J. A. FIELD.

MOLDING MACHINE.

APPLICATION FILED OCT. 28, 1912.

1,079,482.

Patented Nov. 25, 1913.

4 SHEETS—SHEET 1.

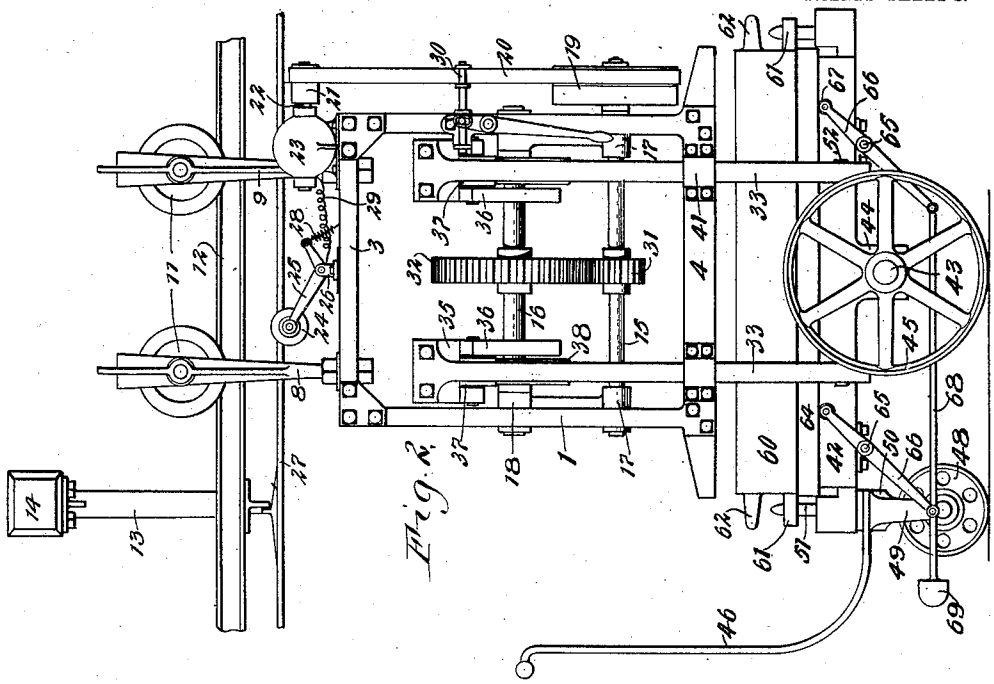


Fig. 2.

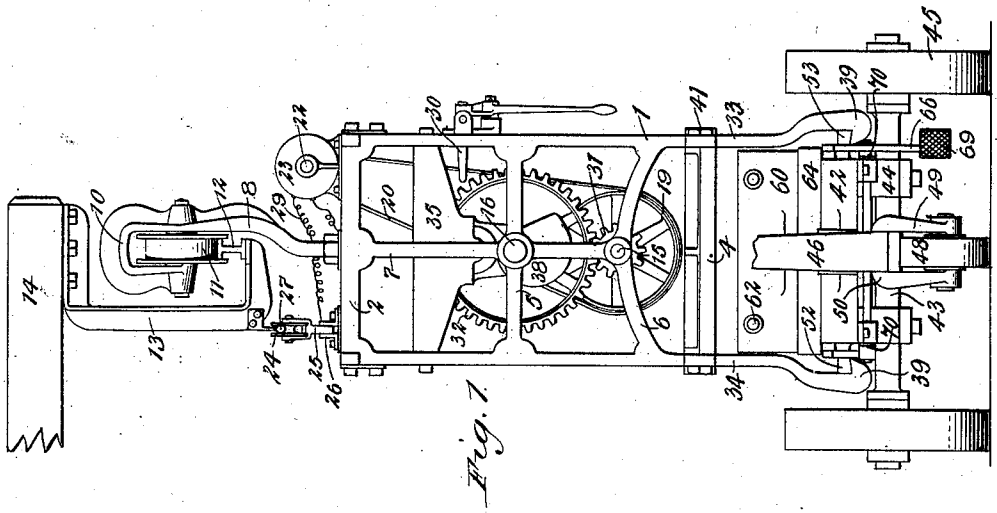


Fig. 1.

