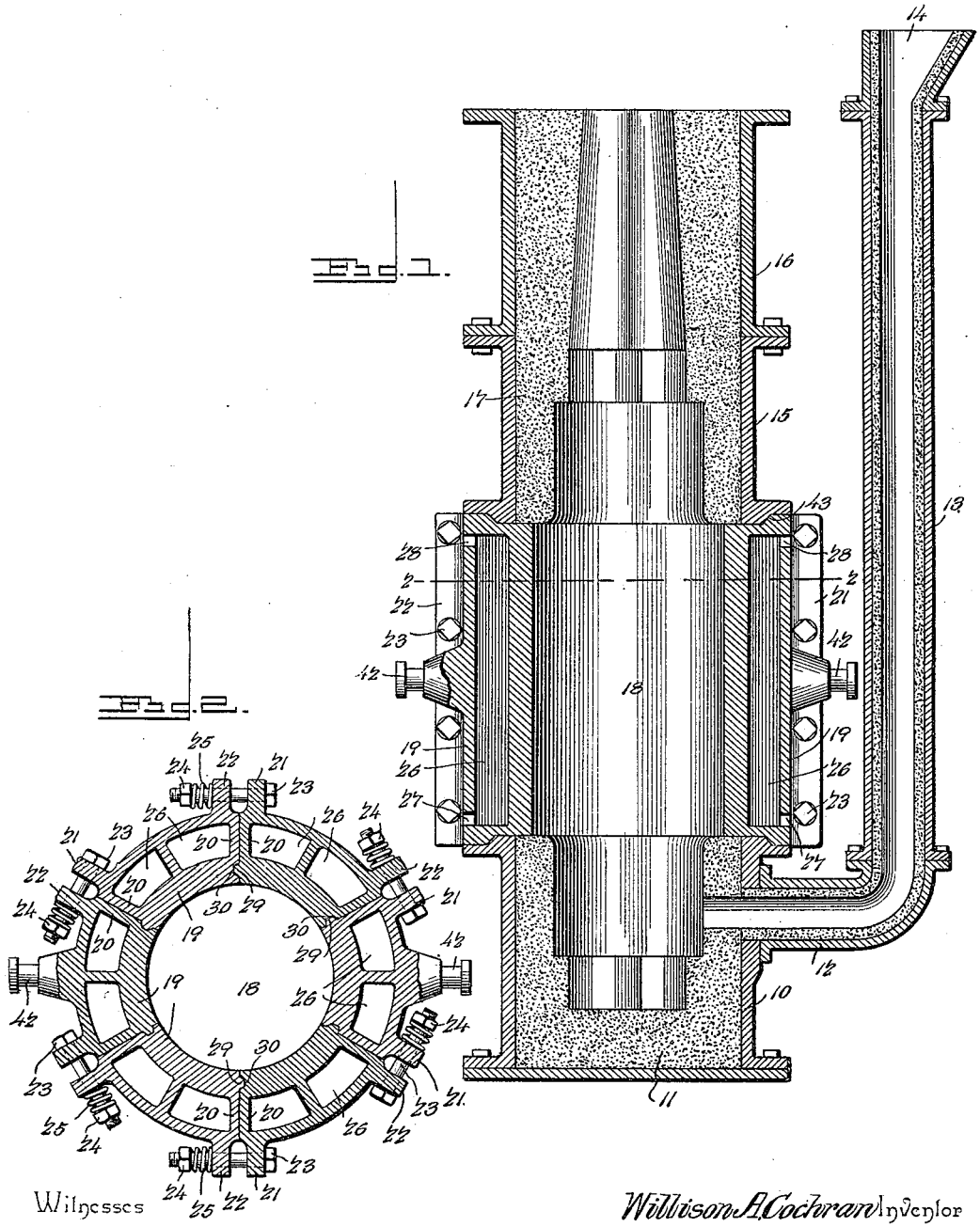
No. 649,044. Patented May 8, 1900.

W. A. COCHRAN.

CHILL MOLD.

(Application filed July 3, 1899.)

(No Model.) 2 Sheets—Sheet 1.



Witnesses

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Fig. 3.

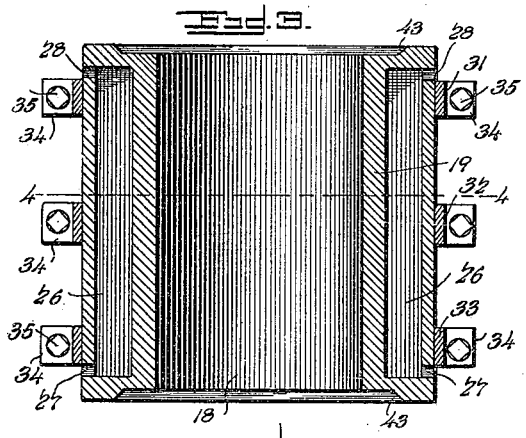


Fig. 4.

