F. KNADLER.

MANUFACTURE OF CAST STEEL CHAIN.

APPLICATION FILED MAY 4, 1918. RENEWED DEC. 13, 1920.

1,365,702. Patented Jan. 18, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

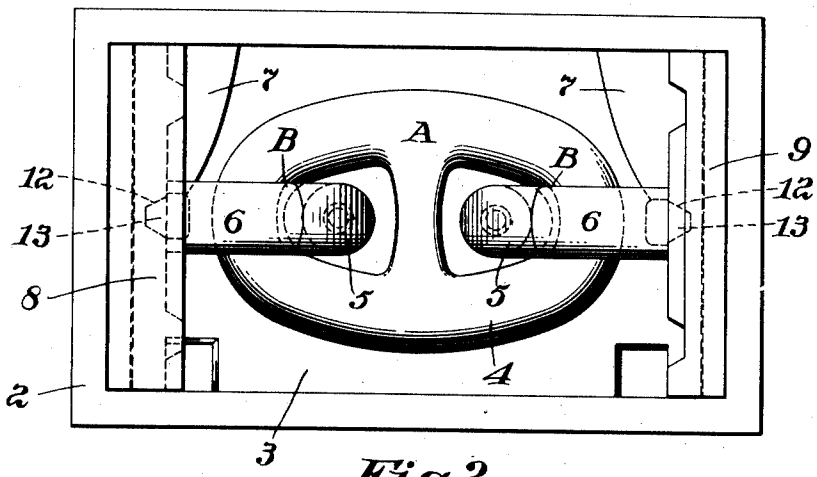


Fig. 2.

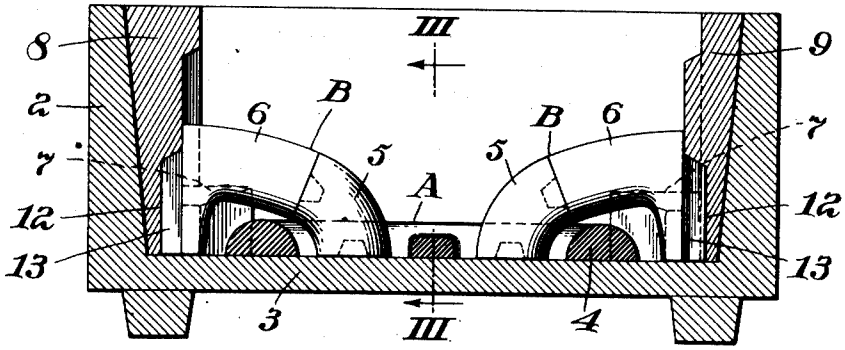
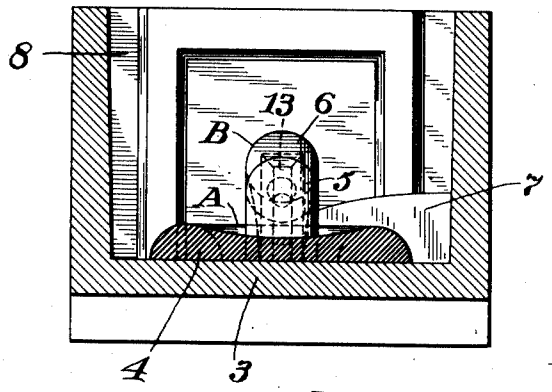


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 5.

