(No Model.) 5 Sheets—Sheet 1.

T. J. RYAN.

SAND CORE MOLDING MACHINE.

No. 571,458. Patented Nov. 17, 1896.

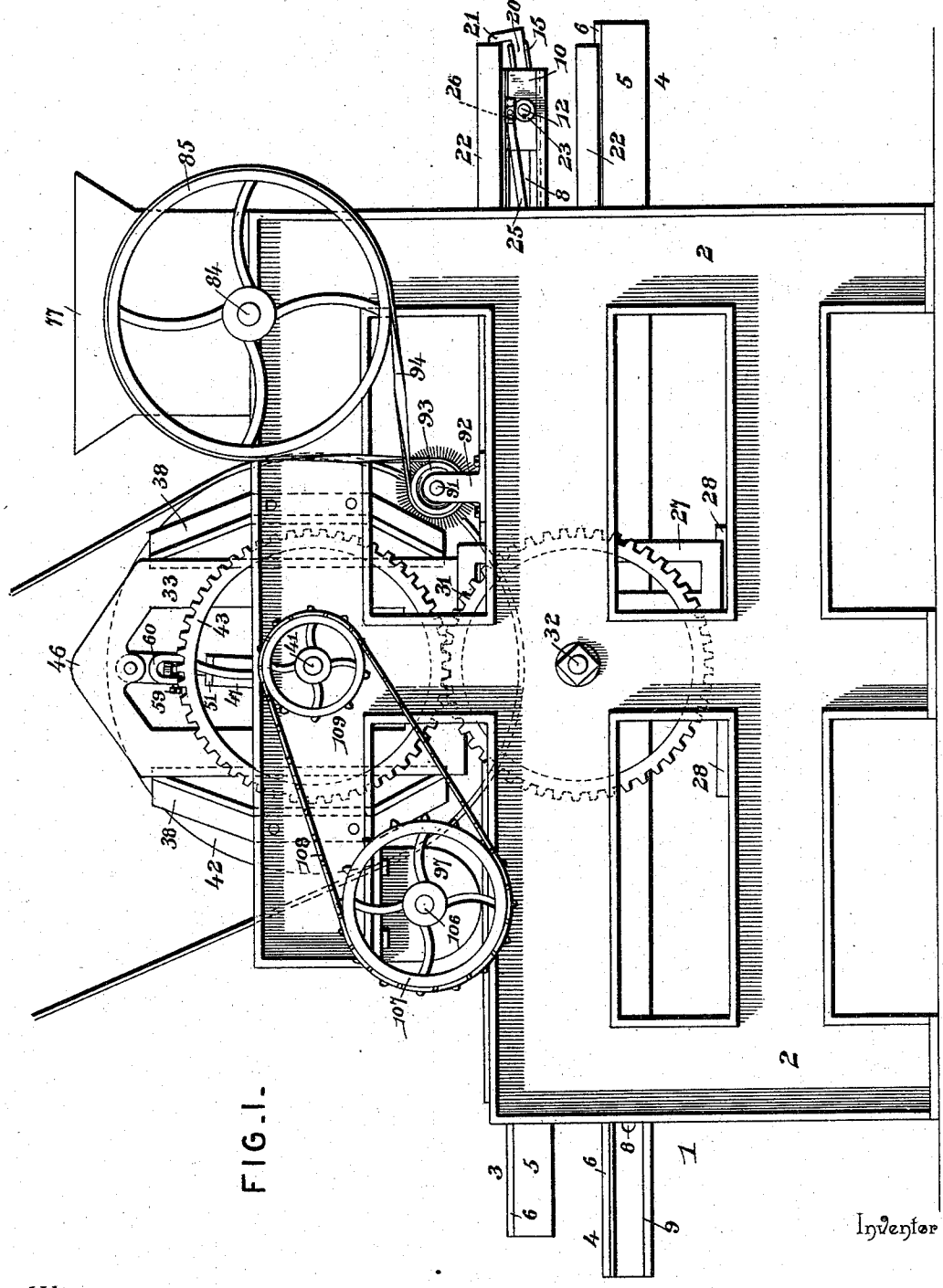


FIG. 1.

Witnesses
Jas. K. McCathran
D. P. Gallaudet

Inventor

By his Attorneys, Thomas J. Ryan
C. A. Snow & Co.

(No Model.) 5 Sheets—Sheet 2.

T. J. RYAN.

SAND CORE MOLDING MACHINE.

No. 571,458. Patented Nov. 17, 1896.

FIG. 2.

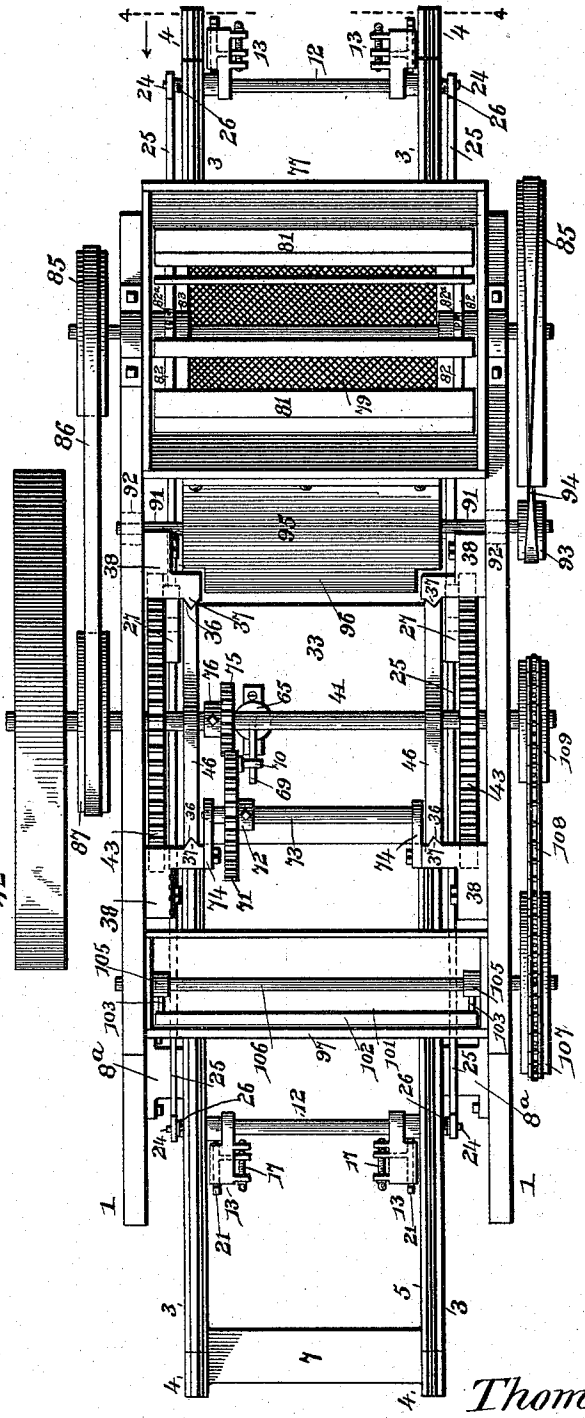
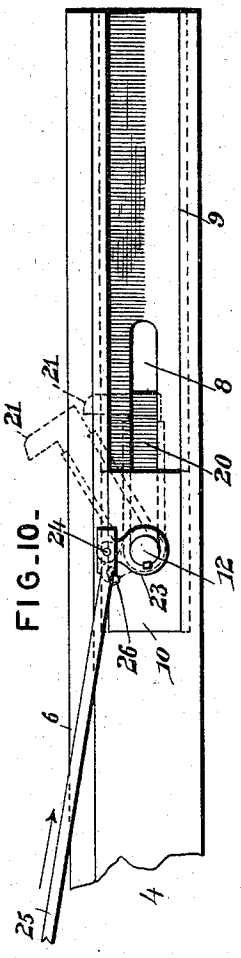