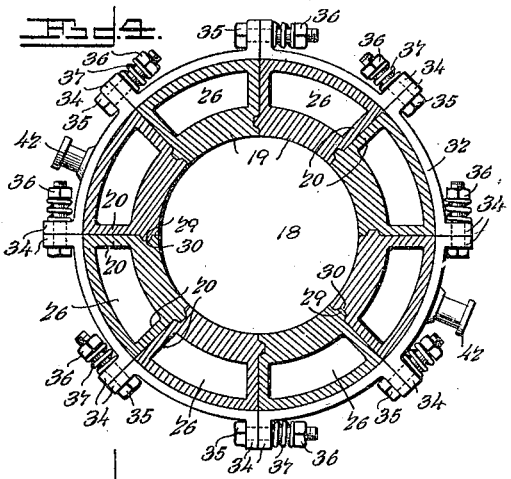


Fig. 5.

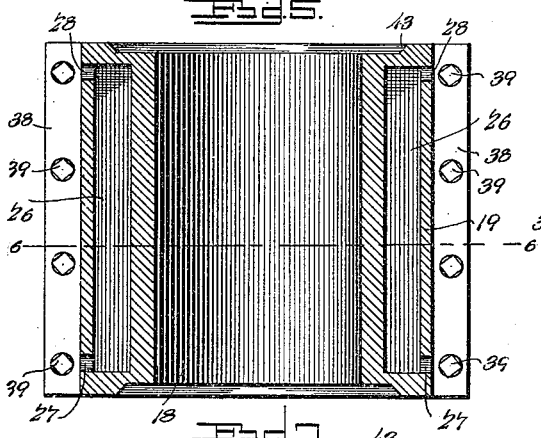


Fig. 6.

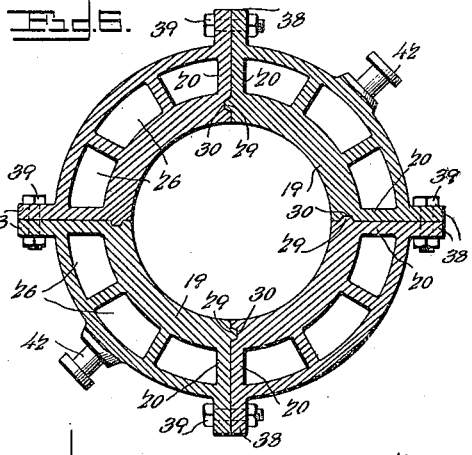


Fig. 7.

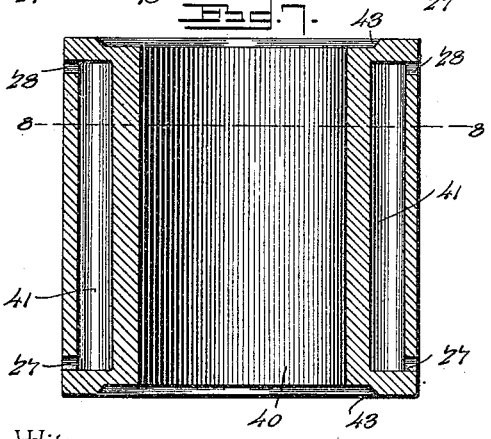
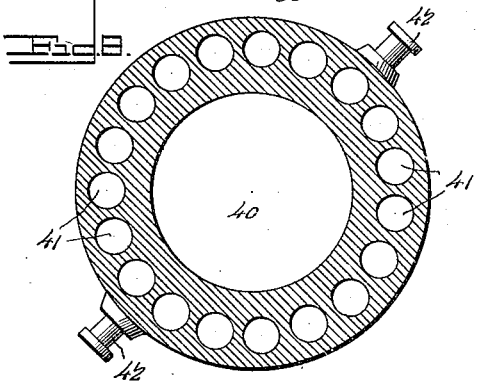


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLISON A. COCHRAN, OF APOLLO, PENNSYLVANIA.

CHILL-MOLD.

SPECIFICATION forming part of Letters Patent No. 649,044, dated May 8, 1900.

Application filed July 3, 1899. Serial No. 722,710. (No model.)