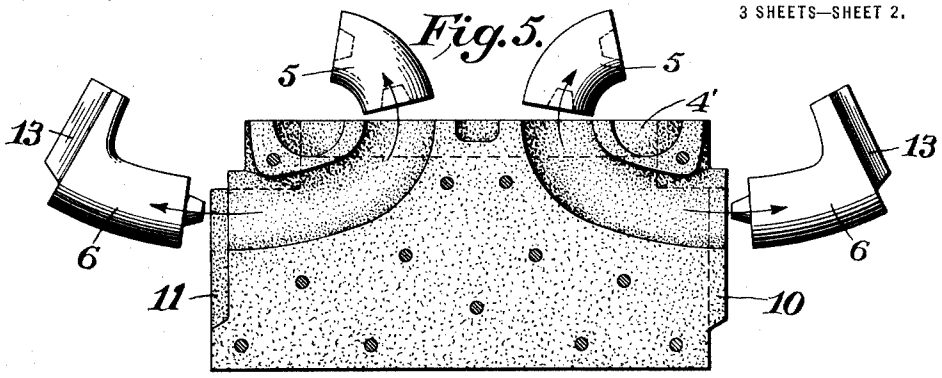
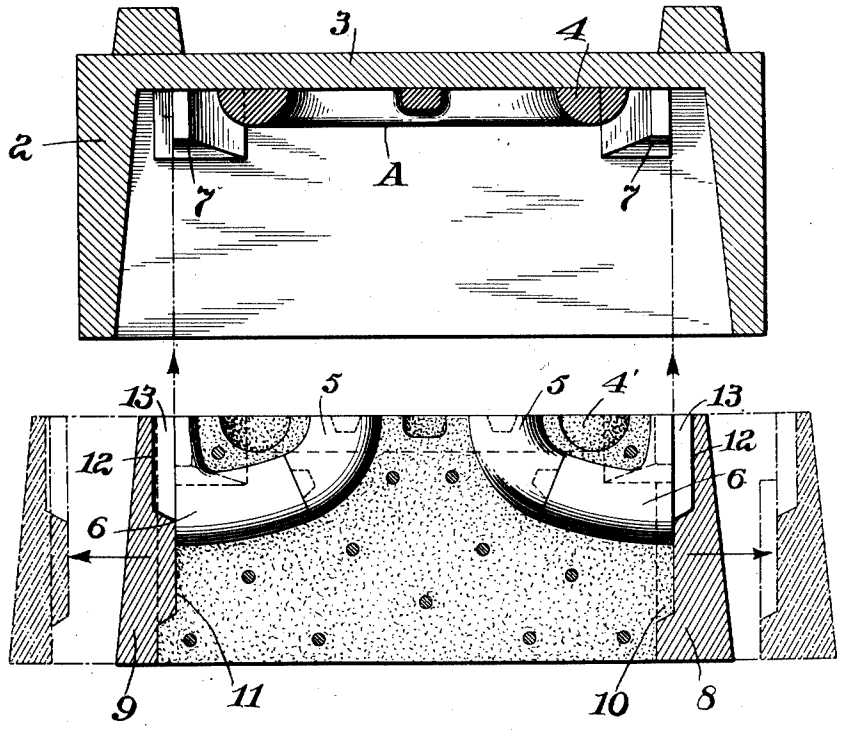


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 6.

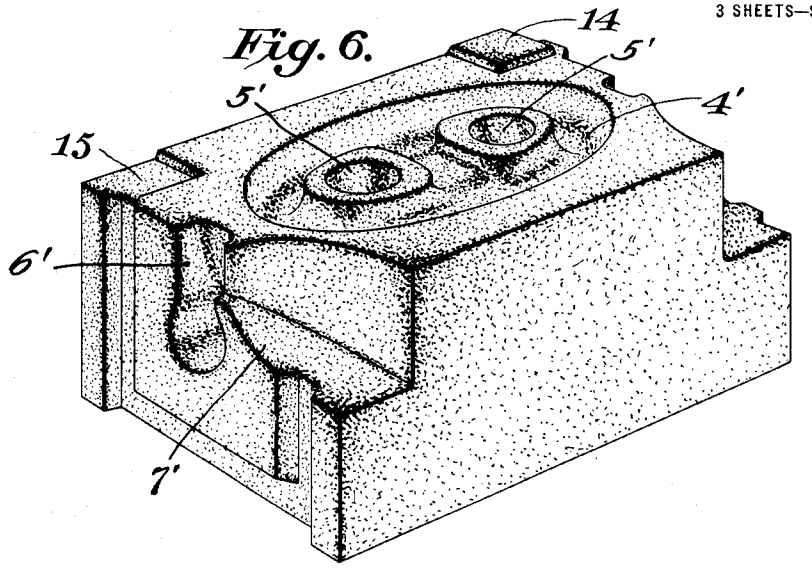


Fig. 7.

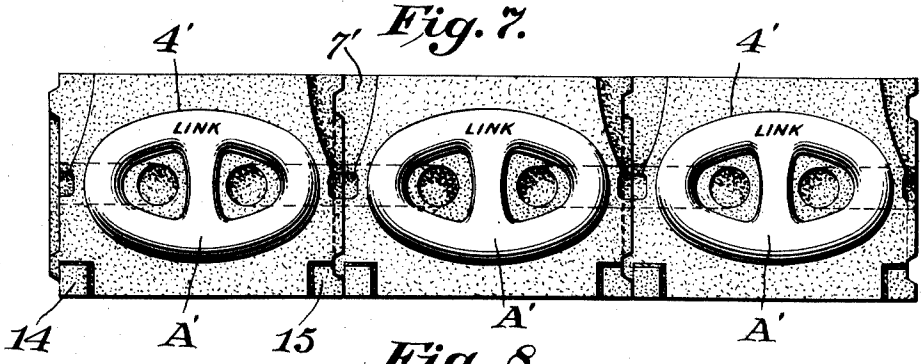
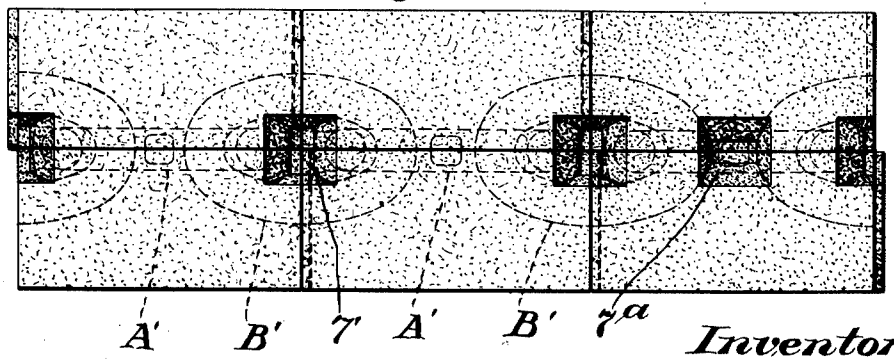


