J. A. RATHBONE.

METHOD OF FORMING SAND MOLDS.

APPLICATION FILED DEC. 9, 1905.

949,498.

Patented Feb. 15, 1910.

3 SHEETS—SHEET 1.

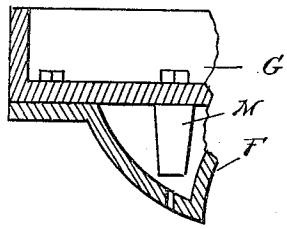

Fig. 1.

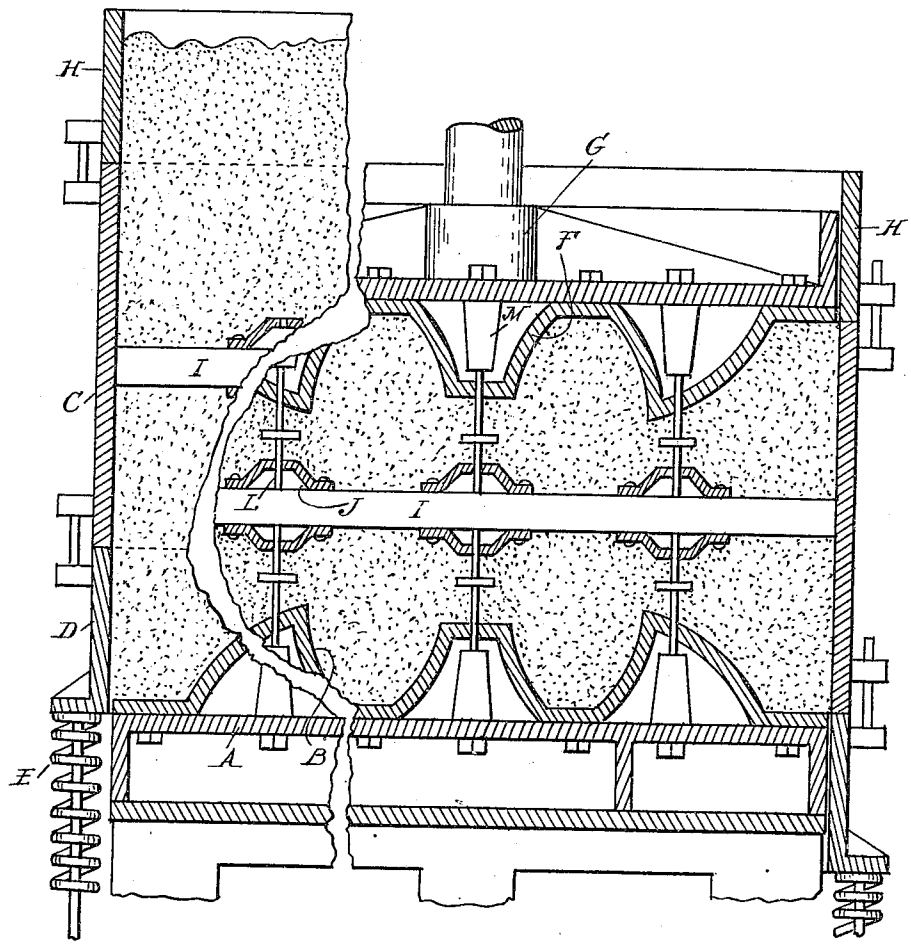

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Fig. 2.

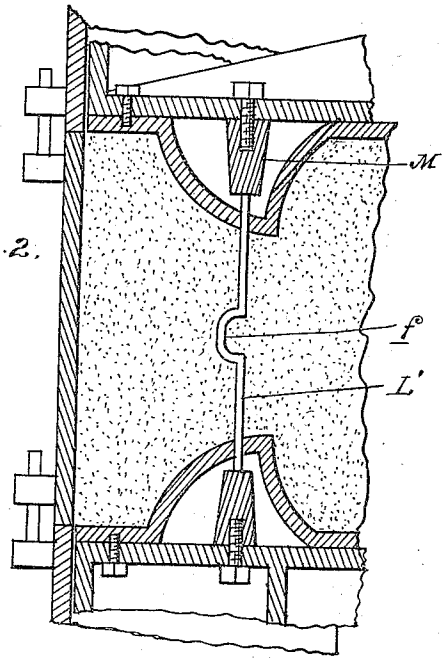


Fig. 3.

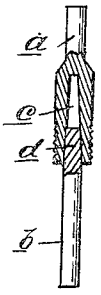


Fig. 4.

