A. B. MOYER.

METHOD OF AND APPARATUS FOR MAKING STEEL CASTINGS.

APPLICATION FILED JULY 26, 1912.

1,053,854.

Patented Feb. 18, 1913.

3 SHEETS—SHEET 1.

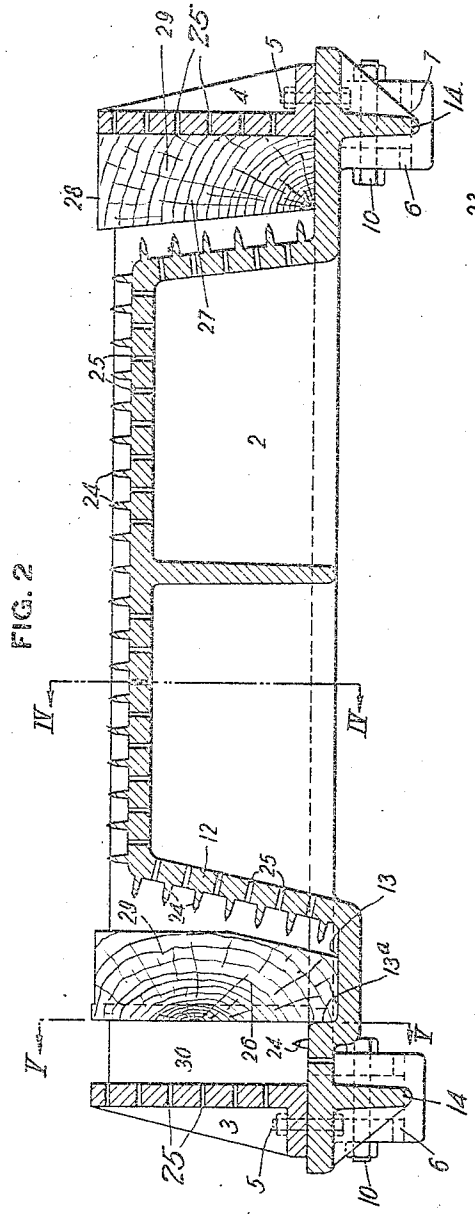

FIG. 2

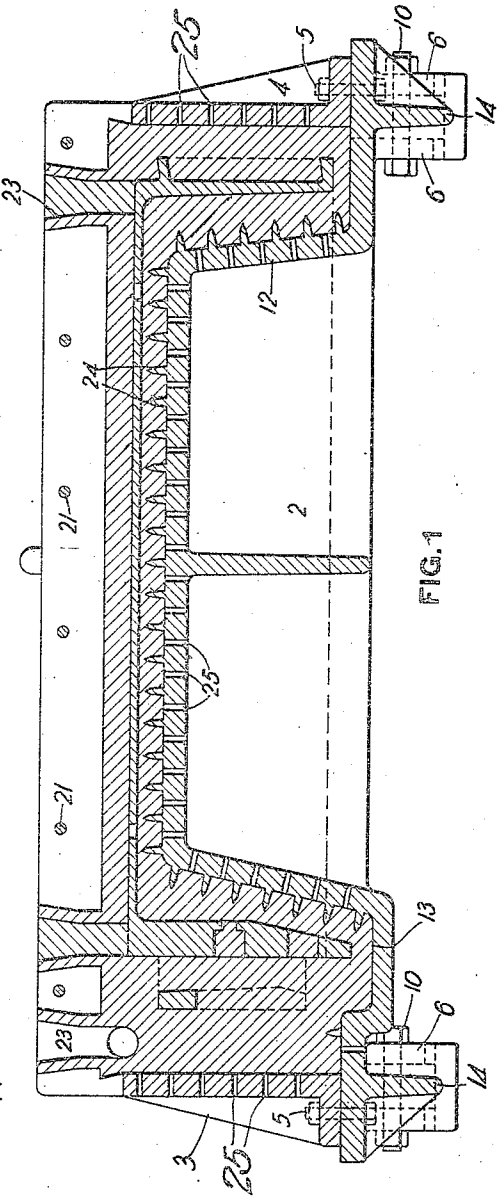

FIG. 1

WITNESSES