FIG. 10.



Witnesses

Jas. K. McCathran

D. C. Holland Jr.

Inventor

Thomas J. Ryan

By his Attorneys,

C. A. Snow & Co.

(No Model.) 5 Sheets—Sheet 3.

T. J. RYAN.

SAND CORE MOLDING MACHINE.

No. 571,458. Patented Nov. 17, 1896.

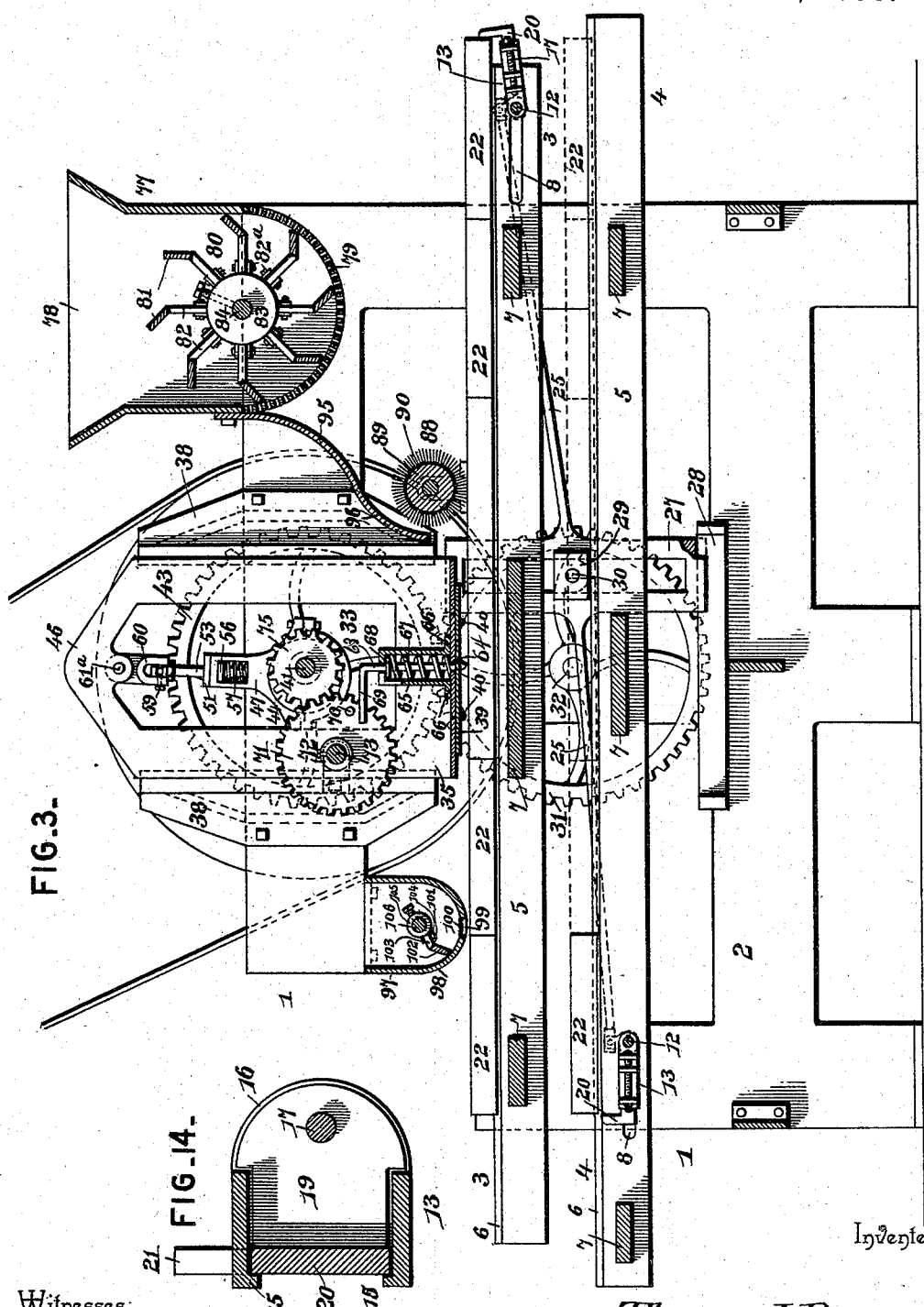


FIG. 3.

FIG. 14.

Witnesses
Jas. K. McCathran
L. P. Wallaupter

Inventor
Thomas J. Ryan
By his Attorneys,
C. A. Snow & Co.

(No Model.) 5 Sheets—Sheet 4.

T. J. RYAN.

SAND CORE MOLDING MACHINE.

No. 571,458. Patented Nov. 17, 1896.

FIG. 4.

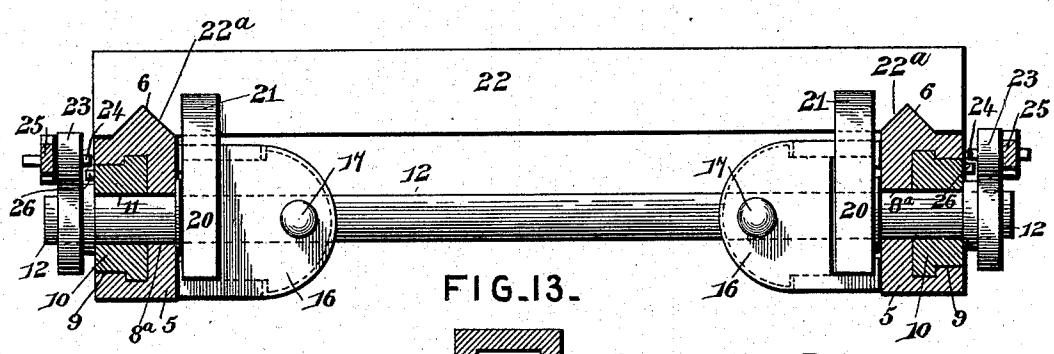


FIG. 13.

