and 24 has a recessed shoulder 30 adapted to be engaged by a

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cooperating or mating shoulder on a longitudinal clamp bar 31. The clamp bars are secured to the sides of their respective frames (20 and 23) by round head bolts 32 fitting in counterbored holes in the clamp bars and registering drilled holes in the frames. Spaces 33 are provided between the adjacent but non-contacting longitudinal sides of the plate and its cooperating clamp bar to permit transverse expansion and contraction of the plate.

Each copper plate (21 and 24) is anchored at its bottom to its respective frame by round headed bolts 34 fitting in counterbored holes in the plate and registering drilled holes in the frame. Each plate is also bolted (36) at its upper end to its respective frame, but the registering holes (35) in the frame are enlarged to compensate for expansion and contraction as illustrated in Fig. 6. Immediately adjacent the copper plate, the holes 35 at the top of the frame 20 are of considerably larger diameter than the diameter of the bolts 36, for about one-half the thickness of the frame, and the larger hole then flares or bevels (37) into a smaller hole of slightly greater diameter than the bolt. It is desirable to provide a packing 38 to seal the joints between each copper plate and its frame, and its cooperating clamp bar and the frame, the packing being heat resistant and of a character that will minimize friction and facilitate movement of the plate and clamp bar with respect to the frame.

Another disadvantage in cooled slab molds of the heretofore customary construction is the attachment of the mold side bars to the copper plate of the metal back by bolts extending through the plate and the frame of the mold back. Expansion and contraction of the side bars during the casting cycle fractures the bars and in practice they fail at relatively short intervals. In our improved mold, this difficulty is overcome by forming the side bars of two sections secured together and to the mold back in such a manner as to permit expansion and contraction of the section adjacent the mold cavity during the casting cycle. The section (43) adjacent the mold cavity is the mold side bar proper and may be made of copper, chrome-nickel-iron, suitable mold iron alloy or other material capable of withstanding the action of the hot metal being cast, and the other section (39) is a backing bar and may be made of ordinary cast iron or machine steel. The construction will be best understood by reference to Fig. 5 of the drawings. The backing bar 39 is securely held against the adjacent clamp bar 31 by round headed bolts 40 fitting in counterbored holes in the backing bar and extending through registering holes in the clamp bar and adjacent frame. The backing bar has a longitudinal tongue 52 fitting in a cooperating longitudinal groove in the adjacent clamp bar 31 to lock the backing bar against transverse movement, and a longitudinal tongue 41 fitting in a longitudinal groove 42 in its cooperating and adjacent side bar 43 to lock the side bar against transverse movement. By this construction the side bar is slidably held against the adjacent copper plate in a manner that permits the bar to expand and contract without undue stresses. The side bar is retained in vertical relation with respect to its backing bar by a screw 44 threaded through the backing bar and fitting in a registering hole near the lower end of the side bar (Fig. 2).

The copper face plates 21 and 24 and the side bars 43 form a rectangular mold cavity 45. A

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spout 50 near the top of the cavity permits the overflow of molten metal when the cavity has been filled in casting. The bottom of the mold cavity is closed by a bottom bar 46, preferably of chrome-nickel-iron, secured by bolts 47 extending through the contacting copper plate and into the adjacent frame. Adjustable bolts 48 in a bracket 49 on the depending foot of the mold back A help support the bottom bar 46 and prevent its sagging. Holes 51 are drilled in the bottom bar 46, directly in front of the bolts 34, so that these bolts may be tightened, when necessary, without removing the bottom bar by inserting a screw-driver through the holes 51.

The mold construction of the invention permits sufficient expansion and contraction of the face plates and mold sides to avoid imposing on those parts any undue or fracturing stresses during the casting cycle. The only longitudinal attachment of the face plate to the frame is through the mating recessed shoulders of the plate and clamp bars. Similarly, the side bars are held against the face plate solely by the tongue and groove connection with their cooperative backing bars. The backing bars contact the clamp bars, rather than the face plate as in the heretofore customary construction and hence the bolts 40 for securing the backing bars to the frame pass through the clamping bar and not through the face plate. The face plates are anchored at their bottoms by the bolts 34 and the side bars are anchored at their bottoms by the bolts 44, but elsewhere throughout the entire areas of the plates and side bars expansion and contraction can take place during the casting cycle.

In cooled slab molds, the mold faces must have good heat conductivity for efficient transfer of heat from the cast metal to the adjacent cooling compartments. Rolled copper plate is now generally used for the mold faces, but it is to be understood that the mold faces may be made of any other metal or material of equivalently good heat conductivity and not deleteriously affected by the molten casting metal. Since the mold sides are not cooled, the side bars 43 may be made of copper, chrome-nickel-iron, suitable mold iron alloy, or the like. The clamp bars may be made of machine steel, chrome-nickel-iron, mold iron alloy, or the like. While the backing bars 39 are preferably made of cast iron or machine steel, they may be made of any other suitable material.