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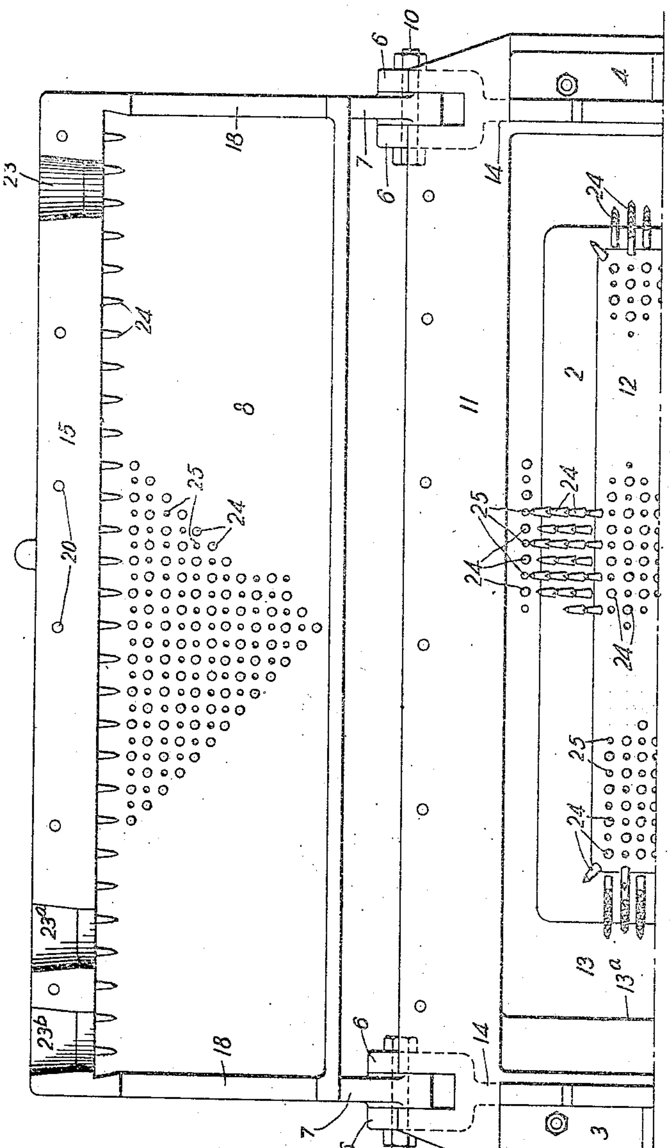

FIG. 3

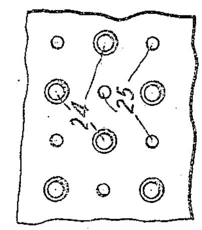

FIG. 7

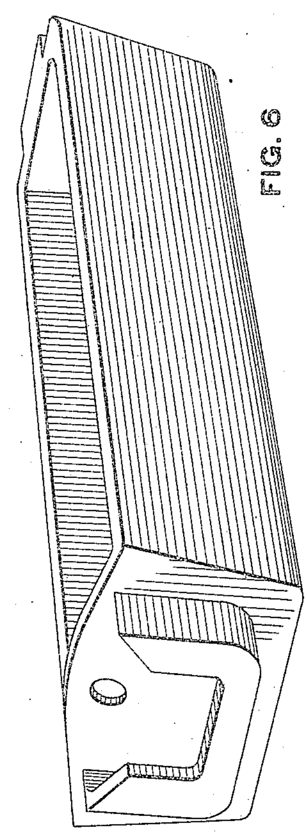

FIG. 6

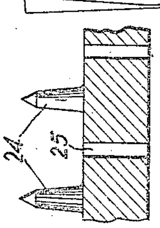

FIG. 8

WITNESSES

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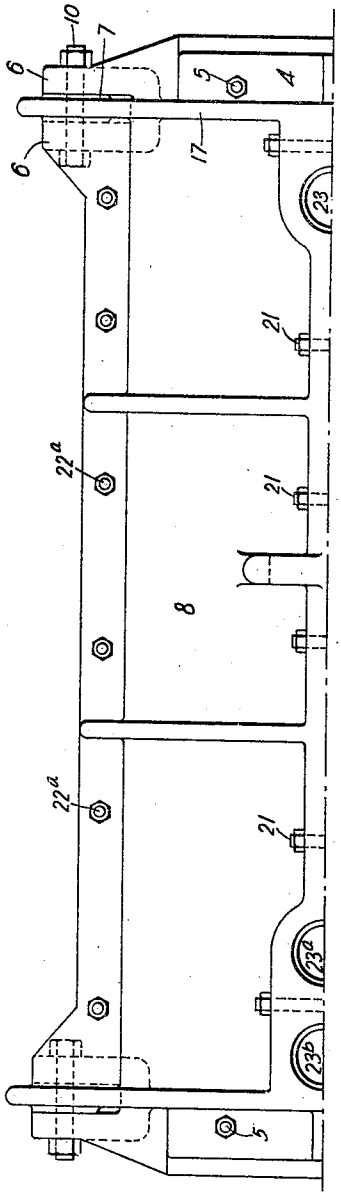