Witnesses:—
Richard Sommer
D. H. Harper

Inventor
Jesse A. Field
by C. L. Haughton
Attorney

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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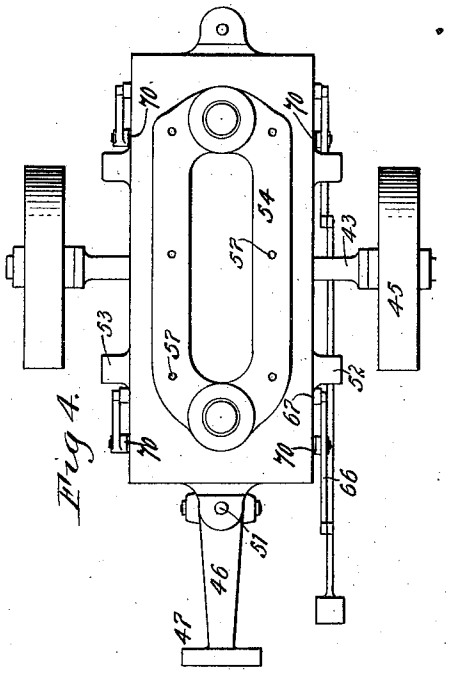


Fig. 4.

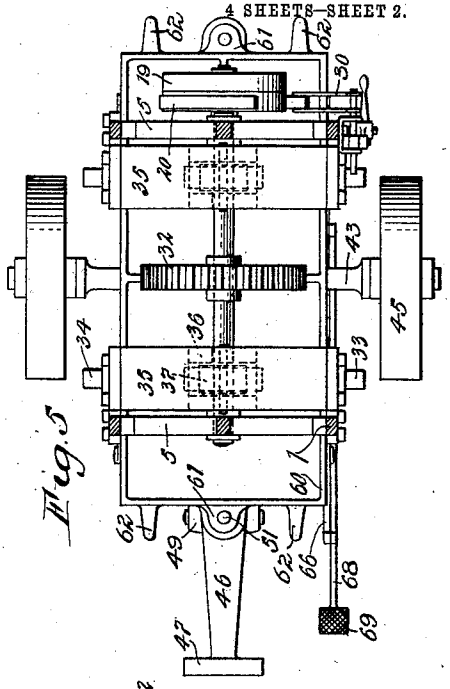