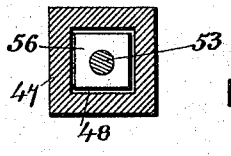


FIG. 5.

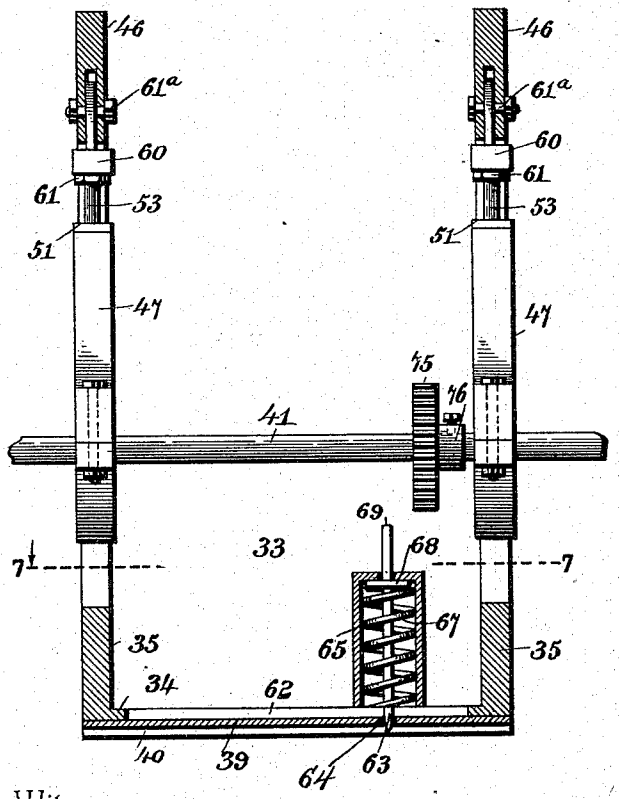
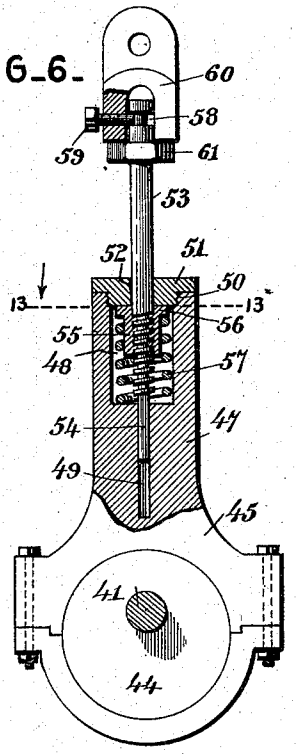


FIG. 6.



Witnesses

Jas. K. McCathran

S. P. Wallace

Inventor

Thomas J. Ryan

By his Attorneys,

C. A. Snow & Co.

(No Model.) 5 Sheets—Sheet 5.

T. J. RYAN.

SAND CORE MOLDING MACHINE.

No. 571,458. Patented Nov. 17, 1896.

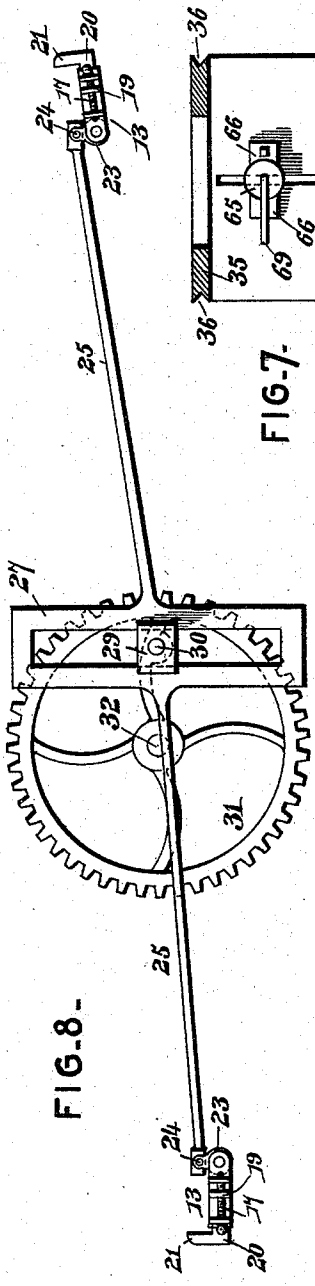


FIG. 8.

FIG. 7.

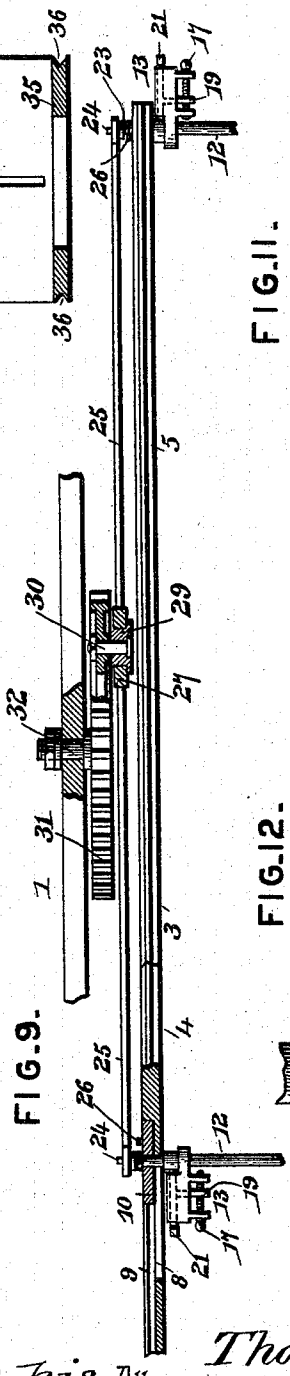


FIG. 9.

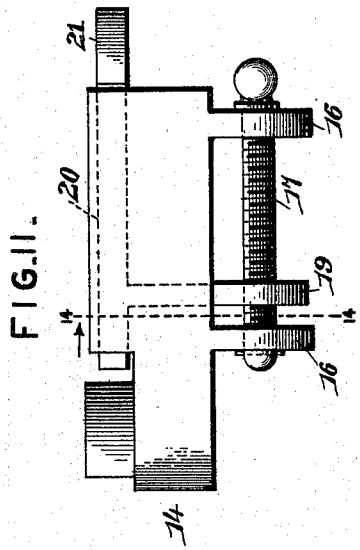


FIG. 11.

