(No Model.) 2 Sheets—Sheet 1.

J. L. LEWIS.

MOLD FOR CASTING ROLLS, &c.

No. 574,616. Patented Jan. 5, 1897.

FIG. 1.

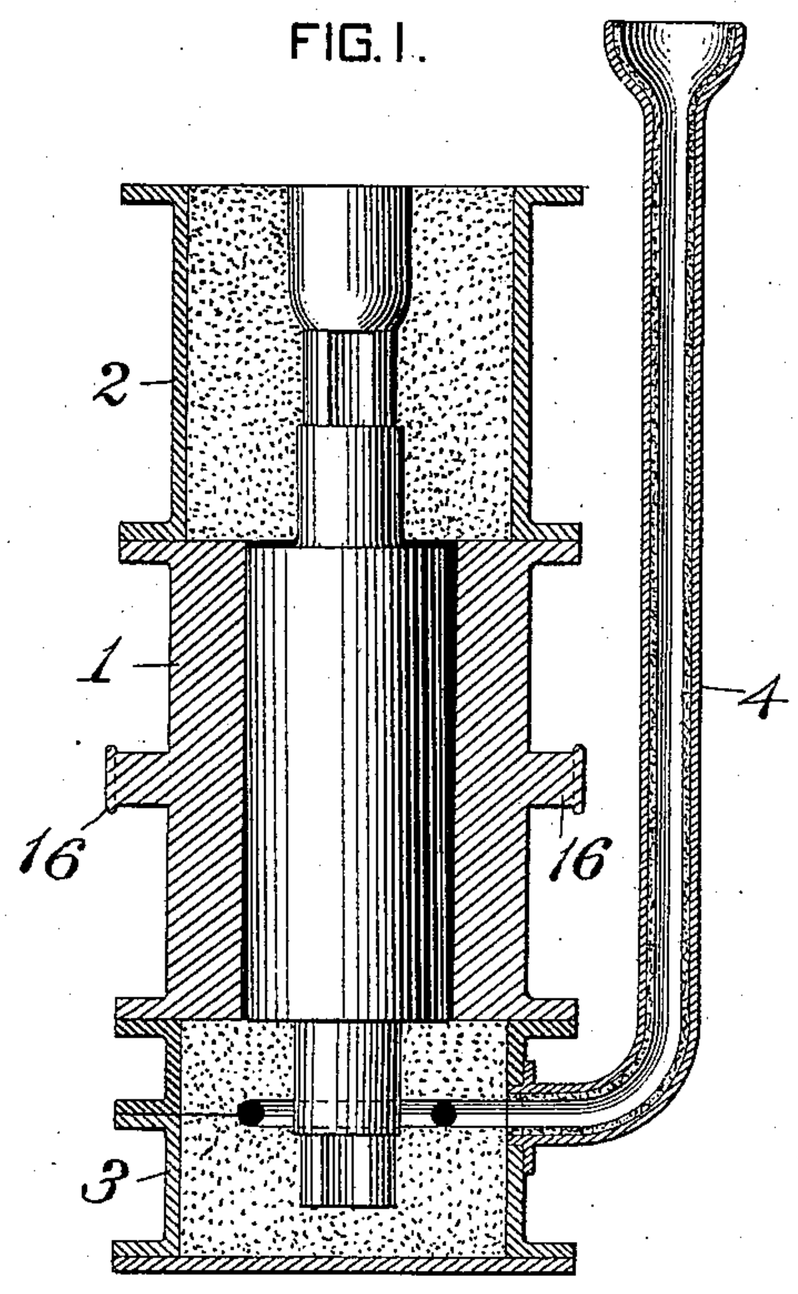