To all whom it may concern:

Be it known that I, WILLISON A. COCHRAN, a citizen of the United States, residing at Apollo, in the county of Armstrong and State of Pennsylvania, have invented a new and useful Chill-Mold, of which the following is a specification.

My invention relates to improvements in chill-molds especially adapted for the casting of chilled rolls for metal-working, such rolls having either plain or grooved surfaces, although the improved mold is well adapted to casting other articles than rolls, which articles are required to have a chilled surface.

The object of the invention is to provide a simple and substantial construction of chill-mold arranged to permit of the ready expansion and contraction of the metal during the pouring operation and solidification, respectively, such improved mold adapted to move inward in order to follow the contraction of the solidifying metal and to maintain such relation to the casting as to insure practically a uniform depth of chill at all points of the chilled surface.

With this end in view the invention in its generic aspect consists of a chill-mold cored to provide a plurality of longitudinal passages arranged in series around the mold-cavity, each cored passage having an ingress-port and an egress-port at its respective ends for the admission and escape of the fluid required for heating and cooling the mold.

The invention further consists of a chill-mold constructed of a plurality of complemental sections assembled in alined relation to form a mold-cavity and said sections confined closely in yieldable relation for expansion and contraction thereof, each mold-section having one or more circulation-passages with proper ports at the respective ends thereof for the ingress and egress of a circulating fluid.

The invention further consists in the novel construction and arrangements of parts, which will be hereinafter more fully described and claimed.

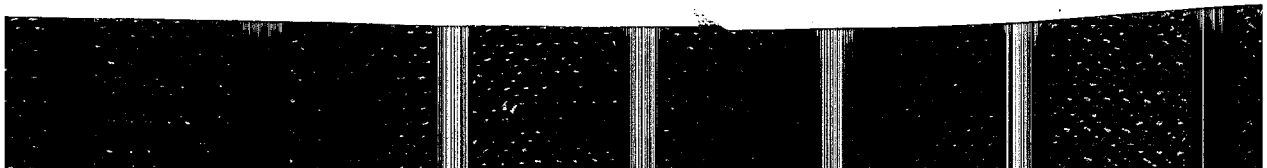
To enable others to understand the invention, I have illustrated different embodiments thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a vertical sectional elevation of a complete apparatus having the improved chill-mold assembled in operative relation to the various parts of such apparatus. Fig. 2 is a horizontal sectional plan view through the improved chill-mold, the plane of the section being indicated by the dotted line 2 2 of Fig. 1. Fig. 3 is a vertical section through another embodiment of the chill-mold, and Fig. 4 is a horizontal section on the line 4 4 of Fig. 3. Figs. 5 and 6 are vertical and horizontal sections of another embodiment of the improved chill-mold, illustrating a different means for holding the complemental sections in proper relation, the plane of section of Fig. 6 being indicated by the line 6 6 of Fig. 5. Figs. 7 and 8 are vertical and horizontal sections of still another form of the chill-mold, the same representing a single-piece cored mold having a plurality of longitudinal circulating-passages, the plane of section of Fig. 8 being indicated by the dotted line 8 8 of Fig. 7.

The same reference-numerals are used to indicate like and corresponding parts in each of the several figures of the drawings.

In order that others may understand the application of my improved chill-mold, I have illustrated the preferred embodiment thereof in operative relation to an ordinary casting apparatus by Fig. 1 of the drawings, referring more particularly to which the numeral 10 indicates the bottom or drag, which contains a sand or loam filling 11, forming the bottom neck-wabble and a portion of the runner-gate. With this bottom or drag communicates the runner-elbow 12, and the runner-spout 13 is coupled to this elbow, said spout having the ordinary runner-box 14. The members of a divided flask are indicated at 15 16, said flask having a sand or loam filling 17, forming the top neck-wabble and sink-head.

The preferred form of the improved chill-mold is indicated by the numeral 18 in Figs. 1 and 2 of the drawings, said chill-mold occupying the ordinary relation to the bottom 10 and the flask 15 16 in Fig. 1. The chill-mold shown by said Figs. 1 and 2 consists of a plurality of complemental members or sections 19, each of which is formed or cast in a single piece in the form of a segment of a circle. The mold may consist of any desired