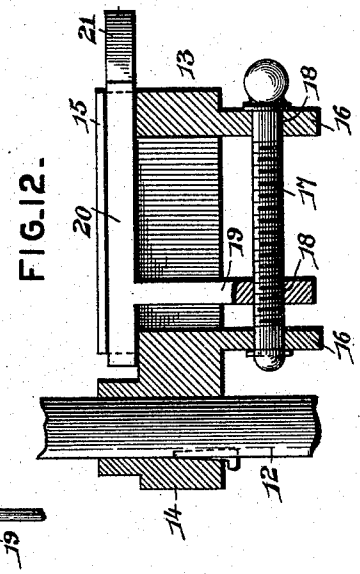


FIG. 12.

Witnesses

Jas. K. McCathran

S. P. Williamson

Inventor

Thomas J. Ryan

By his Attorneys,

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

THOMAS JOSEPH RYAN, OF BUFFALO, NEW YORK.

SAND-CORE-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 571,458, dated November 17, 1896.

Application filed April 7, 1896. Serial No. 586,567. (No model.)

To all whom it may concern:

Be it known that I, THOMAS JOSEPH RYAN, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Sand-Core-Molding Machine, of which the following is a specification.

This invention relates to sand-core-molding machines; and it has for its object to provide a machine of this character having positive and efficient means for forming complete sand cores for use in molding radiator and similar castings, and also involving new and useful means for the positive and convenient handling, continuously, of a series of filled and empty core-box sections.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a side elevation of a sand-core-molding machine constructed in accordance with this invention. Fig. 2 is a top plan view thereof. Fig. 3 is a vertical longitudinal sectional view thereof. Fig. 4 is an enlarged detail sectional view on the line 4 4 of Fig. 2. Fig. 5 is a vertical sectional view of the vent-press part of the machine. Fig. 6 is an enlarged detail elevation, partly in section, of one of the adjustable eccentric operating connections for the vent-press. Fig. 7 is a detail sectional view of the vent-press on the line 7 7 of Fig. 5. Fig. 8 is a detail elevation of one of the obliquely-disposed propelling-rods and the drive connection therefor. Fig. 9 is a detail sectional view of the construction illustrated in Fig. 8. Fig. 10 is a detail elevation of the end portion of one of the guide-rails. Fig. 11 is an enlarged detail plan view of one of the oscillating hook-carrying blocks. Fig. 12 is a horizontal sectional view of the construction illustrated in Fig. 11. Fig. 13 is a detail cross-section on the line 13 13 of Fig. 6. Fig. 14 is a detail sectional view on the line 14 14 of Fig. 11.

Referring to the accompanying drawings, 1 designates the frame of the machine, essentially comprising the opposite upright skeleton frame sides 2, between which frame sides are arranged separate upper and lower slide-tables 3 and 4, respectively. The slide-tables 3 and 4 are arranged one above the other in parallel planes and extend longitudinally the entire length of the machine and project beyond the ends of the frame sides, so as to be within easy reach of the attendants at opposite ends of the machine. Each of the upper and lower slide-tables 3 and 4 consists of a pair of horizontal parallel guide-rails 5, provided with longitudinal V-shaped guide-ribs 6 at their upper edges and rigidly braced and connected together by intermediate cross-braces 7. The said guide-rails 5 of each upper and lower table 3 and 4 have extended from their outer sides the flanged attaching-brackets 8^a, which are securely bolted or otherwise suitably secured to the inner sides of the frame sides 2, to provide a perfectly rigid structure and for the proper positioning of the slide-tables within the frame, as will be readily understood, and at this point it will be noted that the central cross-brace 7 for the guide-rails 5 of the upper slide-table 3 is wider than the other braces to provide for resisting the entire strain of the vent-press during the operation of making the core, as will be hereinafter fully described.

The guide-rails 5 of each of the tables 3 and 4 are provided at or near one end with the longitudinally-disposed slots 8, and at their outer sides with the T-shaped slide grooves or ways 9, which loosely receive therein the flanged slide-blocks 10, which are substantially T-shaped in cross-section, so as to register with the slide grooves or ways 9 of the guide-rails 5. The said slide-blocks 10 are provided with the bearing-openings 11, which loosely receive therein the opposite ends of a transversely-arranged rock-shaft 12, projecting through and working in the longitudinally-disposed slots 8 of the guide-rails. At the inner sides of the guide-rails 5 each transverse rock-shaft 12 has mounted thereon a pair of oppositely-located hollow oscillating blocks 13. The blocks 13, as described, are located, respectively, directly adjacent to the opposite guide-rails 5, at the inner sides thereof, and said oscillating blocks are provided at one end with the shaft-collars 14, which are keyed fast on the shaft 12, so as to turn with said shaft. The said oscil-

lating blocks 13 are provided at one side with a pair of reversely-disposed offstanding guide-flanges 15, and at the side opposite said guide-flanges 15 with a pair of spaced bearing lugs or brackets 16, the said lugs or brackets 16 of each block 13 having loosely mounted therein an adjusting-screw 17, which works in a threaded opening 18, formed in one end of an adjusting-arm 19, arranged to play within the hollowed portion of block 13 and between the lugs or brackets 16 thereof. The adjusting-arm 19, which works within each of the blocks 13 and is engaged by the screw 17, is extended from one side and near the inner end of an adjustable hook-plate 20, mounted to slide between the guide-flanges 15 of the block 13, and provided at its outer end with a hook projection 21, that is designed to be projected up above the plane of the guide-rails forming the slide-tables 3 and 4, so as to engage at one side of the core-box sections on such tables and provide for propelling or sliding the said core-box sections on the slide-tables, as will be more particularly described.

The slots 8 are disposed at or near one end of the guide-rails of each of the slide-tables, but by reference to Fig. 3 of the drawings it will be observed that the slots 8 for the two tables are respectively located at opposite ends thereof, whereby the rock-shaft 12, and its attachments for the upper table 3, is located at the end of such upper table opposite the location of the rock-shaft 12 and its attachments for the lower table 4, and these two rock-shafts are designed to be simultaneously adjusted to provide for the alternate propulsion of the series of core-box sections 22 on the upper and lower slide-tables. Each of the rock-shafts 12, that is, the rock-shaft for each of the slide-tables, has fitted on its opposite extremities, at the outer sides of the guide-rails 5, the short rock-arms 23, which receive the connecting-pins 24 for pivotally connecting thereto one end of the opposite obliquely-arranged reciprocatory propelling-rods 25.

The obliquely-arranged reciprocatory propelling-rods 25 are located within the frame at opposite sides thereof and are disposed between the frame sides 2 and the guide-rails 5 of the upper and lower slide-tables 3 and 4, and by reason of the oblique disposition of the said opposite reciprocatory propelling-rods 25 the upper ends of such rods are pivotally connected with the rock-arms 23 of the rock-shaft 12 for the upper slide-table 3, while the lower ends of said propelling-rods are similarly connected with the short rock-arms 23 of the shaft 12 for the lower slide-table 4, thereby completing a connection providing for the simultaneous adjustment of the two oppositely-located rock-shafts. The pins 24 for connecting the rods 25 with the rock-arms 23 are projected at the inner sides of said rock-arms and are adapted to engage against the short stop-studs 26, projected from the outer sides of the slide-blocks 10, for a purpose to be presently explained.