FIG. 2.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

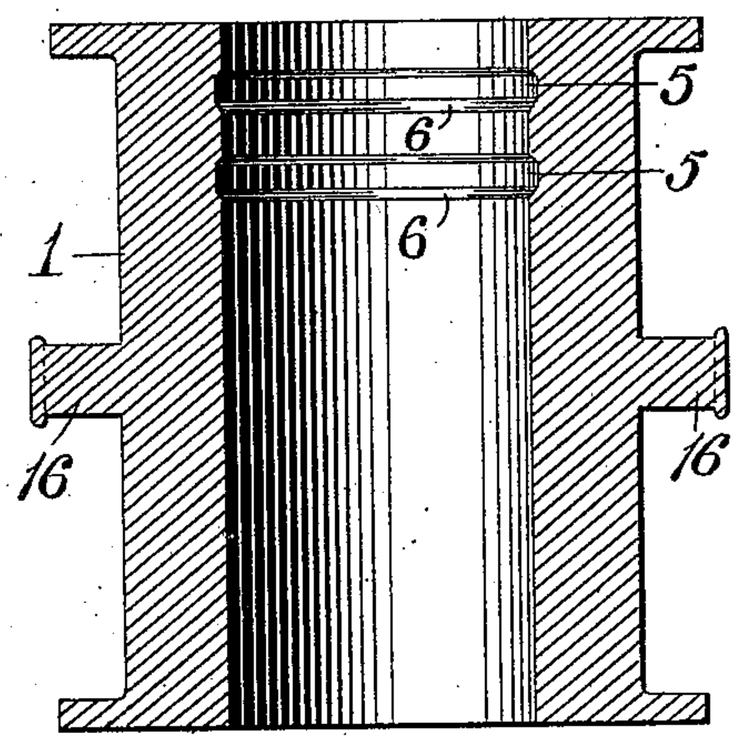


FIG. 4.

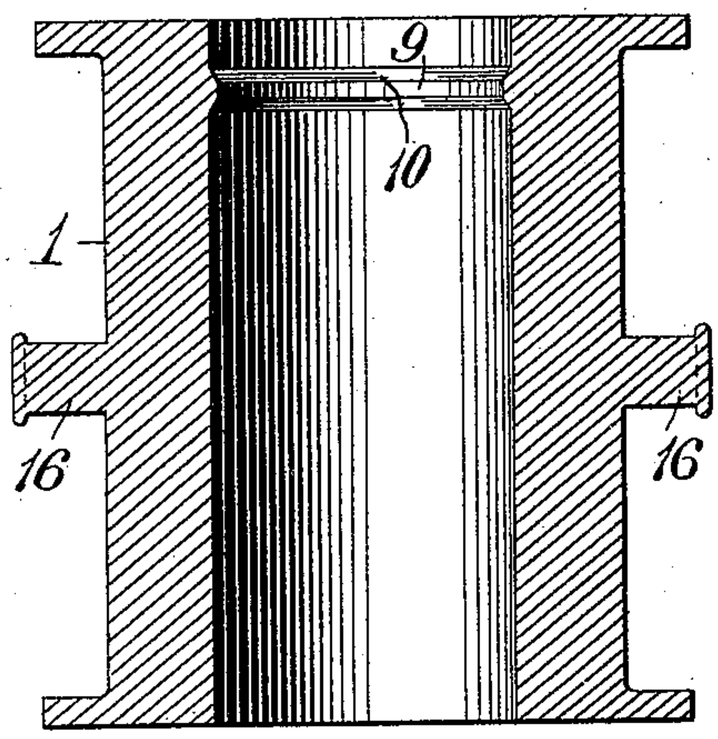


FIG. 5.

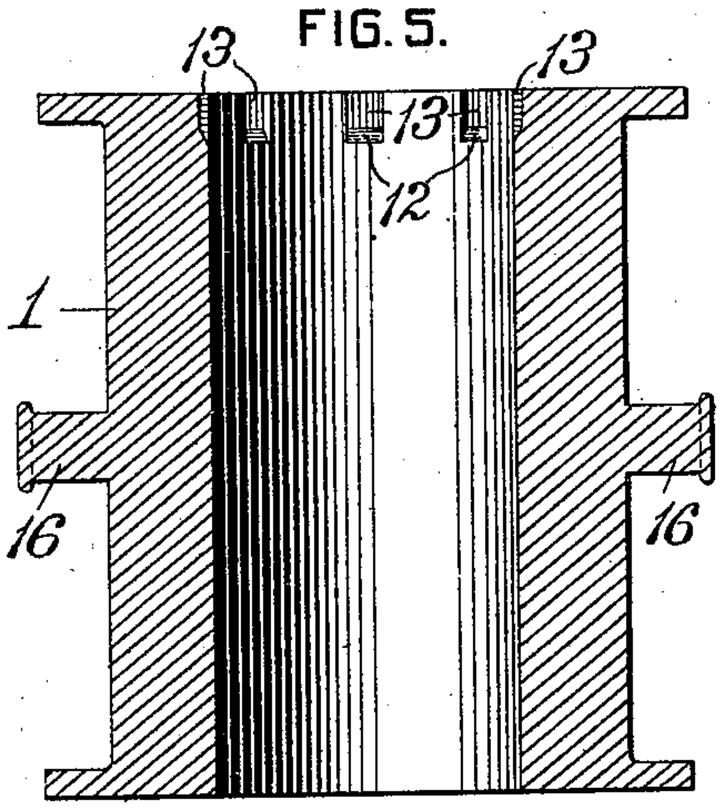


FIG. 6.