Fig. 5

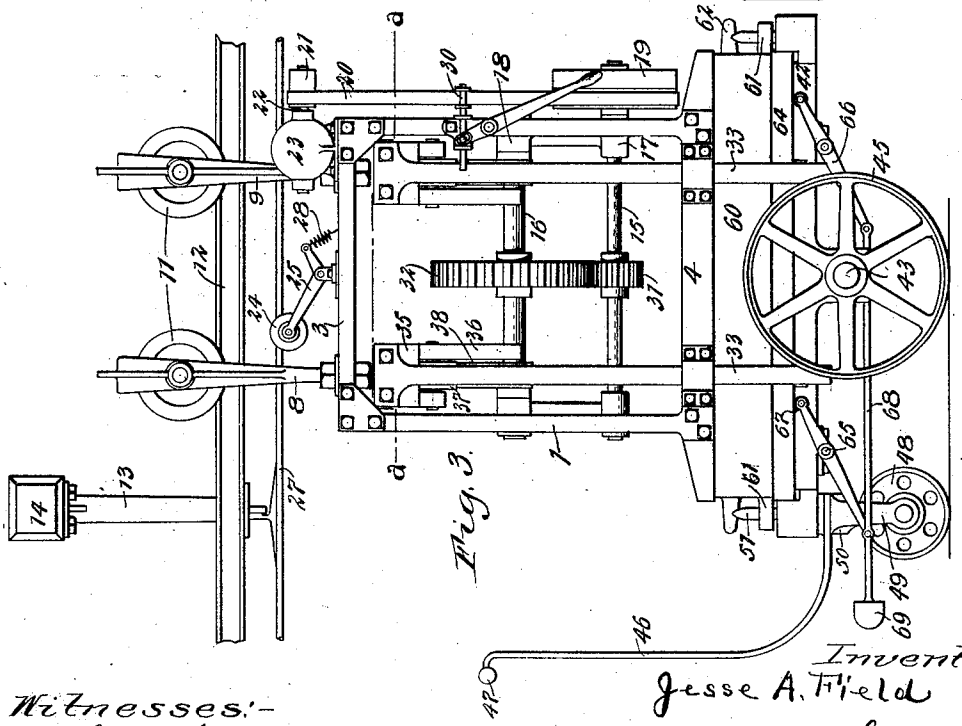


Fig. 3.

Witnesses:-
Richard Sommer
D. H. Harper

Inventor
Jesse A. Field
by G. Langston
Attorney.

J. A. FIELD.

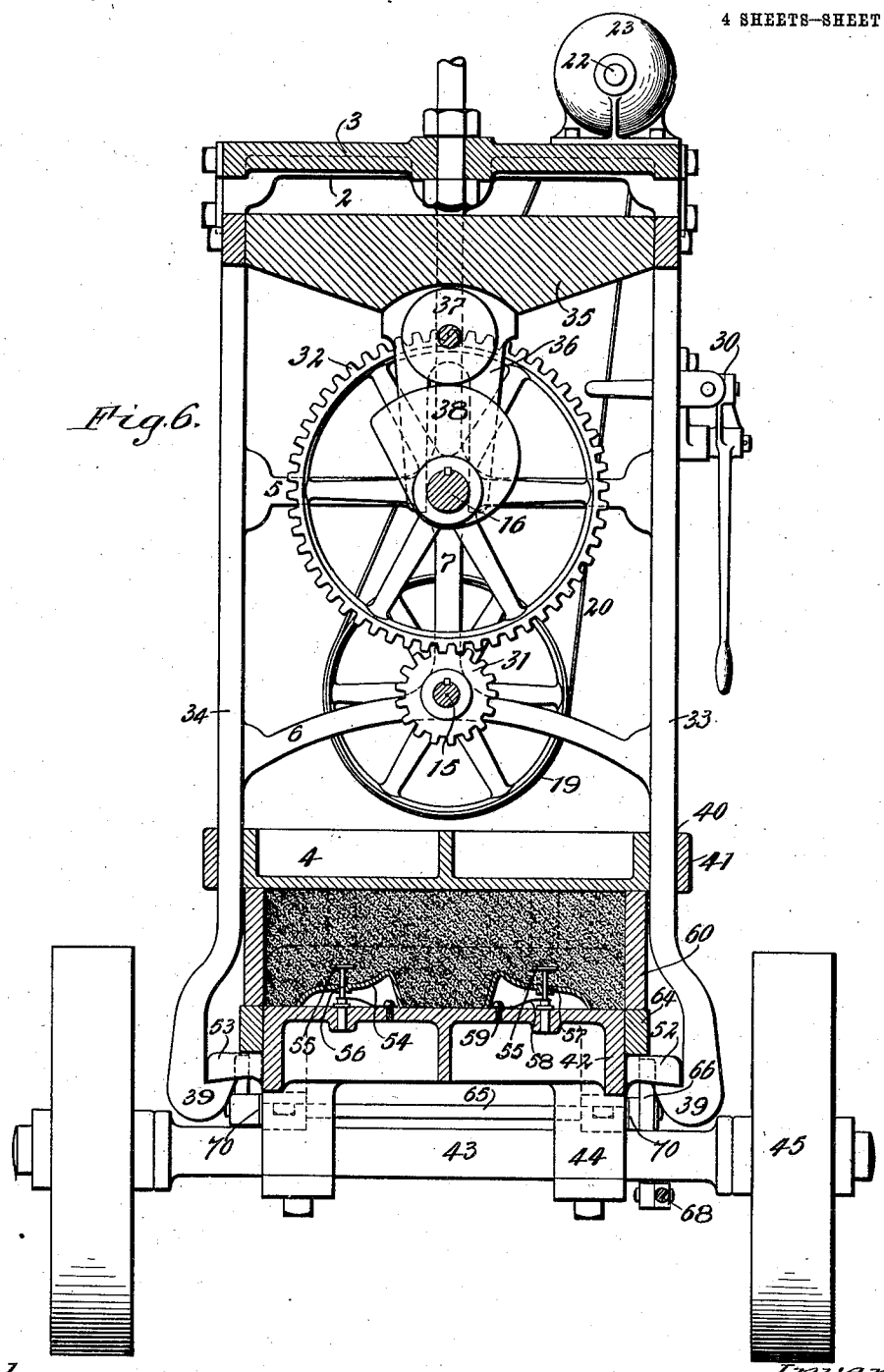
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4 SHEETS—SHEET 3.