The oppositely-located oblique propelling-rods 25 are provided at a point centrally between their ends with the upright vertically-slotted yokes 27, the lower ends of which yokes work on slide-supports 28, fitted within the frame below the lower slide-table 4, and providing means for supporting the weight of the yokes 27, and thereby relieving the propelling-rods 25 from undue strain and obviating sagging. The vertical slots of the upright yokes 27 loosely receive therein the wrist-pin blocks 29, mounted on the wrist-pins 30, projected from the inner side of the gear-wheels 31, arranged at opposite inner sides of the frame 1 and mounted to rotate on the short stub-shafts 32, fastened or fitted in the opposite frame sides 2 and projecting inwardly therefrom. The rotation of the gear-wheels 31 necessarily moves the wrist-pin blocks 29 up and down within the vertical slots of the yokes 27, and thereby imparts a reciprocating movement to the propelling-rods 25, and in turn to the oppositely-located connected rock-shafts 12. The reciprocation of the obliquely-disposed propelling-rods 25 provides for a reciprocation of the adjustable hook-plates 20, carried by each of said shafts, thereby providing means for sliding the entire series of core-box sections 22 on the slide-tables toward one end of each table.

As is well understood by those skilled in the art, the core-boxes used in sand-core making are usually made in two halves or sections, and the present invention contemplates handling core-boxes of this character, the sections or halves of which are designed to be arranged or laid side by side on the slide-tables 3 and 4. The core-box sections 22 are preferably provided at their under sides with the V-shaped slide-grooves 22^a, which register with the V-shaped guide-ribs 6 at the upper edges of the guide-rails 5, so that the core-box sections will maintain their positions on the guide-rails of the slide-tables while moving from end to end thereof, and at this point it will be noted that the entire series of core-box sections 22 on the upper slide-table hold the sand core at various stages of completion, while the entire series of core-box sections on the lower slide-table are empty, and are continuously moved toward that end of the upper table on which the core-box sections are first placed to receive their filling of sand for making the core, all of which will be readily understood by those skilled in the art.

In connection with the sliding of the core-box sections on the upper and lower slide-tables 3 and 4 it is important to note the operation of the connected rock-shafts 12. Assuming that the gear-wheels 31 have reached a position which provides for moving the propelling-rods 25 in a direction toward the end of the lower table 4, supporting the lower rock-shaft 12, it will be obvious that the lower ends

of said propelling-rods will move the rock-arms 23 of the lower rock-shaft in a direction which will cause such rock-shaft to turn and swing the hook-plates 20 downward, thereby lowering the hook projections 21 below the plane of the upper edges of the rails 5 of the table 4, so that as such hook projections move outward toward one end of the table 4 the same will clear the bottom of the empty core-box section 22, which has been placed on the feed end of the table 4, on which end the attendant places a box-section at the same time that an empty box-section is removed from the opposite end of the table 4 and placed on one end of the table 3 directly thereabove. At the same time that the lower rock-shaft 12 is adjusted in the manner described the movement of the propelling-rods 25 will provide for oscillating the upper rock-shaft 12 in a direction that will swing the hook-plates 20 carried thereby upward, thereby elevating the hook projections 21 of such plates to a position at one side of the empty core-box section 22 last placed on one end of the table 3, so that the continued movement of the propelling-rods 25 in the direction noted will provide for sliding the entire series of core-box sections 22 on the upper table 3 in one direction. The upward elevation or oscillation of the hook-plates 20, carried by the upper rock-shaft 12, when such rock-shaft is oscillated as described, is limited by the short stop-studs 26, projecting from the outer sides of the slide-blocks 10, supporting said shaft. The rock-shaft continues to oscillate until the inner projecting ends of the connecting-pins 24 strike against the said stop-studs 26, and when this occurs the continued movement of the propelling-rods 25 moves the blocks 10 in the slide grooves or ways 9 and carries the rock-shaft with said blocks to provide for sliding the core-box sections in the manner described. When the propelling-rods are moved by the gear-wheels 31 in the direction opposite to that described, the lower set of hook-plates will be elevated in precisely the same manner as described for the said upper set of hook-plates, while the said upper set of hook-plates will be lowered as they move outward toward one end of the table 3 and will not interfere with the attendant placing an empty core-box section on that end of the table 3, ready to be engaged by said hook-plates when the propelling-rods 25 again move in a direction away from the upper shaft 12.

While the stop-studs 26, referred to in connection with the pins 24, subserve the important function of limiting the upward oscillation of the blocks 13, carrying the hook-plates, it will be further obvious that should the core-box sections become caught in any manner, so as to cause a heavy strain on the propelling-rods 25, the pins 24 will forcibly slip from the studs 26, and thereby relieve the rods from strain.

Arranged to reciprocate within the frame 1 centrally above the upper slide-table 3 and directly above the central widened cross-brace 7 is the vent-press 33, which provides for forming the vent in the sand core contained within the core-box moved under the press. The vent-press essentially comprises a flat horizontal press-plate 34 and opposite rectangular upright side portions 35, extending upwardly from opposite ends of the plate 34 and provided with grooved side edges 36, which slidably engage the guide-ribs 37, projected from the inner sides of the opposite pairs of upright guide-plates 38, bolted or otherwise suitably secured at opposite inner sides of the frame 1 above the plane of the upper slide-table 3.

The vertically-reciprocating vent-press 33 is constructed so that the flat horizontal press-plate 34 thereof will be sufficiently wide so as to cover any size of core designed to be formed by the machine, and in order to adapt the press for use in connection with different sizes of cores a steel vent-plate 39 is screwed or otherwise detachably fastened to the lower active face of the plate 34, and the said vent-plate 39 is of a size agreeing with the size of core being operated upon and is provided with the vent-forming ribs or beads 40, which of course are of different styles to suit different cores and are designed to impress in the sand cores the usual vent. As a result of the attachment of different vent-plates 39 of the proper size for the particular work to the vent-press the difficulty of removing the entire vent-press to attach different styles of vent-forming ribs or beads is obviated, and when the vent-press descends it only presses the core in the core-box section that lies directly under the vent-plate 39, without touching any portion of the adjacent cores, which may also lie under the vent-press.