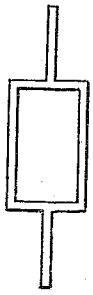


Fig. 5.

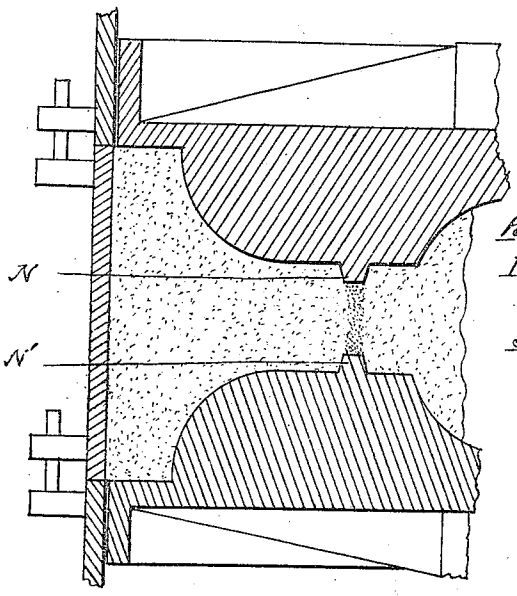
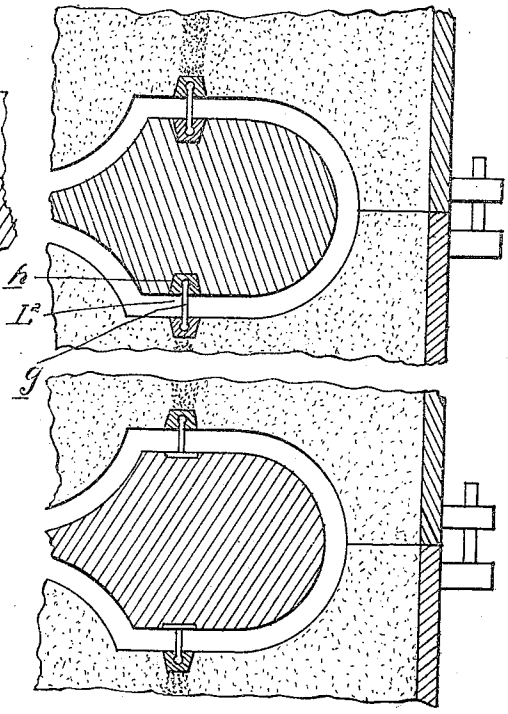


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

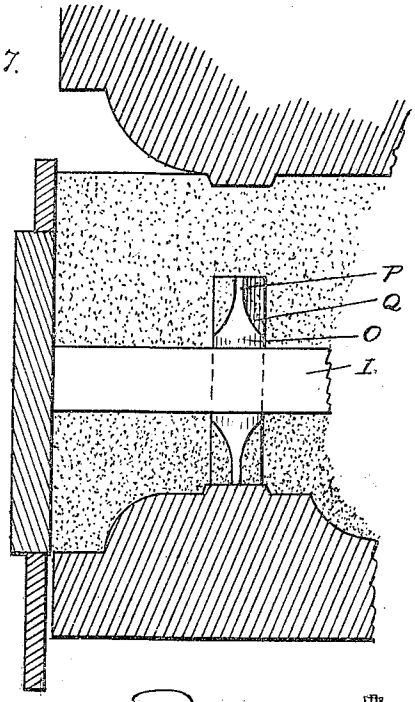


Fig. 8.

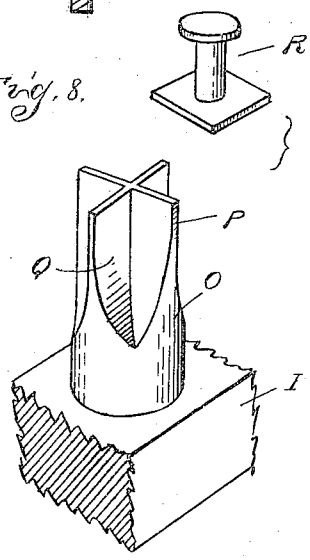
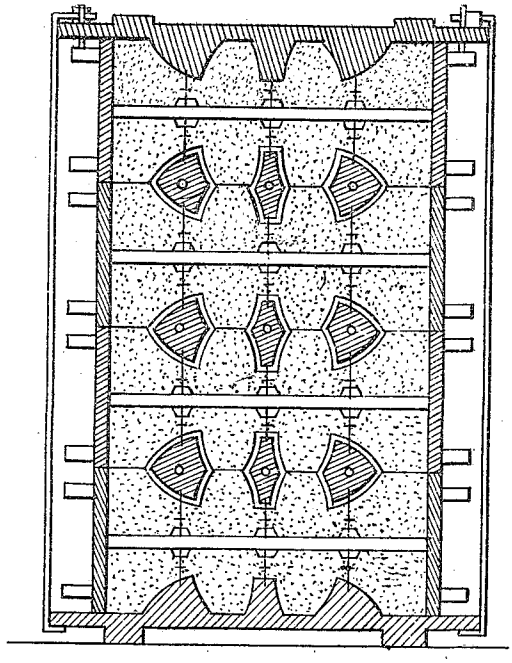