Fig. 6.



Witnesses:—
Richard Sommer
D. H. Harper

Inventor
Jesse A. Field
by C. J. Langston
Attorney

J. A. FIELD.

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4 SHEETS—SHEET 4.

Fig. 7.

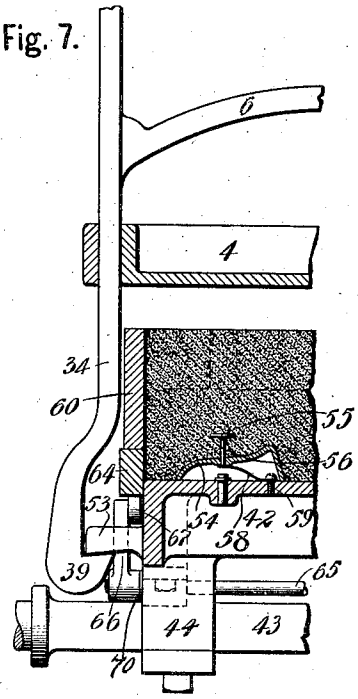


Fig. 8.

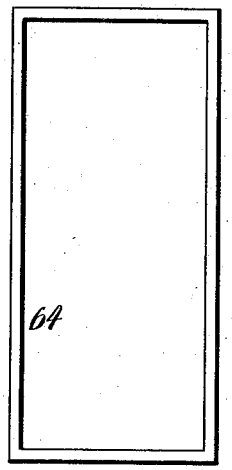


Fig. 9.

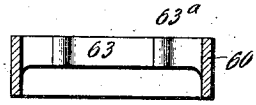
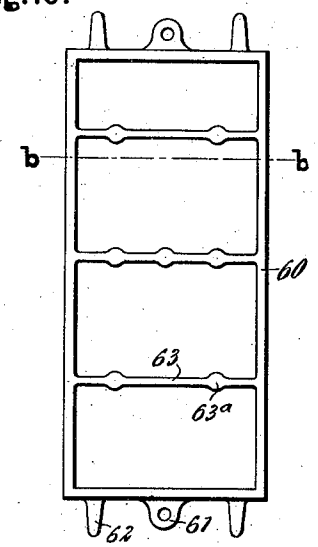


Fig. 10.



Witnesses.

Richard Sommer

D. H. Harper

Jesse A. Field Inventor

By A. J. Langston

Attorney

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JESSE A. FIELD, OF DUNKIRK, NEW YORK.

MOLDING-MACHINE.

1,079,482. Specification of Letters Patent. Patented Nov. 25, 1913.

Application filed October 28, 1912. Serial No. 728,259.

To all whom it may concern:

Be it known that I, JESSE A. FIELD, a citizen of the United States, residing at Dunkirk, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Molding-Machines, of which the following is a specification.

This invention relates to improvements in apparatus for forming metal castings, and primarily to the improved means for compressing the molding sand to form the mold.

The principal object of the invention is to secure perfect and uniform compression of the molding sand, and especially that portion of the sand lying in contact with, and in the vicinity of the pattern. To this end the pattern and mold are moved bodily toward each other to effectively condense and compress the face of the sand mold against the contacting face or surface of the pattern.

The invention also relates to certain details of construction of the improved apparatus which will be fully and clearly hereinafter described, reference being had to the accompanying drawings in which a preferred adaptation of the improved apparatus is illustrated.