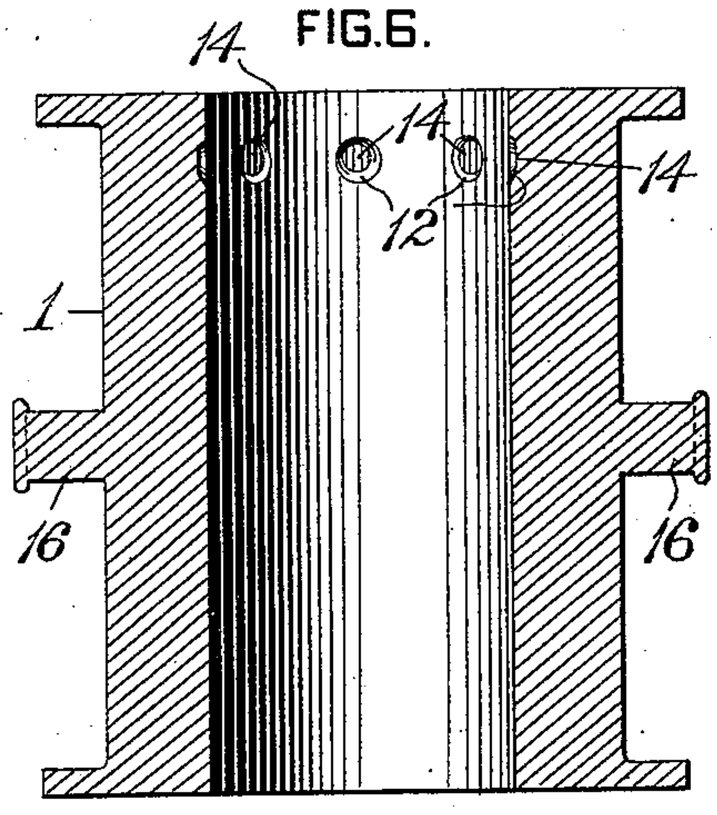
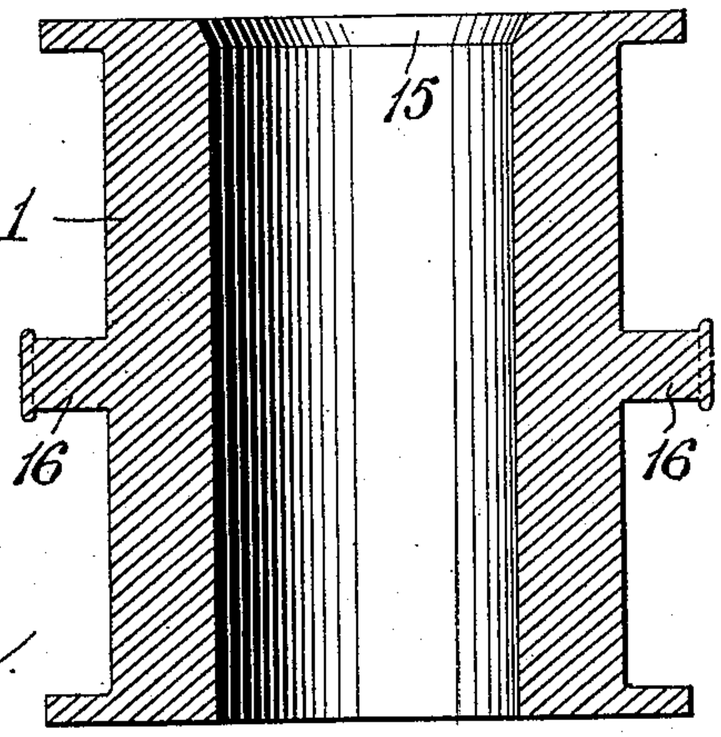


FIG. 7.



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UNITED STATES PATENT OFFICE.

JOHN L. LEWIS, OF PITTSBURG, PENNSYLVANIA.

MOLD FOR CASTING ROLLS, &c.

SPECIFICATION forming part of Letters Patent No. 574,616, dated January 5, 1897.

Application filed August 19, 1896. Serial No. 603,192. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. LEWIS, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Molds for Casting Rolls, &c., of which improvements the following is a specification.

The invention described herein relates to certain improvements in the casting of chilled rolls having plain or ungrooved surfaces.