FIG. 5

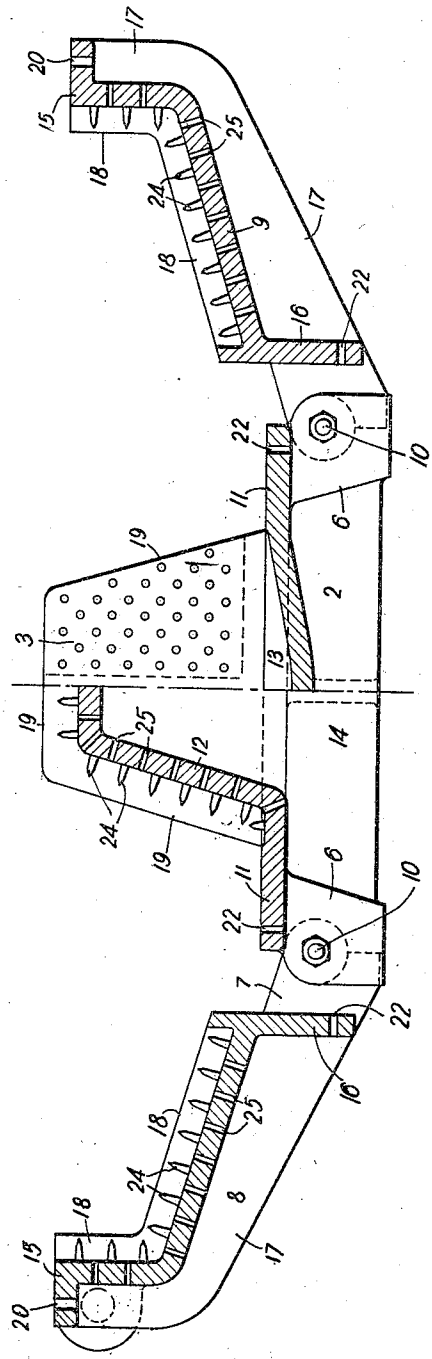

FIG. 4

WITNESSES

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR MAKING STEEL CASTINGS.

1,053,854. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed July 26, 1912. Serial No. 711,628.

To all whom it may concern:

Be it known that I, AMON B. MOYER, a citizen of the United States, residing at Munhall, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Method of and Apparatus for Making Steel Castings, of which the following is a specification.

My invention relates to the manufacture of steel castings and more particularly relates to the manufacture of integrally cast charging boxes used in charging open hearth furnaces and to the construction and arrangement of the apparatus used in molding and casting such boxes.

One object of my invention is to provide an improved method of making the sand molds for making steel castings whereby the use of green sand molds in the manufacture of steel castings is made possible and is effected in a safe and economical manner and whereby continued use of the flask is had as often as is required or found necessary in forming a succession of molds and castings.

Another object of this invention is to provide a new and useful method of forming sand molds and securing the cores in place therein by the use of which the manufacture of cored steel castings in green sand molds is accomplished.

A further object of the invention is to provide a flask of improved construction having novel means whereby the sand molds are formed therein without the use of patterns and the necessity of making patterns is avoided and overcome.

A still further object of my invention is to provide a flask of improved construction having novel means by which the operation of removing the formed castings from the flask is facilitated.

Still further objects of my invention will appear hereinafter as the invention is more fully disclosed in the specification and pointed out in the appended claims.