Figure 1 is a front elevation of the improved apparatus with the elements thereof in operating position in readiness to compress the sand in a mold. Fig. 2 is a side elevation of the improved apparatus with the elements thereof in position for the sand mold to be compressed. Fig. 3 is a side elevation of the improved apparatus with the sand mold compressed. Fig. 4 is a detached plan view of the pattern supporting truck. Fig. 5 is a transverse horizontal section on line *a*—*a* Fig. 3, looking downward. Fig. 6 is an enlarged vertical transverse section to illustrate the sand mold in its compressed position. Fig. 7 is an enlarged fragmentary section through Fig. 3 on the same line as Fig. 6, illustrating the position of the parts before the sand in the mold is compressed. Fig. 8 is a detached plan view of the rectangular flask supporting frame. Fig. 9 is a transverse section through the flask on line *b*—*b* of Fig. 10. Fig. 10 is a plan of the flask.

In this improved apparatus instead of ramming the sand of the mold by hammers which impinge or strike the top surface of the sand, and relying on the force or rapidity of the hammer blows against said top surface to condense or compress the lower portion of the sand against the pattern, the condensing or compressing action is secured by bodily moving the contacting opposed surfaces of the pattern and sand mold toward each other sufficiently to compress the sand to the desired degree. This directly compresses the sand in contact with the pattern and produces a sand mold having its greatest hardness or condensation on that portion located immediately in the vicinity of the pattern, thereby securing a clear, fine and distinct impression of the pattern in the surface of the mold with a surface of great density and hardness.

In the following description, the improved apparatus will first be referred to and explained in detail, and then the method by which the sand mold is formed through the aid of the improved apparatus will be described.

In the preferred adaptation of this apparatus, as illustrated, a mold-forming machine is suspended from an overhead rail so that it may be moved manually to any desired point in the shop by the workmen. The desired pattern is mounted or supported on a suitable truck which is adapted to be manually moved into position beneath the mold-forming machine. A flask is mounted on the truck over the pattern and is filled with sand, and the machine is operated in any desired manner to lift or elevate both the pattern and flask against a stationary presser plate, and to then force the pattern bodily upward against the bottom surface of the sand in the flask for a sufficient distance to thoroughly compress and condense the sand in said flask and thereby produce a mold.

Mold forming machine.—The frame of the mold-forming machine is constructed substantially as shown in Figs. 1, 2, 3, 5 and 6, and consists of four vertical corner members 1 which are firmly connected to each other at the top by transverse horizontal members 2 and a top plate 3, a bottom horizontally extending presser plate 4, intermediate transversely extending frame members 5 and 6 which carry bearings in which the two shafts of the machine are journaled, and intermediate vertical members 7 which extend between and connect the center portions of the transverse top members 2 and the frame members 5 and 6, as shown in

Fig. 1. The machine is suspended from an overhead rail by means of two hangers 8 and 9 which are bolted to the top of the frame, and have hooked upper ends 10 between the forks of which flange supporting wheels 11 are journaled, as shown in Figs. 1 and 2. The supporting rail 12 is supported at intervals on brackets 13 which are bolted to overhead beams 14, as shown in Figs. 1, 2 and 3. Two horizontal shafts 15 and 16 are journaled in bearings 17 and 18 in the frame, as shown in Figs. 1, 2, 3, 5 and 6. The shaft 15, which is the lower shaft will be hereinafter termed the main shaft, and is provided with a double pulley 19, one face of which is idle. The double pulley 19 is connected by a belt 20 to a small pulley 21 on the shaft 22 of an electric motor 23 of suitable size and power mounted on the top of the frame, as shown in Figs. 1, 2, 3 and 6. The electric motor is supplied with current by means of a trolley wheel 24 which is carried by a trolley pole 25 pivoted to a bracket 26 mounted on the top of the machine frame, as shown particularly in Fig. 2. The trolley wheel is of the usual grooved type and runs or travels in contact with a trolley wire 27. The trolley wheel is yieldingly maintained in contact with the trolley wire by means of a spring 28, as shown in Fig. 2, and current is conducted from the trolley pole to the electric motor by a conducting wire 29. The belt 20 is shifted from the driving face to the idle face of the double pulley, and vice versa, by means of a belt shifter 30 of convenient type. The main shaft 15 is provided with a small pinion 31, and the other shaft 16, previously referred to which is mounted above the main shaft, is provided with a large gear wheel 32 which meshes with the pinion on the main shaft. The upper shaft 16 will be hereinafter designated as the counter shaft. Compressing arms 33 and 34 are vertically mounted in opposed pairs on opposite sides of the machine frame, as shown in Figs. 1, 2, 3, 6 and 7. The arms of each pair are connected at their upper ends to the opposite ends of a transverse connection or yoke 35. Each connection or yoke is provided with depending vertical forks or bifurcated portions 36 which straddle the counter shaft, as shown in dotted lines in Fig. 6. The object of this construction is to maintain the connections or yokes against lateral movement on the counter shaft without interfering with the necessary vertical movement. Rollers 37 are journaled in each connection or yoke, as shown in Fig. 6, and cams 38 mounted on the counter shaft, are adapted to have their peripheral edges bear against the surface of the rollers. The lower ends of the compressing arms have inwardly extending lugs or hooks 39 which are adapted to catch or hook beneath opposite outwardly extending lugs connected with the pattern in a manner to be hereinafter described. To maintain the lower portions of the compressing arms against outward movement, vertical slideways 40 are provided in lateral extensions 41 of the lower portion of the frame of the mold-forming machine, as shown in Fig. 6. The compressing arms move freely in a vertical direction through these slideway openings, but are prevented by the walls of said openings from swinging either laterally out or longitudinally of the machine.