Fig. 8.



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Atty.

UNITED STATES PATENT OFFICE.

FREDERICK KNADLER, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL MALLEABLE CASTINGS COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

MANUFACTURE OF CAST-STEEL CHAIN.

1,365,702. Specification of Letters Patent. Patented Jan. 18, 1921.

Application filed May 4, 1918, Serial No. 232,462. Renewed December 13, 1920. Serial No. 430,558.

To all whom it may concern:

Be it known that I, FREDERICK KNADLER, a citizen of the United States, residing at Cleveland, Cuyahoga county, Ohio, have invented new and useful Improvements in the Manufacture of Cast-Steel Chain, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a plan of a mold box for the making of molds for carrying out my invention; Fig. 2 is a vertical longitudinal section thereof; Fig. 3 is a section on lines III—III of Fig. 2; Fig. 4 is a vertical longitudinal section of the mold box and mold after the box has been lifted; Fig. 5 is a similar section of the mold showing the removal of the pattern parts as indicated by the arrows; Fig. 6 is a perspective view of a completed quarter mold; Fig. 7 is an elevation of a series of quarter molds with preformed links in place; and Fig. 8 is a top plan of a series of completed molds ready for pouring.

My invention relates to the making of cast steel chain links in the form of a continuous chain and consists in casting the chain in sand molds without the use of inserted cores or mold parts. My invention also consists in the various steps which I shall hereinafter describe and claim.

In carrying out my invention for the manufacture of cast steel chain links interlinked with each other, the molds are formed in the mold box 2, which has a bottom or board 3 which may be integral therewith. Secured to the bottom 3 is the pattern 4, which corresponds to the form of one half a link A′ divided longitudinally. Loosely mounted also on the board 3, in a plane at right angles to the plane of the pattern 4, are the pattern pieces 5, 6, each pair of which comprises a quarter link pattern B. Each piece 6 also is in the form of one-fourth of the stud or intermediate connecting portion of the link pattern B. Also attached to the board 3 are the pieces 7, each of which forms an impression for one fourth of the gate 7′ through which a complete link impression B′ is poured.

In the ends of the box 2 are the loose members 8 and 9. The member 8 is intended to form a projection 10 on the end of the mold while the piece 9 forms a complementary recess 11 into which a corresponding projection 10 on an adjacent mold part is intended to be inserted to keep the mold parts in alinement. Each of the members 8 and 9 also has a recess 12 on its inner face which takes about a corresponding projection 13 on the piece 6 and serves to hold such piece firmly in position in the mold box. The end members 8 and 9 have on their outer faces sufficient draft or taper to permit the easy removal of the box from the mold after it has been inverted.

In forming a quarter mold in the mold box, the parts are placed in the positions shown in Figs. 1 and 2, and sand is rammed in and about the pattern pieces 4, 5 and 6. The box is then inverted and withdrawn, thereby removing the pattern piece 4 for the link A and the piece 7 for the gate as is shown in Fig. 4. Next, the members 8 and 9 are taken off the ends of the mold, and the pieces 5 and 6 can then be withdrawn, as is shown in Fig. 5, leaving a quarter mold completely formed, which may be baked if desired. In Fig. 6 a completed quarter mold is shown having an impression 4′ for a half longitudinal section of a link A′, two impressions 5′ for quarter sections of two complete link impressions B′, and also impressions 6′ for quarter sections of the stud portions of the link impressions B′.

A correspondingly shaped quarter mold may then be formed, which, when arranged side by side with quarter mold just described with the impressions 4′ in registry, completes the form of one-half of a mold. In order to maintain the quarter molds in alinement they may be provided with the projections 14 and recesses 15 in their meeting faces, which are formed by complementary depressions and projections on the bottom 3 of the box. A pair of similarly formed quarter molds are then placed with their meeting faces on the vertical line of division between the pair of quarter molds first mentioned, thus forming a complete connecting link impression B′.