Referring to the accompanying drawings forming part of this specification, Figure 1 is a longitudinal section showing a flask constructed and arranged in accordance with my invention, this figure showing the flask with a charging box therein after the completion of the mold forming and the casting operations. Fig. 2 is a similar longitudinal sectional side elevation with the flask sections as positioned during the mold forming operation preparatory to each casting operation. Fig. 3 is a half plan of the flask after completion of the mold forming operations as assembled in readiness for the casting operation. Fig. 4 is a sectional end elevation, the left hand half of the section being taken on the line IV—IV of Fig. 2, and the right hand half on the line V—V of Fig. 2, showing the flask in its open position or its position during the mold forming operations. Fig. 5 is a half plan of the open flask, the sections being as positioned during the mold forming operations. Fig. 6 is a perspective view of a charging box (the article for which the particular form of flask shown is adapted for use). Fig. 7 is a plan and Fig. 8 a sectional detail on an enlarged scale, showing the construction and arrangement of the projecting pins or spikes and the vent holes alternating therewith with which the inner surfaces of the flask are preferably covered when made in accordance with my invention.

The particular apparatus illustrated in the drawings is constructed and arranged for use in making hollow steel castings forming charging boxes for use in handling solid materials charged into open hearth furnaces.

In the drawings the numeral 2 designates the bottom member of a sectional flask having the end members of the flask 3 and 4 rigidly secured on the ends thereof by bolts 5. The bottom member 2 has downwardly extending lugs or ears 6 to which the similar lugs or ears 7 on the hinged members 8 and 9 forming the sides and top of the flask are secured by means of bolts 10 in fastening the sides 8 and 9 to the bottom 2. The bottom member 2 has a flange portion 11 formed integrally with and surrounding the lower marginal edge of a hollow raised portion 12 and a depression or recess 13 is located in the flange portion 11 adjacent to one end of the bottom member 2, which is provided for a purpose described later. The lugs 6 on opposite sides of the bottom member 2 are connected by a stiffening rib 14 extending transversely across the bottom member.

The members 8 and 9, each of which forms a side and part of the top of the sectional flask, are Z-shaped in cross section (see Fig. 4) and each of these members has a flange 15 on one marginal edge, these flanges contacting with each other when the flask

sections are assembled in position for pouring. Flanges 16 on the opposite marginal edge engage with the upper face of the flange portion 11 of the bottom member 2 when the flask is in assembled position in readiness for the casting operations. The ends of the members 8 and 9 have marginal flanges 17 thereon and the inwardly projecting edges 18 of the flanges 17 are formed to the exact size and contour of the outer surface of the charging boxes made with the apparatus shown in the drawings, as will be explained hereinafter. The marginal top and side edges 19 of the end members 3 and 4 also are of exactly the same size and contour as the outer surface of the charging boxes being made, the edges 19 of the end members being in engagement with the edges 18 on the members 8 and 9 when the flask members are in closed position as in the casting operations. The engaging flanges 15 on the members 8 and 9 have registering holes 20 for the fastening bolts 21 by which the members 8 and 9 are temporarily fastened together during each casting operation and the flanges 16 on the side members 8 and 9 have holes 22 registering with similar holes in the flange 11 on the bottom member 2 through which the bolts 22ª extend in temporarily fastening the side members 7 and 8 rigidly to the bottom member 2, as is preferably done in assembling the flask sections for the pouring operations.

The meeting faces of the flanges 15 on the top of the flask have semi-circular registering grooves therein which form gates 23, 23ª and 23ᵇ through which the metal is poured into the molds in the flask in casting the charging boxes.

The top, side and end surfaces of the raised portion 12 of the bottom member 2 and also the inner surfaces of the side members 8 and 9 are studded with a series of integral inwardly projecting tapering pins or spikes 24 and between the spikes 24 is a series of openings or holes 25 forming vents for the molds during the casting operations. The end members 3 and 4 of the flask also are provided with a series of vent-holes 25.

When making charging boxes like that for which the apparatus shown and described is particularly constructed, dry sand cores must be used in order to form the cored recesses on the outer end surfaces of such charging boxes, and as in making castings with my improved flask and by my improved method a pattern is not used, it is necessary to provide means for sweeping the part of the mold which forms the interior of the charging boxes. For this purpose I provide removable blocks 26 and 27 which are placed in position on the upper face of the flange 11 of the bottom member 2 during the mold forming operations. These blocks have their side and top edges 28, 29 formed to exactly the contour and size of the interior of the charging box being formed. The block 26 is seated within the depression or groove 13 located at one end of the bottom member 2 with the outermost surface of the block engaging one side surface 13ª of the groove 13 when positioned on the bottom member 2, and block 27 is positioned on the flange 11 at the opposite end of the bottom member 2 with its outermost surface in engagement with the end member 4 of the flask.