Pattern supporting machine.—The pattern supporting truck has a frame 42 and a single axle 43 mounted in depending portions 44 located at or near the center of the truck frame. Wheels 45 are journaled on the opposite ends of said axle. An operating handle 46 extends from the forward end of the truck and bends upward and is provided with a knob 47 adapted to be conveniently grasped by a workman. A smaller supporting wheel 48 is journaled between depending forks 49 of a supporting member 50 which is rotatably mounted in the front of the truck frame, as shown in Figs. 1, 2 and 3.

The truck frame is provided at the front and rear thereof with upwardly extending vertical centering pins 51. The truck frame constitutes a pattern supporting plate or bed and is provided with opposite outwardly extending side lugs 52 and 53 under which the hooked lower ends of the compressing arms are adapted to catch in the manner shown in Fig. 6. A pattern 54 of the desired type is mounted on the pattern supporting plate or bed, and is preferably formed of metal, and hollow, as shown in Fig. 6. Chaplets 55 are arranged at intervals on the face of the pattern having their stems 56 fitted through the openings 57 shown in Fig. 4. In order that those portions of the sand lying beneath the chaplets may be compressed to the same degree, or substantially the same degree as the remainder of the sand in the mold, the chaplets are maintained in their elevated position with a spring tension. While springs employed in connection with these chaplets may be of any suitable form, the flat form shown in Figs. 6 and 7 is preferable. In these figures a flat spring 58 has one end secured within the hollow of the pattern by a screw 59 and the other end projecting beneath the stem of the chaplet, as shown in Fig. 7. When the sand is being compressed in the mold, the tension of the spring maintains the chaplet in its lifted position until the pressure of sand above the chaplet becomes sufficiently strong to force the chaplet down against the tension of said spring. By this means the sand immediately be-

neath the chaplet is compressed near the latter end of the compressing action to substantially the same degree of condensation or compression as the remaining portions of sand in the mold.

The flask 60 is supported and centered above the pattern by means of the eye-lugs 61 through which the centering pins 51 fit, as shown in Fig. 3. The flask is also provided with the usual lifting handles 62, as shown in Figs. 2—3—5 and 10. Ribs or bars 63 are arranged transversely of the flask and laterally enlarged as at 63ª to reinforce the upper portion of the mold flask, as shown in Figs. 9 and 10. The rib or bar 63 and the buttons 63ª are preferably cast integral with the flask and partially form a part of the mold constructing a skeleton frame for the same.

In order that sufficient sand may be placed within the flask to form the mold, it is necessary to provide a lower rectangular frame 64 of substantially the same interior size and shape as the flask, which can be placed beneath the flask to practically constitute a continuation of the flask, as shown in Fig. 6. The preferable form of this frame is shown in Fig. 8 and is merely an open-ended rectangular box having both the top and bottom thereof entirely open.