Motion is communicated to the vertically-reciprocating vent-press 33 from the horizontal drive-shaft 41, journaled in bearings at opposite sides of the frame 1 and carrying upon one end the band-wheel 42, which receives the belt for transmitting motion to the machine. At the inner sides of the opposite frame sides 2 the drive-shaft 41 has mounted thereon the gear-wheels 43, which mesh with the gear-wheels 31 to provide for transmitting motion to such gear-wheels and to the propelling-rods 25, having a wrist-pin connection therewith, and at the inner sides of the gear-wheels 43 and carried by the shaft 41 are the eccentrics 44, encircled by the eccentric-straps 45. The eccentrics and eccentric-straps are located on the shaft 41 directly within the opposite rectangular side portions 35 of the vent-press and directly below the upper cross-bars 46 of said side portions 35 of the vent-press.

Each of the oppositely-located eccentric-straps 45 is provided at its upper side with a strap-arm extension 47, having in its upper end a squared socket 48 and a guide-bore 49, leading downward from the floor or base of the said squared socket 48. The squared

socket 48 is provided with an interiorly-threaded upper end 50, which detachably receives the exteriorly-threaded cap-nut 51, having a rod-opening 52 therein to receive the eccentric-rod 53. The eccentric-rod 53 is provided with an unthreaded extension 54 at its inner end, which works in the guide-bore 49 of the strap-arm extension 47, and the portion of the rod 53 working within the socket 48 is threaded and adjustably receives thereon the nut 55, having a squared head 56, loosely registering within the squared socket 48 to prevent the nut from turning therein, and interposed between the squared head or flange 56 of the nut and the floor of the socket 48 is a coiled spring 57, which provides a yielding connection between the strap-arm 47 and the rod 53 to relieve the core-box sections or shaft 41 from any undue strain when the vent-press descends onto the core-box directly thereunder. By adjusting the rod 53 in the nut 55 the rod 53 is made extensible to adapt the position of the vent-press to different heights of core-boxes which are adjusted thereunder.

The oppositely-located eccentric-rods 53, which are adjustably connected with the oppositely-located eccentric-straps in the manner just described, are provided at their upper extremities with the annular grooves 58, which receive therein the inner ends of the set-screws 59, mounted at one side of the bifurcation of the bifurcated pivot-plates 60. Immediately below the lower ends of the pivot-plates 60 the eccentric-rods 53 are provided with the nut portions 61, whereby the rods 53 can be readily turned and adjusted in and out of the nuts 55 within the strap-arm extensions 47, the set-screw and groove connections 58 and 59 allowing the said eccentric-rods to be readily turned in the manner noted. The pivot-plates 60 are pivotally bolted at 61^a to the upper crross-bars 46 of the upper side portions 35 of the vent-press to complete the eccentric connections between the shaft 41 and the vent-press, whereby the latter may be reciprocated up and down as the shaft 41 continues to rotate.

The horizontal flat press-plate 34 of the vent-press 33 is provided therein with a longitudinally-disposed slot 62, extending nearly the entire length of the said press-plate and receiving therein the lower pointed end of the L-shaped punch-pin 63, which end of the punch-pin is designed to work through and below a pin-opening 64, formed in the vent-plate 39, which is attached to the active face or under side of the press-plate 34. The L-shaped punch-pin 63 is supported within an adjustable upright box 65, provided at its lower end with the attaching-flanges 66, adjustably secured to the upper side of the press-plate 34 to provide for adjusting the punch-pin 63 at any point in the slots 62 as the requirements of the work may demand.

The upright adjustable box 65 accommodates therein a retracting-spring 67, the lower end of which bears on the upper side of the plate 34 and the upper end of which bears against a flange 68, fitted on the vertical portion of the pin 63, said spring providing means for normally elevating the punch-pin 63 and holding the lower pointed end thereof normally in a plane above the core-box sections, which are continuously moved under the vent-press. The upper horizontal portion 69 of the pin 53 above the top of the box 65 is designed to be engaged at intervals by the stop-stud 70, projected from one side of a gear-wheel 71, provided with a hub 72, adjustably fitted on a short transversely-arranged counter-shaft 73, journaled at its ends in suitable bearing-brackets 74, attached to directly opposite guide-plates 38, as clearly illustrated in Fig. 2 of the drawings. The gear-wheel 71 meshes with an adjacent gear-pinion 75, provided with a hub 76, adjustably fitted on the drive-shaft 41, and it will be observed that the pinion 75 and the wheel 71 are similarly adjustable on their respective shafts, so that the same may be readily adjusted to the proper positions on the shafts 41 and 73 to correspond with the adjusted position of the punch-pin, which is moved downwardly and into the core whenever the rotation of the wheel 71 carries the stud 70 down onto the horizontal portion 69 of the said punch-pin.

The gear 71 is illustrated as being twice the size of the pinion 75, so that two rotations of the latter will provide for one complete rotation of the wheel 71 and the consequent downward thrust of the punch-pin into the core immediately therebelow to provide for forming the necessary opening in the core in conjunction with the vents formed therein by the ribs or beads 40 of the vent-plate 39. Immediately after the punch-pin has been depressed by the stud 70 and said stud rides off of the upper horizontal portion of the punch-pin the spring 67 provides for a quick upward retraction of the punch-pin a trifle in advance of the upward movement of the vent-press, and this operation entirely obviates the possibility of destroying the core while the punch-pin is being withdrawn therefrom, and in connection with the operation of the punch-pin at every two revolutions of the shaft 41 it will be noted that the said pin punches a hole in every alternate core, and should it be necessary to punch more than one hole in a core it will simply be necessary to increase the number of punches, as will be quite obvious. By reason of the adjustability of the punch-pin it will also be obvious that the said punch-pin may be adjusted to punch cores of different lengths or to punch the same in any required spot.

Supported within the frame 1 at one side of the vent-press and above the upper slide-table 3 is a sand-feed box 77, having at its upper open side a hopper portion 78, which provides for holding a quantity of sand that is to be fed or sifted into the empty core-box section which lies in position on the table 3 directly below the box 77. The box 77 is in-

closed at the lower side by a curved grating 79, within which is arranged to work the sifter 80, which provides for sifting the sand through the grating 79 and into the core-box section 22 immediately therebelow. The said sifter 80 essentially comprises a circular group of sifter blades or paddles 81, having blade-arms 82 disposed at an angle thereto and having a suitable detachable connection 82^a at their inner ends with the hub-blocks 83, fitted on a horizontal sifter-shaft 84, journaled in suitable bearings at opposite ends of the box 77, and having fitted on its extremities beyond the ends of the said box the belt-wheels 85, one of which receives the belt 86, which also passes over a belt wheel or pulley 87, mounted on the shaft 41 at one side of the wheel 42, and providing means for communicating motion to the rotary sifter within the box 77. During the rotation of the rotary sifter 80 there is a continuous flow of sand through the grating 79 into the empty core-box section immediately therebelow, but it will be obvious that if it is not desired to have a continuous flow of sand through the grating one-half of the sifter blades or paddles 81 may be dispensed with, so that the sand will be worked through the grating 79 at every alternate half-revolution of the shaft 80 and only at a time when an empty core-box section 22 remains in a stationary position directly below the sand-box, so that when the said core-box section begins to move forward toward the vent-press no sand will fall from the sand-feed box until another empty core-box section has stopped thereunder, and it will therefore be observed that the invention contemplates using any desired number of the sifter blades or paddles 81 and any arrangement thereof to provide the proper feed of sand.