When it is desired to form a section of chain links, a series of quarter molds are arranged end to end, as is shown in Fig. 7, and preformed links A′ are placed in the impressions 4′. A series of complementary quarter molds are next placed with their impressions 4′ facing the impressions 4′ on the first mentioned series of quarter molds. The sets of quarter molds are carefully

brought into alinement, the meeting edges about the gates 7′ are luted with a silicious material and the connecting link or links are then poured in the impressions B′. The molds are then broken up and a connected section of linked chain is found to have been formed. It is obvious that as many links as are desired may be connected together by the method which I have described.

If desired, the whole chain may be cast at one time by pouring the impressions 4′, as is shown at the right in Fig. 8, through the gates 7ª, thereby forming the links A′ as well as the connecting links in the impressions B′ in the same casting operation.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention in the use of such terms and expressions, of excluding equivalents for the steps and construction described and shown but recognize that the various modifications are possible within the scope of the invention claimed.

What I claim is:

1. The herein described process of making continuous cast chain which consists in forming at one ramming a mold section having in one face a half-link impression and quarter-link impressions contained within said mold section and opening into the said face and ends thereof, associating said mold section with complementary mold sections to form a complete mold and pouring the mold.

2. The herein described process of making continuous cast chain which consists in forming at one ramming a mold section containing in one face a half-link impression, and in forming by removable pattern pieces in a plane at right angles to the plane of said face and inclosed by said mold section quarter-link impressions, removing said pattern pieces, placing a preformed link in said half-link impression and associating said mold section and link with complementary mold sections to form a complete mold and pouring the mold.

3. The herein described process of making continuous cast chain which consists in forming a series of mold sections, each of said sections providing upon one face a half-link impression, and containing within the body of the section quarter-link impressions, inclosing between pairs of said mold sections preformed links within said half-link impressions, and registering the quarter-link impressions in one of said pairs of mold sections with similar impressions in an adjacent pair and pouring the mold thus formed.

4. The herein described process of making cast steel chain, which consists in forming in one plane an impression of a half longitudinal section of a link and two impressions of a quarter section of a link in a plane at right angles to the first plane, associating the quarter mold containing said impressions with three similarly made quarter molds to form a complete mold, the four sections containing in one plane impressions for precast links and in another plane impressions for a complete link and for two half links, associating other four part molds with the first named mold and uniting the precast links into a complete chain by pouring hot metal into the intermediate unfilled link impressions.

5. The combination in apparatus for casting chain links, of a flask; a bottom board; a half section of a link pattern secured to the said board; a pattern of a quarter section of a link mounted vertically and made in two parts; means for securing the parts together and to the flask so that when the sand is rammed around the pattern and the pattern is withdrawn a mold for a section of enchained links is formed and when a series of these mold sections is arranged side by side a mold for a complete series of enchained links is formed so that when the metal is poured a continuous chain is produced.

6. The herein described process of making cast steel chain, which consists in forming in a mold box at one ramming a mold section containing within it two separate part-link impressions each terminating into two of the surfaces thereof, and having a third part link impression on one surface thereof, removing the pattern pieces and mold box from the mold, placing the mold with its impressions in registry with other complementary impressions contained within molds similarly made to form impressions for a complete chain link and pouring the link.

7. The herein described process of making continuous cast chain, which consists in forming at one ramming a mold section containing two complete and separate quarter-link impressions the central longitudinal sections of which lie in an axial plane of said mold section, and having impressions on a face thereof to receive a preformed link the central longitudinal section of which lies in the plane of the said face and at right angles to the central longitudinal sections of the quarter-link impressions; associating said mold section with complementary mold sections similarly made to form a complete mold and pouring the mold.

8. A box for forming cast chain link molds comprising sides and bottom, a pattern piece to form a part impression for a central link secured on said bottom and pattern pieces to form part impressions for adjacent links arranged in a plane at right angles to the plane of the first mentioned pattern piece, each of said second mentioned

pattern pieces being made in parts, said parts being separable and withdrawable from within the mold through a side and bottom thereof respectively.

9. The herein described process of making continuous cast chain which consists in forming a series of mold sections, each section having at least two impressions at right angles one to the other, each of said impressions being for a portion of a chain link, one of said impressions being upon a face of the mold section and another of said impressions being contained within said mold section and opening into said face and ends thereof, associating said mold section with complementary mold sections to form a series of completed molds, and pouring the molds.

10. A box for forming mold sections for cast chain links comprising sides and a bottom, a pattern piece to form a part impression for a chain link, other pattern pieces to form a part impression for an adjacent link, said last named pattern pieces meeting at the point of change of radius of curvature of the second named link, and each of said last named pattern pieces being contained within the body of the mold section and being removable along its own curved axis from within the mold section.

FREDERICK KNADLER.