A manually controlled means is provided for elevating the rectangular frame from the depressed position it occupies after the flask has been properly compressed and the said flask and the completed mold have been removed, and the pattern brushed and cleaned preparatory to forming another mold. The preferred construction of this elevating means is shown principally in Figs. 1, 2, 3 and 4, to which reference is to be had. The mechanism as shown in these figures consists of two transversely arranged horizontal rock shafts 65 which are journaled in bearings beneath the frame of the truck and are widely separated from each other, double crank arms 66 mounted on opposite ends of each of said rock shafts and each carrying a roller 67 at one end adapted to contact with and bear against the bottom edge of the rectangular frame 64, and an operating arm 68 on one side of the rock shafts and pivoted to the lower ends of the double crank arms 66 as shown in Fig. 3. The double crank arms 66 are each mounted at an intermediate point on the end of the rock shaft, as shown in Fig. 3, the shorter member of each arm extending upward and the longer member extending downward and carrying the pivot at its lower end which connects it to the operating arm 68. The operating arm 68 extends longitudinally of the truck and beneath the main axle at its front end with an enlarged roughened surface knob 69 against which the foot of the operator is adapted to press to force said arm rearwardly and turn the double crank arms 66 from the position shown in Fig. 3 to the position shown in Fig. 2, thereby elevating the rectangular frame from the position shown in Fig. 3 to the position shown in Fig. 2. This brings the rectangular frame up in proper position for the fitting thereon of the flask after the spring tension chaplets have been fitted in place in openings in the pattern.

The rock shafts are arranged to turn rather hard by employing leather friction washers 70 as illustrated. The purpose of this is to maintain the crank arms and the rectangular frame in their elevated position against the combined weight of the rectangular frame, the flask and the sand therein. When the sand is compressed, the pattern and pattern supporting plate are lifted upward by the compressing arms which elevate them sufficiently to turn the double cranks from the position shown in Fig. 2 to the position shown in Fig. 3 bringing the rectangular frame into its lower or depressed position, as shown in Fig. 3.

The operation of this improved apparatus for producing sand molds is as follows: A suitable pattern is first placed upon the pattern supporting truck; the rectangular frame forming a continuation of the flask is then placed around the pattern. A flask is then fitted on the truck over the rectangular frame, and the flask and frame are loosely filled with sand. The top surface of the sand is scraped level with the top of the flask, and the truck supporting the pattern and the sand filled flask and the rectangular frame are moved into position beneath the mold compressing machine. This brings the hooked ends of the compressing arms into hooking engagement with the oppositely extending lugs on the pattern supporting plate or bed, as shown in Figs. 6 and 7. The mold is now in position to be compressed. The operator shifts the belt by moving the handle of the belt shifter, which brings the belt from the idle face of the double pulley to the driving face of the double pulley, and the power from the electric motor begins to rotate the main shaft. The rotation of the main shaft is transmitted to the counter shaft through the meshing pinion and gear wheel mounted respectively on the main shaft and counter shaft, and the counter shaft is slowly turned. The turning of the counter shaft forces the peripheral edges of the cams against the rollers carried by the yokes and gradually lifts or elevates the compressing arms. The pattern supporting plate is raised by the elevating of the compressing arms, and forces the pattern bodily up against the opposed surface of the sand in the mold. The sand in the mold is thus compressed with great force

between the stationary bottom plate of the mold compressing machine and the movable pattern supporting plate of the truck.

In Fig. 7 the pattern, flask and sand mold are shown in position to be compressed, while in Fig. 6 they are shown compressed. It will also be noted that the chaplets are shown in an elevated position in Fig. 7 and in a depressed position in Fig. 6.

The great advantage of this improved apparatus for producing a mold is that the sand is directly compressed against the pattern by pressure only, instead of by the force and agitation of the blows of a ramming hammer.

The parts or elements of this improved apparatus may be rearranged, modified or changed, or some may be altogether omitted, within the scope of the following claims without departing from my invention.