As is well known among roll-manufacturers, it is nearly impossible to obtain at all times a uniform depth of chill at all points on the roll-surface. It is also well known that almost as soon as the fluid metal comes into contact with the inner wall of the chill the metal is solidified, forming a thin shell, while the metal within the shell remains liquid for a considerable time. The contraction which occurs on the formation of the thin shell of chilled iron draws the latter out of immediate contact with the mold-chill, so that such shell is subjected to considerable internal pressure due to the liquid column of metal, while nearly or entirely unsupported externally. This internal pressure against the unsupported shell frequently produces longitudinal cracks in the roll, rendering the latter useless except for scrap.

The object of the present invention is to provide for the maintenance of the cooling and solidifying metal in such position within the mold that all points on the surface of the roll shall be equidistant from the internal wall of the chill of the mold, or that the solidifying metal shall be held in such relation to the chill of the mold that an approximately uniform depth of chill may be obtained at all points.

It is a further object of the invention to provide a series of circumferential supports for the solidifying metal until such time as it is relieved from the internal pressure of the liquid column, or, in other words, until such time as the chilled shell shall have become strong enough by cooling to resist the fluid-pressure within.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a section of elevation showing the usual form of mold employed in casting rolls with the latter in position in the mold. Fig. 2 is a similar view having my improvements applied thereto. Figs. 3, 4, 5, 6, and 7 are sectional elevations of chills, illustrating different forms or means for the carrying out of my improvements.

As shown in Fig. 1, the mold now in general use consists of the cylindrical chill 1, the cope and drag 2 and 3, and the spout 4, which is connected to the drag, as shown. The cope and drag 2 and 3 contain, when prepared for casting, the dried loam-sand, in which the journals and coupling ends of the rolls are formed.

I have found that when a mold of the character or construction above described is filled with metal and the latter begins to contract during cooling and solidification the roll will frequently take an inclined position, that is, it will lean against the chill of the mold on one side, and consequently will be separated from it at other points. Wherever the roll remains in contact with the chill of the mold by reason of the bending or inclination of the roll-body the depth of chill may be considerable, while at those points which are not in contact the depth of chill will be less, such shallowness of chill being proportioned to the distance between the surface of the roll and the internal wall of the chill. It frequently occurs that the roll in cooling and contracting will change its position one or more times. Hence there will be one or more points having a considerable depth of chill and a corresponding number of points having lesser depth of chill. In order to overcome this inequality of chill, I provide for the maintenance of the roll centrally within the chill of the mold during cooling and solidification, so that all points on the surface of the roll will be equidistant from the inner wall of the chill of the mold. This centralization of the roll may be effected in different ways, as, for example, the chill of the mold may be so constructed as to be provided with a series of downwardly beveled or inclined shoulders, which will bear upon correspondingly-inclined shoulders formed on the roll during casting. During cooling and solidification the roll contracts longitudinally and diamet-

rically, and as the longitudinal contraction will necessarily produce a sinking or downward movement of the roll in the chill of the mold the inclined shoulders on the roll and chill of the mold will bear upon each other and hold the roll centrally within the chill of the mold. As the inclined shoulders on the chill of the mold and on the roll are in contact with each other, the thin shell first formed by the contact of the liquid metal with the inner wall of the chill of the mold will have ample external support to prevent rupture by the internal pressure. The inclination or bevel of these shoulders should be such as will not interfere with the natural or necessary movement of the roll due to contraction, or, in other words, care should be taken to prevent the roll hanging on the shoulders, as in such case the roll might be liable to be torn apart or otherwise injured.

In the construction shown in Figs. 2 and 3 one, two, or more grooves 5 are formed in the inner wall of the chill of the mold, and the lower edges of these grooves are beveled or inclined downwardly, forming shoulders 6. When the metal is poured in the mold, one or more circumferential bands, or a number of such projections 7 as may be provided for, will be formed upon the roll-body, having their lower edges inclined, as shown at 8. As the metal contracts in cooling and solidification the bands or projections 7 will be gradually drawn out from the annular grooves or recesses in the chill of the mold, and the settling down of the roll in the mold will cause the shoulders 8 on the roll to move along the correspondingly-inclined shoulders 6 on the chill, thereby maintaining the roll centrally within the chill.

As shown in Fig. 4, a band or circumferential projection 9 may be formed on the inner wall of the chill of the mold. said projection having its upper edge inclined, as at 10. This circular projection will form a recess in the roll, with its upper edge beveled or inclined corresponding to the inclination of the shoulder 10. As the metal contracts and the roll settles or moves longitudinally in the mold, *i. e.*, downward, the same centralizing action will occur as in the construction shown in Figs. 2 and 3.