In forming molds with my improved apparatus and in accordance with my improved method the flask sections are assembled and connected in the open position shown in Figs. 2, 3 and 4. A quantity of sand is then rammed in the members 8 and 9 and on the spiked surfaces of the raised portion 12 of the bottom member 2. The filler blocks 26 and 27 are then placed in position on the bottom member 2 and the space 30 between the adjacent faces of the end member 3 and the block 26 (see Fig. 2) is rammed with sand to form a backing to hold and cause the block 26 to remain in the position in which it is placed. A straight edge is then employed with its ends in contact with the edges 28 and 29 defining the width and height of the blocks 26 and 27 and is drawn over the edges of these blocks in such manner as will wipe or sweep off any surplus sand rammed on the spiked surface of the bottom member 2 and projecting above the plane or planes of the marginal edges of the blocks. In this way the sand is formed in the flask to the exact size and contour necessary to make the interior of the castings of the desired shape. The straight edge is also employed with its edge in engagement with the edges 18 of the flanges 17 on the opposite ends of the member 9 and likewise on the member 8 to remove surplus sand rammed on the inner or spiked surfaces of the member 8 and of the member 9, these operations forming the mold in the flask sections 8 and 9 exactly to the size necessary to produce castings having the desired contour and size on their exterior. The blocks 26 and 27 determine the length to which the casting is formed, sand being rammed between the adjacent end surfaces of the blocks and the ends of the raised portion 12 on the bottom member 2 in forming the mold. After the mold has been formed in this manner the blocks 26 and 27 are carefully removed from the bottom member 2 and are replaced by dry sand cores of the same size and outline. These cores, of course, will have the recesses formed therein necessary to suit the particular article being made and will be made beforehand in the usual known manner. After the cores have been placed in position on the bottom member 2 of the flask and

the sand surfaces of the now formed sectional mold have been slicked in the customary manner, the hinged members 8 and 9 are swung on the bolts 10 in the lugs 6 and 7 forming the hinges until these members are in the position shown in Figs. 1 and 5, in which position the flanges 15 on the members 8 and 9 are in contact and the edges 18 of the flanges 17 are in engagement with the marginal edges 19 of the end members 3 and 4. The bolts 21 and 22ª are then tightened in place in the holes therefor in these flanges and the apparatus is then in readiness for the pouring operation. The gates are formed in the sand forming the mold within the flask, these operations being carried out in the usual manner. The molten steel is then poured into the so-formed mold and a casting is thereby formed. The bolts 21 and 22ª in the flanges 15 and flanges 16 are then loosened and the hinged side and top members 8 and 9 of the sectional flask are folded back until again in the position shown in Fig. 4. When sufficiently cooled, the formed casting is then removed from the bottom member 2 and after the sand is removed and the flask members 2, 3 and 4 are cleaned the apparatus is again in readiness for another mold forming operation. The above described operations are then repeated as often as desired in making the molds forming the castings.

The advantages of my invention will be apparent to those skilled in the art. The apparatus is simple and is capable of continued use in the mold forming and casting operations. By the employment of the metal flask with a thin layer of green sand in the mold and by arranging the parting surfaces of the flask so as to define the contour of the inner and outer surfaces of the molds, the manufacture of steel castings in green sand molds is readily accomplished in a safe and economical manner.

Modifications in the construction and arrangement of the parts may be made without departing from my invention. Articles other than the charging boxes shown may be made with my improved apparatus and in accordance with my novel method, and other variations may be made within the scope of my invention as defined in the claims.

I claim:—

1. Apparatus for forming steel castings comprising a green sand mold made in sections, a sectional flask rectangular in outline in which said mold is formed, the meeting edges of the flask sections defining the outline of the exterior of castings formed in said flask, and fastening means whereby the flask sections are secured together during the casting operations.

2. Apparatus for forming steel castings comprising a green sand mold made in sections, a sectional flask rectangular in outline in which said mold is formed, the meeting edges of the flask sections forming the parting lines of the sectional molds formed therein, and fastening means whereby the flask sections are secured together during the casting operations.