The compressing action of this improved machine and in this improved method is comparatively slow, the compressing parts traveling at a slow rate of speed relatively to each other, so that the air contained in the molding sand is gradually but surely forced out, thereby securing a close and firm adhesion between the particles of the molding sand and producing a sand mold of practically even density throughout and from which all of the air has been squeezed or pressed.

I claim:—

1. In an apparatus for making molds for metal castings, a mold-forming machine consisting of a frame having a lower plate, a shaft journaled in said frame, a cam on said shaft, compressing arms slidably mounted in said frame and connected by a top yoke adapted to engage the cam, said compressing arms having hooks at their lower ends in combination with a pattern, a plate on which said pattern is mounted, the hooked lower ends of the compressing arms being adapted to catch beneath the lower edge of said latter plate, and a flask containing molding sand interposed between the lower plate of the mold-forming machine and the pattern supporting plate.

2. In an apparatus of the class described, a mold-forming machine consisting of a frame, a main shaft journaled in said frame, a counter shaft journaled in said frame above the main shaft, intermeshing gears connecting said shafts, cams mounted on the counter shaft, compressing arms adapted to operatively engage a pattern at their lower ends, means connected to the arms and operatively engaging the cams to actuate the arms, and means for rotating said main shaft.

3. In an apparatus of the class described, a mold-forming machine consisting of a frame, a main shaft journaled in said frame, a counter shaft journaled in said frame above the main shaft, intermeshing gears connecting said shafts, cams mounted on the counter shaft, and compressing arms yoked together in pairs and adapted to operatively engage a pattern carrying element at their lower ends and to operatively engage the cams on the counter shaft at their upper ends.

4. In an apparatus of the class described, a mold-forming machine consisting of a frame, a plurality of shafts journaled in said frame and connected to each other by intermeshing gears, cams mounted on one of said shafts, compressing arms adapted to operatively engage a pattern carrying element, and yokes connecting said arms in pairs and arranged in operative proximity to the cams.

5. In an apparatus of the class described, a mold-forming machine consisting of a frame, a plurality of shafts journaled in said frame and connected to each other by intermeshing gears, cams mounted on one of said shafts, compressing arms adapted to operatively engage a pattern carrying element, yokes connecting said arms in pairs, and having depending forked portions straddling one of said shafts, and rollers contacting with the edges of the cams on said shafts.

6. In an apparatus of the class described, a plurality of plates, a flask located between said plates, a frame arranged on the under side of said flask, said frame practically forming a lower continuation of said flask and both said flask and frame being adapted to be filled with molding sand, a pattern mounted on one of said plates, means for moving said latter plate and pattern through the frame to force and compress the sand in said frame into the flask, and manually operative means for elevating said frame after the flask and completed mold have been removed consisting of rock shafts carrying cranks adapted to press against the bottom edge of said frame and an operating arm pivoted to said cranks.

7. In an apparatus of the class described, a fixed plate, a movable plate adapted to support a pattern, a flask arranged intermediate the plates, a frame underlying the flask, frame operating means normally supporting the frame in position to form a sand receiving element with the flask, and means for simultaneously moving the movable plate, flask, and frame toward the fixed plate, said means operating to cause a relative movement of the frame and movable plate.

8. In an apparatus of the class described a fixed plate, a movable plate, lugs carried by said movable plate, a frame surrounding the movable plate, means for normally supporting the frame spaced from the lugs, a flask supported on the frame, and plate ele-

vating means adapted to engage the lugs to move the parts toward the fixed plate.

9. In an apparatus of the class described relatively movable pressure plates, means for operating one of said plates with relation to the other, a sectional flask coöperating with said operated plate, and means for normally supporting the sectional flask in predetermined relation to said operated plate, the plate operating means moving the flask supporting means to inoperative position.

10. In an apparatus of the class described relatively movable pressure plates, means for operating one of said plates with relation to the other, a sectional flask, means for normally supporting said flask in predetermined relation to said operated plate, said plate operating means inducing initial relative movement of the flask and operated plate to move the flask supporting means to inoperative position.

JESSE A. FIELD.

Witnesses:
AMELIA G. GUNTHER,
L. T. WALSH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."