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN A. RATHBONE, OF UTICA, NEW YORK, ASSIGNOR TO RATHBONE MOLDING MACHINE CO., OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

METHOD OF FORMING SAND MOLDS.

949,498. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed December 9, 1905. Serial No. 291,018.

To all whom it may concern:

Be it known that I, JOHN A. RATHBONE, a citizen of the United States of America, residing at Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Methods of Forming Sand Molds, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention consists in an improved method of forming sand molds, being more particularly designed for use in the formation of multiple or series molds.

In the present state of the art, multiple or series molds have been employed for forming castings, the several mold cavities having complementary faces formed in the sand contained within adjacent mold flasks said flasks being then assembled in series. So far as I am aware, however, this system has not been employed, excepting for comparatively small work and has not been used for cored work employing cores of material size.

It is the object of the present invention to provide means for firmly anchoring the body of sand within the flask between the molding faces; and further to provide means for forming core supports within the body of sand, which are accurately positioned in relation to the molding faces. Thus, when the sections of the mold are assembled and the cores placed within the mold cavities, the latter will be held in exactly predetermined position.

In the drawings, Figure 1 is a vertical section through a mold flask, illustrating the method of compacting the sand to form the mold cavities and also showing one means of positioning the core supports; Fig. 2 is a similar view illustrating a modification; Figs. 3 and 4 illustrate different forms of chaplets which may be employed for the core supports; Fig. 5 is a view similar to Fig. 1, showing a modification in the method of forming a core support; Fig. 6 illustrates a mold formed in accordance with Fig. 5; Fig. 7 is a similar view showing another modification; Fig. 8 is a perspective view of a chaplet support, such as shown in Fig. 7; and Fig. 9 illustrates a completed series mold.

In carrying out my improved method, I preferably employ a molding machine of any suitable construction which is adapted to compact the sand within the flask by the impact of the pattern.

As illustrated in Fig. 1, A is the bed of the machine, upon which a suitable pattern face such as B is mounted and C is the mold flask positioned to surround the bed and pattern and resting upon a sand frame D, which is yieldably supported, as by the springs E. F is an opposed pattern face which is secured to the movable plunger G, and H is a second sand frame above the flask C.

The construction of the machine further than described is immaterial to the present invention and is therefore not illustrated but it is to be understood that in operation, the loose sand fills the flask and the two sand frames, after which the descent of the plunger G will cause the compression of the sand into the space inclosed by the flask, the springs E yielding to permit the downward movement of the latter. In this operation it is, however, important that the plunger should descend with sufficient velocity to throw the sand into all of the depressions of the pattern face, which effect cannot be successfully produced merely by pressure but requires an impact.

To sustain the body of sand between the mold faces, the flasks are provided with bars or other anchors I projecting inward centrally from their sides. These bars or anchors being in the center of the mass of sand, do not interfere with the compacting of the latter but, when the operation is completed, afford a strong support for the molded faces. Thus, these faces are firmly held against downward stress due to the weight of the molten metal, or upward stress due to flotation pressure, even where the mold cavities are of considerable size. Furthermore, when the mold sections are assembled in series, the intermediate sections will be as strong as the end sections, which is not the case where the sand is supported solely from the sides of the flask.

To sustain and accurately position the cores within the mold cavities, chaplets are necessary and the accuracy of the work depends upon the placing of these chaplets so that their inner ends will project an exactly predetermined distance within the mold cavity. Ordinary methds of positioning the chaplets are not adapted to use where the sand is compacted by impact of the pattern.

Thus, if a chaplet bearing of ordinary construction were placed within the mold flask, as, for instance, upon the bar I, it would form an obstruction to the movement of the sand during compression and would result in the formation of a hard spot, preventing the opposed patterns from coming the required distance from each other and destroying the accuracy of the work. The hard spot in the sand also frequently causes the mold to "blow." I have avoided this difficulty by providing means for accurately positioning the chaplets without interference with the flow of the sand and which may be accomplished in several different ways.