We claim:

1. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, the longitudinal edges of said face plate being recessed, a clamp bar for each longitudinal side of said plate having a recessed edge conforming with and cooperating with the mating recessed edge of the face plate to hold the plate firmly against the frame, the surface of each clamp bar that faces away from the frame being substantially flush with the surface of the face plate that faces away from the frame, means securing the clamp bars to the frame, and a mold side of substantially the same depth as the thickness of slabs cast in said mold overlying each clamp bar and the adjacent edge portions of the face plate and fastened to the frame.

2. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, each longitudinal edge of said face plate having a recessed shoulder, a clamp bar for each longitudinal side of said plate having a re-

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cessed shoulder engaging the adjacent shoulder of the plate and holding the plate firmly against the frame, the surface of each clamp bar that faces away from the frame being substantially flush with the surface of the face plate that faces away from the frame, the adjacent but non-contacting side edges of the plate and cooperating clamp bar being spaced to permit expansion and contraction of the plate during the casting cycle, means securing the clamp bars to the frame, and a mold side of substantially the same depth as the thickness of slabs cast in said mold overlying each clamp bar and the adjacent edge portions of the face plate and fastened to the frame.

3. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, a clamp bar on each longitudinal side of the face plate in clamping engagement with an edge portion thereof and firmly holding the plate against the frame while permitting expansion and contraction of the plate during the casting cycle, the surface of each clamp bar that faces away from the frame being substantially flush with the surface of the face plate that faces away from the frame, means for securing the clamp bars to the frame, a mold side at each longitudinal side of the face plate overlying the adjacent clamp bar and the adjacent edge portion of the face plate, said mold side being of a depth substantially equal to the thickness of slabs cast in said mold and comprising a side bar and a backing bar firmly holding the side bar against the face plate while permitting expansion and contraction of the side bar during the casting cycle, and means for securing the backing bars to the frame.

4. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, each longitudinal edge of said face plate being recessed, a clamp bar for each longitudinal side of said plate having a recessed edge conforming with and cooperating with the mating recessed edge of the face plate to hold the plate firmly against the frame, means securing the clamp bars to the frame, a mold side at each longitudinal side of the face plate, said mold side comprising a side bar and a backing bar firmly holding the side bar against the face plate while permitting expansion and contraction of the side bar during the casting cycle, and means for securing the backing bars to the frame.

5. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, each longitudinal edge of said face plate having a recessed shoulder, a clamp bar for each longitudinal side of said plate having a recessed shoulder engaging the adjacent shoulder of the plate and holding the plate firmly against the frame, the adjacent but non-contacting side edges of the plate and cooperating clamp bar being spaced to permit expansion and contraction of the plate during the casting cycle, means securing the clamp bars to the frame, a mold side at each longitudinal side of the face plate, said mold side comprising a side bar and a backing bar having a tongue and groove connection there-

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with for firmly holding the side bar against the face plate while permitting expansion and contraction of the side bar during the casting cycle, and means securing the backing bars to the frame.

6. In a metal slab mold having a recessed metal frame and a mold face plate covering the recess in the frame, clamp bars engaging side edge portions of the face plate and firmly clamping the face plate to the frame with the outer surface of the clamp bars substantially flush with the outer surface of the face plate, a mold side at each longitudinal side of the face plate, said mold side comprising a side bar and a backing bar firmly holding the side bar against the face plate, a longitudinal tongue on said backing bar engaging in a corresponding recess formed in the clamp bar to lock the backing bar against transverse movement, and means for securing the backing bar to the frame.

7. In a slab mold having a recessed metal frame and a mold face plate attached thereto and covering the recess in the frame, a mold side at each longitudinal side of the face plate comprising a backing bar and a side bar, the backing bar having along one side thereof a projection which extends toward the interior of the mold and a longitudinal rib extending laterally from the side edge of said projection at the outer end thereof so as to define a longitudinal groove extending laterally into said projection adjacent the base thereof, and the side bar correspondingly having along the side thereof adjacent the backing bar a projection which extends away from the interior of the mold and a longitudinal rib extending laterally from the side edge of said projection at the outer end thereof so as to define a longitudinal groove extending laterally into said projection adjacent the base thereof, said backing bar and side bar being interlocked by insertion of the laterally extending ribs on the side and backing bars into the laterally extending grooves in the backing and side bars respectively, whereby the side bar may be disengaged from the backing bar by lateral movement of the side bar with respect to the backing bar, and means for securing the backing bar to the frame.

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