number of these segmental complemental members, which are adapted to be assembled together in abutting relation, as shown by Fig. 2, to produce a complete circular mold-cavity, and these abutting complemental members are joined or confined together by any suitable means in order to hold them in their proper assembled relation to form the complete mold. Each segmental member 19 of the mold has closed ends 20, the same being disposed radially to the axis of the complete mold in order that the members may meet or abut throughout the width of the end faces. Each section is furthermore provided with radial flanges 21 22, which are formed integral therewith, said flanges being arranged at or near the respective ends of the section and extending the full length thereof. In the embodiment of the invention shown by Fig. 2 the longitudinal radial flanges 21 22 are disposed within the planes of the closed ends 20 of the sections, and on the assemblage of these sections to form the mold the end faces 20 of said sections abut on lines radial to the axis of the mold, while the flanges 21 22 on adjacent sections or members 19 are spaced in parallel relation, such spaces extending the full length of the mold and adapted to receive a suitable filling, such as sand or loam, which fillings serve to close the joints between the mold-sections for the exclusion of air from the metal contained in the mold-cavity. Each section of the mold is united to adjacent mold-sections by a series of bolts 23, which pass through suitable openings provided in the parallel flanges 21 22, and in the type of mold shown by Fig. 2 each bolt is equipped with a pair of nuts 24, one of which nuts is screwed on the bolt to bear against a flange on one mold-section. The other nut of the pair on each bolt occupies a spaced relation to one flange on the adjacent mold-section, thus permitting a coiled spring 25 to be placed on the bolt between said spaced nut and the flange of the mold-section. It will be noted that the plurality of complemental sections are united together at numerous points by bolts which are equipped with springs that tend normally to force the mold-sections into close abutting relation; but these mold-sections are adapted to be expanded by admitting thereto a heated fluid, such as steam, or they are contracted by supplying to the heated mold a cooling medium, such as cold water, whereby the mold may contract to closely conform to the metallic casting during the solidification thereof in order to give to the casting a uniform depth of chilled surface throughout the entire area thereof exposed to contact with the mold. For the circulation of the heatable and cooling medium I construct each sectional member of the mold with one or a plurality of passages 26, which are cored out during the process of casting or making the mold-section. In Fig. 2 of the drawings each section or member of the mold is represented as having two circulation-passages, which are separated or divided by an intervening wall, said passages extending nearly the full length of the mold-section. Each passage in said mold-section has ports for the ingress and egress of the circulation fluid, the ingress-port 27 being preferably located at the lower extremity of the longitudinal passage 26, while the egress-port 28 is at the upper extremity of said longitudinal passage. The heating and cooling fluids are to be supplied to the passages 26 after the mold shall have been assembled properly with respect to the bottom or drag and to the flask, and to provide for the supply and exit of the fluid to the mold the ports 27 28 open through the vertical face of the mold instead of through the upper and lower extremities of the mold-sections, whereby the ports lie radially and horizontally to the vertical axis of the mold-cavity. Any suitable appliance may be adopted for supplying the fluid to and conveying the same from the passages 26 of the chill-mold; but as this appliance constitutes no part of the present invention I have not considered it necessary to illustrate or describe the same.

Another feature of my improved sectional chill-mold consists in the provision of means by which the complemental members of the sections have interlocking connection along the radial meeting faces thereof, such interlocking joints tending to preserve the alinement of the mold-sections during the operation of assembling the mold with respect to the casting apparatus. Each member or section 19 is provided in one closed face 20 with a longitudinal rib 29, arranged midway the depth of the face and protruding a proper distance therefrom, while the other radial face 20 of said section or member has a longitudinal groove 30. The members or sections of the mold are placed in position for the closed radial faces 20 thereof to abut one against the other and for the rib 29 of one section to fit in the groove 30 of an adjacent section; but it is necessary to slip the final sectional member endwise into place to fill the gap between the contiguous sections, thus connecting all the sections by interlocking joints. After the mold sections or members shall have been properly brought together the bolts 23 may be fitted in the flanges, the springs 25 placed in position, and the nuts 24 screwed on the bolts to compress the springs and assist the bolts in holding the mold sections or members 19 in position to form a complete circular mold-cavity.

In the embodiment of the mold shown by Figs. 3 and 4 it is composed of a series or plurality of cored sections each having a single longitudinal passage 26, provided with the ingress and egress ports at its opposite ends and adapted to have interlocking connection along its vertical faces with adjacent sections; but the mold-sections themselves are not flanged, as in Figs. 1 and 2, because I have represented an equivalent clamping means for the flanges and bolts for holding the mold-

sections in their alined positions to form a complete circular mold-cavity. This locking means consists of a number of annular bands, a series of three of such bands being shown by Fig. 3 at 31 32 33, arranged to closely circumscribe the sectional mold at different points. Each circumscribing-band consists, preferably, of a number of sections equal in length to the width of the mold-sections and provided with radial flanges 34, said flanges on the band-sections arranged to meet and abut in the plane of the abutting spaces of the mold-sections, (see Fig. 4,) whereby the joints between the sections of the bands are coincident with the joints of the mold-sections. The bolts 35 pass through the flanges of the band-sections, each bolt having a nut 36 and a coiled spring 37. The circumscribing sectional bands have their members held yieldably together for the purpose of closely holding the complemental members of the sectional mold, and these sectional spring-controlled bands permit the members of the mold to expand and contract, so that the mold will closely follow the contour of the casting during solidification thereof.