As illustrated in Fig. 1, the chaplets are positioned during the compression of the sand by providing guides J upon the cross bar I, with which the inner ends of the chaplets L may be engaged. The patterns are also apertured in alinement with these guides, so as to permit the end of the chaplet to pass therethrough and into contact with a block or chair M, these blocks being secured respectively to the bed A and plunger G. The length of chaplets used is preferably slightly in excess of that required to project the proper distance into the mold cavity and thus, during the descent of the plunger, the blocks M will impinge against the ends of the chaplet before the end of the movement and will cause an upsetting or compression of the chaplet to reduce it to the proper length.

In Fig. 3, one form of compressible chaplet is shown, which is formed of two sections *a b* provided respectively with a socket *c* and an engaging shank *d*.

Another form is illustrated in Fig. 4, in which, intermediate the ends of the chaplet, there is a laterally bent portion permitting of compression. These and various other forms of chaplet are adapted for use with the method above described.

In Fig. 2, a modification is illustrated in which the chaplet L′, instead of abutting against the bar I, extends completely through the body of the sand and is positioned by compression between the opposed blocks M on the bed and plunger. With this latter construction, the chaplet must be sustained by the body of the sand and to this end is provided with a laterally projecting central anchor *f*.

Another modification is illustrated in Fig. 5, in which the opposed patterns are provided with chaplet prints N N′ in alinement with each other and which extend inward beyond the pattern face. During the compression of the sand, these prints form a hard spot therebetween which will afford a support for the chaplet. The chaplet L^2, as illustrated in Fig. 6, is provided with a middle portion *g* and an end portion *h*, the latter being formed of baked sand and of a shape to fit the cavity formed by the prints N N′. Thus, these chaplets when placed in position, will form with the baked sand portion *h*, the complementary face of the mold cavity and, by reason of the wide bearing of said portion *h* which is supported upon the hard sand, the metallic chaplet will be held from displacement and in accurately predetermined position.

In Figs. 7 and 8, another modification is illustrated in which core supporting bearings are formed directly upon the bar I, being either integral therewith or formed of a separate piece rigidly attached thereto. These bearings O are so formed that they will cut through the sand during the descent of the plunger and will therefore not interfere with the free flowing of the sand. As illustrated in Fig. 7, the chaplet bearing is formed by tapering the end of the projecting member O, so as to form a knife-edge P, which, as illustrated, is in the shape of a cross. The tapering sides Q extending from the knife-edge, will laterally deflect the sand but the sharpened edges will nevertheless afford a stable support for the base of the chaplet such as R.

In all of the various modifications above referred to, the core supports are accurately positioned during the compacting of the sand so that the chaplets will extend a predetermined distance into the mold cavity and will accurately position the core.

What I claim as my invention is:—

1. The method of forming sand molds which consists in compacting sand within a flask between opposed patterns to form opposite molding faces for adjacent mold cavities and in simultaneously positioning in predetermined relation and within the body of the compacted sand, between said molding faces, a supporting member.

2. The method of forming sand molds which consists in compacting sand within a flask between opposed patterns to form opposite molding faces for adjacent mold cavities and in simultaneously positioning in predetermined relation to said faces core supports.

3. The method of forming sand molds which consists in compacting sand within a mold flask between opposed patterns to form the molding faces for adjacent mold cavities and in simultaneously positioning and anchoring a chaplet within the sand so as to have a portion thereof projecting into the mold cavity.

4. The method of forming sand molds which consists in compacting sand within a mold flask between opposed patterns to form the molding faces for adjacent mold cavities and in simultaneously positioning a chaplet within the sand and in adjusting the length thereof by end compression.

5. The method of forming sand molds

which consists in compacting sand against a patterned face and in positioning a supporting member for a molding face other than that formed by the compacted sand by forcing said member through the sand.

6. The method of forming sand molds which consists in compacting sand against a patterned face and simultaneously forcing a supporting member for a molding face other than that formed by the compacted sand through the sand to position the same.

7. The method of forming sand molds which consists in relatively moving a flask and a pattern to compact sand in the flask against the pattern, and in simultaneously positioning a supporting member for a molding face other than that formed by the compacted sand.

8. The method of forming sand molds which consists in relatively moving a flask and pattern to compact sand in the flask against said pattern, and simultaneously positioning and compressing endwise a core support.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. RATHBONE.

Witnesses:

JAMES P. BARRY,

EDWARD D. AULT.