3. Apparatus for forming steel castings comprising a green sand mold made in sections, a sectional flask rectangular in outline in which said mold is formed, the meeting edges of the flask sections forming the parting lines of the sectional molds formed therein and defining the outline of the exterior of castings formed in said flask, and fastening means whereby the flask sections are secured together during the casting operations.

4. Apparatus for forming steel castings comprising a sectional green sand mold, a sectional flask rectangular in outline in which the mold sections are formed, and fastening means whereby the flask sections are held in assembled position during the casting operations, the meeting edges of the flask sections forming the parting lines of the sectional molds formed therein and conforming to the transverse outline of the exterior side surfaces of castings formed in the molds in said flask.

5. Apparatus for forming steel castings comprising a sectional green sand mold, a sectional flask in which the mold sections are formed, removable members arranged for positioning in a flask section in determining the length of the molds and the castings formed therein, the meeting edges of the flask sections forming the parting lines of the sectional molds formed therein and conforming to the transverse outline of the exterior of the castings formed in said flask, and fastening means whereby the flask sections are held in assembled position during the casting operations.

6. Apparatus for forming steel castings comprising a sectional green sand mold, a sectional flask in which the mold sections are formed, removable members arranged for positioning in a flask section in determining the length of the molds and the castings formed therein, dry sand cores to replace the removable members during the casting operations and determine the length of the castings formed in said molds, the meeting edges of the flask sections forming the parting lines of the sectional molds formed therein and conforming to the transverse outline of the exterior of the castings formed in said flask, and fastening means whereby the flask sections are held in assembled position during the casting operations.

7. Apparatus for forming steel castings comprising a sectional green sand mold, a sectional flask in which the mold sections are formed, removable members arranged

for positioning in the flask in determining the length of castings formed therein, and the cross sectional outline of the interior of said castings, the meeting edges of the flask sections conforming to the transverse outline of the exterior of the castings formed in said flask and forming the parting lines of the sectional molds formed therein, and fastening means whereby the flask sections are held in assembled position during the casting operations.

8. Apparatus for forming steel castings comprising a sectional green sand mold, a sectional flask in which the mold sections are formed, removable members arranged for positioning in the flask in determining the length of castings formed therein, dry sand cores to replace the removable members during the casting operations and determine the length of the castings formed in said molds, and the cross sectional outline of the interior of said castings, the meeting edges of the flask sections conforming to the transverse outline of the exterior of the castings formed in said flask and forming the parting lines of the sectional molds formed therein, and fastening means whereby the flask sections are held in assembled position during the casting operations.

9. The method of making molds for rectangular steel castings consisting in lining the sections of a sectional flask with sand, sweeping the flask sections by a straight edge held in engagement with the parting edges of the flask sections to remove surplus sand therefrom and thereby form a mold having the cross sectional contour of the casting to be made, and then securing the flask sections in assembled relation.

10. The method of making molds for rectangular steel castings which consists in lining the interior of the sections of a sectional flask with green sand, sweeping the sand lining with a straight edge held in engagement with the marginal edges of the flask sections to remove surplus sand therefrom and form the mold sections therein, and then assembling the flask sections.

11. The method of making molds for hollow steel castings which consists in lining the interior of the side sections of a sectional flask with green sand, sweeping the sand lining therein with a straight edge held in engagement with the marginal edges of such flask sections to remove surplus sand therefrom and form the mold sections therein, positioning removable filler blocks having marginal side edges conforming to the contour of the interior of the hollow castings being made in the bottom section of the flask before placing the sand lining therein, sweeping the sand lining in said bottom section with a straight edge held in engagement with the side edges of said filler blocks to remove surplus sand and form the bottom section of the mold to the contour of the interior surface of the hollow casting, and then assembling the flask sections.

12. The method of making molds for hollow steel castings which consists in lining the interior of the side sections of a sectional flask with green sand, sweeping the sand lining therein with a straight edge held in engagement with the marginal edges of such flask sections to remove surplus sand therefrom and form the mold sections therein, inserting removable filler blocks in the bottom section of the flask before placing the sand therein, then replacing the filler blocks with dry sand cores, and then assembling the flask sections.

In testimony whereof, I have hereunto set my hand.

AMON B. MOYER.

Witnesses:
R. H. Stevens,
W. H. Corbett.