The chill-mold embodying the principles of this invention and shown by Figs. 5 and 6 of the drawings consists of sections or members of a less number than the molds of Figs. 2 and 4, the mold of Fig. 6 comprising quadrantal sections each having a plurality of cored passages 26, each mold-section being shown by Fig. 6 as having a series of three passages separated by intervening bridge-walls and each passage having the ingress and egress ports 27 28. The quadrantal sections abut one against the other and are united by the interlocking joints; but in lieu of the spring-actuated bolts I have shown the mold-sections as having the radial longitudinal flanges 38, adapted to meet or abut laterally one against the other in pairs, such flanges being apertured for the reception of the fastening-bolts 39.

The chill-mold illustrated by Figs. 7 and 8 is shown as cast in a single piece of metal, the mold being designated in its entirety by the numeral 40. This mold has a continuous series of independent circulation-passages 41 cored therein during the operation of casting the mold, and each circulation-passage has the ports opening horizontally through the cylindrical surface of the mold for the ingress and egress of the heating or cooling fluid.

In each of the molds herein shown and as different embodiments of this invention I prefer to employ the trunnions 42, located at diametrically-opposite points, such trunnions adapted for the reception of means by which the mold may be conveniently handled.

In the end faces of the mold are the cavities 43, adapted to receive flanged ends of the bottom or drag 10, and the flask-section 15, as shown by Fig. 1, for the purpose of making a close joint between each part or element with which the mold engages.

After the mold is properly fitted to the bottom or drag and the flask a heating medium, such as steam, is admitted by the ports 27 to circulate through the passages 26 and escape by the ports 28, such fluid heating the mold up to the required temperature. The fluid metal may now be run into the apparatus through the runway and gate to fill the mold-cavity. Cold water may be admitted to the circulation-passages for contracting the mold during the operation of solidifying the casting, and the mold is thus caused to closely conform and follow the solidifying casting in order to impart a uniform chill to all surfaces of the casting exposed to contact to the mold.

Changes may be made in the form and proportion of some of the parts while their essential features are retained and the spirit of the invention embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described the invention, what I claim is—

1. An annular chill-mold comprising a series of segmental complemental members assembled into abutting relation on lines radial to the axis of the mold-cavity produced by the members, each member having a longitudinal circulation-passage which terminates in ports arranged to open through the external lateral face of the section, and means for confining the mold-sections yieldably in their abutting relation, substantially as described.

2. An annular chill-mold comprising a plurality of segmental complemental hollow sections, assembled into abutting relation on lines radial to the axis of the mold-cavity, and said sections coupled by interlocking joints at their abutting faces, the chamber in each mold-section forming a longitudinal circulating-passage which has ports opening through the lateral external face of the section, and means for yieldably holding the sections in place, substantially as described.

3. An annular chill-mold comprising a plurality of complemental hollow sections assembled into abutting relation on lines radial to the mold-cavity, interlocking ribs and grooves in the abutting faces of the mold-sections, circulation-passages in said mold-sections and having ports which open through the external faces thereof, and clamping devices for holding the mold-sections in yieldable abutting relation, substantially as described.

4. A chill-mold comprising a series of complemental members assembled into abutting relation on lines radial to the axis of the mold-cavity, and spring-controlled clamping devices connected with the mold members to hold them closely together, substantially as described.

5. A chill-mold comprising a series of complemental members each having passages and assembled in abutting relation on lines radial to the mold-cavity, bolts connecting the

mold members together, and springs fitted to said bolts for the latter to yield to the expansion or contraction of the mold, substantially as described.

6. A chill-mold comprising a series of complemental members each having passages and assembled into abutting relation, sectional bands arranged to circumscribe the sectional mold, and bolts provided with tension-springs and connecting the members of the sectional bands, the joints between the sections of each band lying coincident with the joints between the mold-sections.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLISON A. COCHRAN.

Witnesses:

J. ROSS COLHOUN,

THEODORE DALTON.