In lieu of providing continuous shoulders on the inner wall of the chill of the mold, as shown in Figs. 2, 3, and 4, a series of independent shoulders 12 may be provided. As shown in Fig. 5, these shoulders 12 are formed by cutting notches 13 in the inner wall of the chill of the mold and suitably beveling the lower edges thereof. In Fig. 6 the shoulders 12 are formed by cutting or drilling conical cavities 14, having flat bottoms, in the wall of the chill of the mold. In Fig. 7 a suitably beveled or inclined shoulder 15 is formed at the upper end of the chill of the mold by beveling the mouth of same in the manner shown.

It will be readily understood by those skilled in the art that the recessing, notching, or cutting away of portions of the wall of the chill of the mold will result in the production of shoulders or projections on the roll, such shoulders or projections having bevels or inclines corresponding to similar bevels or inclines in the recesses, grooves, or cavities in the chill of the mold.

Care should be taken that the shoulders on the chill of the mold should be so proportioned as to height or their outstanding from the surface of the wall of said chill that the shoulders on the roll will be in contact therewith during contraction due to solidification, but when such contraction has ceased such shoulders will not prevent the removal of the chill of the mold from the roll by stripping or lifting it off the roll by the trunnions 16, formed on the outer sides of the chill of the mold.

It will be readily understood by those skilled in the art that the shoulders or grooves which are formed on or in the rolls during casting are comparatively slight and, being temporary, are removed when the rolls are turned, so that such shoulders or grooves are not to be confounded with the collars or grooves finally formed on or in rolls for reducing billets, rods, &c., and by the phrase "plain-faced rolls," as used in the following claims, I refer to the roll-body in its cylindrical state after the temporary projections or depressions, as the case may be, are removed in the ordinary turning operation.

It is characteristic of the preferred means for the practice of the invention described herein that advantage is taken of the movement or sinking down of the metal due to contraction to hold the roll in the desired relation to the wall of the chill of the mold, and also to maintain an external support for the thin shell of chilled iron.

I do not wish to limit myself herein to any particular means or construction whereby the roll is maintained or forced into a central position within the chill of the mold, as I consider it within the scope of my invention to employ any suitable means for effecting such an equalization of distance of the roll from the walls of the chill of the mold as will result in an equalization of the depth of the chill at all points in the roll.

I claim herein as my invention—

1. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner surface and supports for the casting constructed and arranged to bear on the surface of the casting during cooling and which, while permitting the longitudinal movement of the casting, will maintain the latter in a central position with reference to the mold, substantially as set forth.

2. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner surface, and supports constructed and arranged in such position as to be brought into contact with the surface of

the casting by the movement of the latter due to its contraction during cooling and solidification and which while permitting the longitudinal movement of the casting will maintain the latter in a central position with reference to the mold, substantially as set forth.

3. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold provided on its inner wall with one or more downwardly-inclined or beveled shoulders located at or near the upper end of the chill-mold and constructed and arranged to maintain the casting in a central position with reference to the mold and support the same externally during cooling and solidification and permit longitudinal movement thereof, the remaining portions of the inner wall of the mold being substantially smooth.

4. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner wall and provided with one or more annular shoulders having their edges downwardly inclined or beveled, one of said recesses being located at or near the upper end of the chill-mold, whereby the casting will be maintained in a central position with reference to the mold and supported externally during cooling and solidification, substantially as set forth.

5. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner wall provided with one or more downwardly-inclined or beveled shoulders constructed and arranged at or near the upper end of the chill-mold to maintain the casting in a central position with reference to the mold while permitting of a longitudinal movement thereof, and so proportioned with reference to the expected shrinkage of the casting during cooling substantially as described as to permit of the stripping of the mold from the casting after solidification, substantially as set forth.

6. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner wall and provided with one or more outstanding downwardly-inclined or beveled shoulders constructed and arranged at or near the upper end of the chill-mold to maintain the casting in a central position with reference to the mold while permitting of a longitudinal movement thereof, and so proportioned as to height or outstanding from the surface of the wall of said chill with reference to the expected shrinkage of the casting during cooling substantially as described as to permit of the stripping of the mold from the casting after solidification, substantially as set forth.

7. Means for producing plain-faced rolls with a practically uniform depth of chill, consisting of a chill-mold having a substantially smooth inner surface, and lateral supports constructed and arranged in such position as to be brought into contact with the surface of the casting by the movement of the latter due to its contraction during cooling and solidification and which while permitting the longitudinal movement of the casting will maintain the latter in a central position with reference to the mold, and will also brace or support the chilled shell of the casting during solidification as against internal pressure, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN L. LEWIS.

Witnesses:
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F. E. GAITHER.