After an empty core-box section has been filled with sand the same is moved toward the vent-press under a horizontal leveling-brush 88. The horizontal leveling-brush comprises a drum 89, carrying on its periphery steel or other suitable bristles 90, which are designed to be rotated over each core-box section and provide means for striking or leveling the core off very accurately as the core-box sections pass underneath the brush, and the shaft extremities 91 of said brush are mounted in suitable bearings 92 at opposite sides of the frame. One of the shaft extremities 91 of the leveling-brush has mounted thereon a pulley 93, which receives its motion from a crossed belt 94, passing over the belt-wheel 85 at one end of the sifter-shaft 84, and this belt connection provides for rotating the leveling-brush at a high rate of speed. A curved shield-plate 95 is attached at its upper end to one side of the sand-box 77 and is provided with a curved hood portion 96 at its lower end, disposed around one side of the brush, between the same and the vent-press, and said shield-plate prevents the brush from throwing particles of sand over the machine, but the rotation of said brush is such that the major portion of the sand struck off of the cores will be thrown back into the feed of sand as it drops from the grating 79 of the sand-box 77.

Suitably supported transversely within the frame of the machine at the side of the vent-press opposite the sand-box 77 is a flour-box 97. The flour-box 97 is provided with a curved lower side 98, having therein a narrow longitudinal discharge-slot 99, covered by a sifting-screen 100, through which the flour is worked by a rotary sifter 101, mounted within the said box. The sifter 101 essentially comprises one or more sifter blades or paddles 102, having blade-arms 103 disposed at an angle thereto, and detachably connected at 104, at their inner ends, with hub-blocks 105, fitted on a horizontal sifter-shaft 106, journaled in suitable bearings at opposite ends of the box 97, and having mounted on one shaft extremity a chain or sprocket wheel 107, which receives its motion from a sprocket-chain 108, passing over a smaller sprocket-wheel 109, mounted on the extremity of the shaft 41 opposite the wheel 42, and the wheel 109 is preferably one-half the size of the wheel 107, so that when a single blade or paddle 102 is employed such blade or paddle will work the flour through the screened slot 99 once in every two revolutions of the shaft 41, whereby the joint of every alternate core will have flour distributed thereover, as will be readily understood by those skilled in the art. The screened slot 99 is so disposed that one edge thereof is always directly above the front edge of the core-box section when such core-box section is stationary, but the moment such core-box section starts to move the single blade or paddle 102 passes over the screen 100, and by the time said blade or paddle has passed entirely over the screen the core-box section will have traveled its entire width, thereby insuring the proper flouring of the core without a waste of flour, and this distribution of the flour over the face of every alternate core provides for forming a paste, so that when the two halves or sections are put together the same will stick tightly together to make the complete core.

It will of course be understood that if a continuous flow of flour be desired from the flour-box the blades or paddles 102 can be multiplied to effect this result.

It is thought that the operation of the herein-described machine will be obvious from the foregoing description, but at this point especial attention is directed to the fact that the lower slide-table 4 forms a return-slideway for the empty core-boxes, and in connection with the sliding or propelling of the series of core-box sections on the upper and lower slide-tables 3 and 4 it will be noted at this point that the screw 17 used in connection with the oscillating hook-plates 20 in each slide-table provides for the adjustment of these hook-plates to change the inward and

outward limit of travel for the hook projections thereof as may be required. The other features of the machine and the operation thereof are thought to be apparent to those skilled in the art without further description, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a sand-core-molding machine, a pair of slide-tables arranged in different planes, propelling mechanism for sliding core-boxes on each of said tables, and core-forming devices suitably arranged over one of said tables, substantially as set forth.

2. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables extending the entire length of the frame and arranged in parallel planes, propelling mechanism for sliding core-boxes on each of said tables, and core-forming devices suitably arranged over the upper of said slide-tables, substantially as set forth.

3. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged one above the other within the frame, hooks for moving the core-box sections suitably supported at one end of each of said tables, suitable connections between the hooks for both tables to provide for the simultaneous movement thereof, and core-forming devices suitably arranged over the upper of said slide-tables, substantially as set forth.

4. In a sand-core-molding machine, the frame, upper and lower slide-tables arranged one above the other within the frame and each consisting of a pair of horizontal parallel guide-rails, propelling mechanism for sliding the core-boxes on each of said tables, and core-forming devices suitably arranged over the upper table, substantially as set forth.

5. In a sand-core-molding machine, the frame, upper and lower slide-tables arranged one above the other within the frame and each consisting of a pair of horizontal parallel guide-rails, intermediate cross-braces connecting the guide-rails of each table, the central cross-brace for the guide-rails of the upper table being wider than the other braces, propelling mechanism for sliding core-boxes on each of said tables, a vent-forming press supported to work above the upper table and of a width substantially equaling the width of said wide cross-brace for the upper table, and suitably-arranged sand-feed and flouring devices, substantially as set forth.

6. In a sand-core-molding machine, the frame, upper and lower slide-tables arranged one above the other within the frame and each consisting of a pair of parallel guide-rails provided with longitudinal guide-ribs at their upper edges to slidably support thereon the core-boxes, obliquely opposite hooks for moving the core-box sections respectively supported at one end of each of said tables, suitable connections between the obliquely opposite hooks to provide for the simultaneous movement thereof, and core-forming devices suitably arranged over the upper of said slide-tables, substantially as set forth.

7. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged one above the other within the frame, movable hooks supported to oscillate and reciprocate at one end of each of said tables, the hooks for the two tables being obliquely opposite, a rod connection with the obliquely opposite hooks to provide for the simultaneous oscillation and reciprocation thereof, means for operating the rod connection, and core-forming devices suitably arranged over the upper of said tables, substantially as set forth.

8. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged one above the other within the frame, a horizontally-movable rock-shaft supported at one end of each of said tables and carrying hooks for moving the core-box sections, the two rock-shafts being obliquely opposite, a rod connection with the obliquely opposite rock-shafts to provide for the oscillation and reciprocation thereof, means for operating the rod connection, and core-forming devices suitably arranged over the upper table, substantially as set forth.

9. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged one above the other within the frame to support core-boxes thereon, a horizontally-movable rock-shaft supported at one end of each of said tables and carrying hooks for moving the core-box sections, the two rock-shafts being obliquely opposite, opposite obliquely-arranged reciprocatory propelling-rods provided at a central point between their ends with upright slotted yokes and connected at their opposite ends respectively with the opposite extremities of the obliquely opposite rock-shafts to provide for the oscillation and reciprocation thereof, suitably-rotated gear-wheels mounted at opposite sides of the frame and carrying wrist-pin blocks loosely working in the vertically-slotted yokes of the propelling-rods, and core-forming devices suitably arranged over the upper table, substantially as set forth.

10. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged one above the other within the frame to support core-boxes thereon, a horizontally-movable rock-shaft supported at one end of each of said tables, the two rock-shafts being obliquely opposite, suitably-reciprocated obliquely-arranged propelling-rods connected at their ends respectively with the opposite extremities of the obliquely opposite rock-shafts, a pair of oscillating blocks mounted fast at one end on each of said rock-shafts and provided at one side with a pair of

reversely-disposed offstanding guide-flanges and at the side opposite said flanges with a pair of spaced bearing lugs or brackets, an adjustable hook-plate mounted to slide between the guide-flanges of each oscillating block and provided with a laterally-projecting adjusting-arm having a threaded opening and working in the block between the bearing lugs or brackets thereof, an adjusting-screw loosely mounted in said bearing lugs or brackets and working in the threaded opening of the adjusting-arm of each hook-plate, and core-forming devices suitably arranged over the upper table, substantially as set forth.

11. In a sand-core-molding machine, the frame, upper and lower horizontal slide-tables arranged within the frame and each consisting of a pair of parallel guide-rails, the guide-rails of each of said tables being provided near one end with longitudinally-disposed slots and at their outer sides with slide grooves or ways, flanged slide-blocks mounted in said slide grooves or ways and provided upon their outer sides with short projecting stop-studs, horizontally-movable rock-shafts carrying hooks for moving the core-box sections and having their opposite ends projecting through the slots and the slide-blocks near one end of the guide-rails of each of said tables, the two rock-shafts being obliquely opposite, short rock-arms fitted on the opposite extremities of each of said rock-shafts, reciprocatory obliquely-arranged propelling-rods having a pin connection at their ends respectively with the short rock-arms of the obliquely opposite rock-shafts, the pin connection between said propelling-rods and said rock-arms being extended at the inner sides of the rock-arms and adapted to engage against the short stop-studs projected from said slide-blocks, means for reciprocating said propelling-rods, and core-forming devices suitably arranged over the upper table, substantially as set forth.

12. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, means for moving the core-boxes on said table, a vertically-reciprocating press supported to work above the table and carrying a detachable vent-plate provided with vent-forming ribs or beads, a punch-pin mounted on the press, means for intermittently moving said punch-pin, a suitably-supported drive-shaft, operating connections between the drive-shaft and the vent-press, and suitably-arranged sand-feed and flouring devices, substantially as set forth.

13. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, means for sliding the core-boxes on the table, a vertically-reciprocating vent-press supported to work above the table, a punch-pin adjustably mounted on the vent-press, means for forcing the punch-pin downward at intervals, and suitably-arranged sand-feed and flouring devices, substantially as set forth.

14. In a sand-core-molding machine, the frame, opposite pairs of upright guide-plates arranged at opposite inner sides of the frame, a table mounted within the frame and adapted to slidably support thereon the core-boxes, means for sliding the core-boxes on the table, a vertically-reciprocating vent-press arranged above the table and comprising a flat horizontal press-plate and opposite upright side portions slidably mounted between said upright guide-plates, a suitably-supported drive-shaft, yielding adjustable eccentric connections between said drive-shaft and the upright side portions of the vent-press, a punch-pin adjustably mounted on the vent-press, a vent-plate detachably fastened to the lower side of said press-plate and provided with vent-forming ribs or beads, means for forcing the punch-pin downward at intervals, and suitably-arranged sand-feed and flouring devices, substantially as set forth.

15. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, a vertically-reciprocating vent-press supported to work above the table and provided with a flat horizontal press-plate having therein a longitudinally-disposed slot, a vent-plate detachably fastened to the lower side of the press-plate and provided with vent-forming ribs or beads, an upright box adjustably mounted on the upper side of the press-plate, a normally spring-elevated L-shaped punch-pin mounted within said box and having its lower end disposed in and working through the slot of said press-plate, a suitably-supported drive-shaft, operating connections between said drive-shaft and the vent-press, a gear-pinion adjustably mounted on said drive-shaft, a suitably-supported counter-shaft, a gear-wheel adjustably mounted on said counter-shaft and meshing with said pinion, said gear-wheel being larger than the pinion, and provided with a strike-stud adapted to work at intervals onto the upper horizontal portion of said punch-pin, and sand-feed and flouring devices, substantially as set forth.

16. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, a vertically-reciprocating vent-press supported above the table and having opposite rectangular upright side portions provided with upper cross-bars, a suitably-supported drive-shaft carrying a pair of eccentrics, eccentric-straps encircling said eccentrics directly below the said cross-bars and each of said eccentric-straps being provided with a strap-arm extension having in its upper end a squared socket and a guide-bore leading downward from the floor of said socket, a cap closing the upper end of said socket and having a rod-opening, an eccentric-rod projecting through said rod-opening and provided with a threaded portion disposed within said socket and with an unthreaded extension beyond said threaded portion working in said guide-bore, said eccentric-rod being

provided at its upper end with an annular groove and immediately below said groove with a nut portion, a nut mounted on the threaded portion of the eccentric-rod and having a squared head registering within the squared socket, a spring interposed between the squared head of the nut and the floor of the socket, a bifurcated pivot-plate embracing the upper end of the eccentric-rod and pivotally secured to the cross-bar immediately thereabove, a set-screw mounted in said pivot-plate and projecting into the annular groove of said eccentric-rod, and suitably-arranged sand-feed and flouring devices, substantially as set forth.

17. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, a vertically-reciprocating vent-forming press supported above the table, a sand-feed device supported at one side of the vent-forming press, a flouring device supported at the opposite side of the press, a rapidly-rotating cylindrical leveling-brush supported over the table between the sand-feed device and the press, and a curved shield-plate extended from one side of the sand-feed device between the brush and the press, substantially as set forth.

18. In a sand-core-molding machine, a table adapted to slidably support thereon the core-boxes, the vent-forming press supported above the table, a sand-feed device supported at one side of the vent-press, a flour-box supported at the opposite side of the vent-press and provided in its lower side with a screened narrow longitudinal discharge-slot, a rotating sifter blade or paddle working within said box over said screened slot, means for sliding the core-box section on the table, and means for rotating said sifter blade or paddle across said slot during the travel thereunder of every alternate core-box section, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

THOMAS JOSEPH RYAN.

Witnesses:

WILLIAM F. SHEEHAN,

J. C. SHEEHAN.