

July 28, 1925.

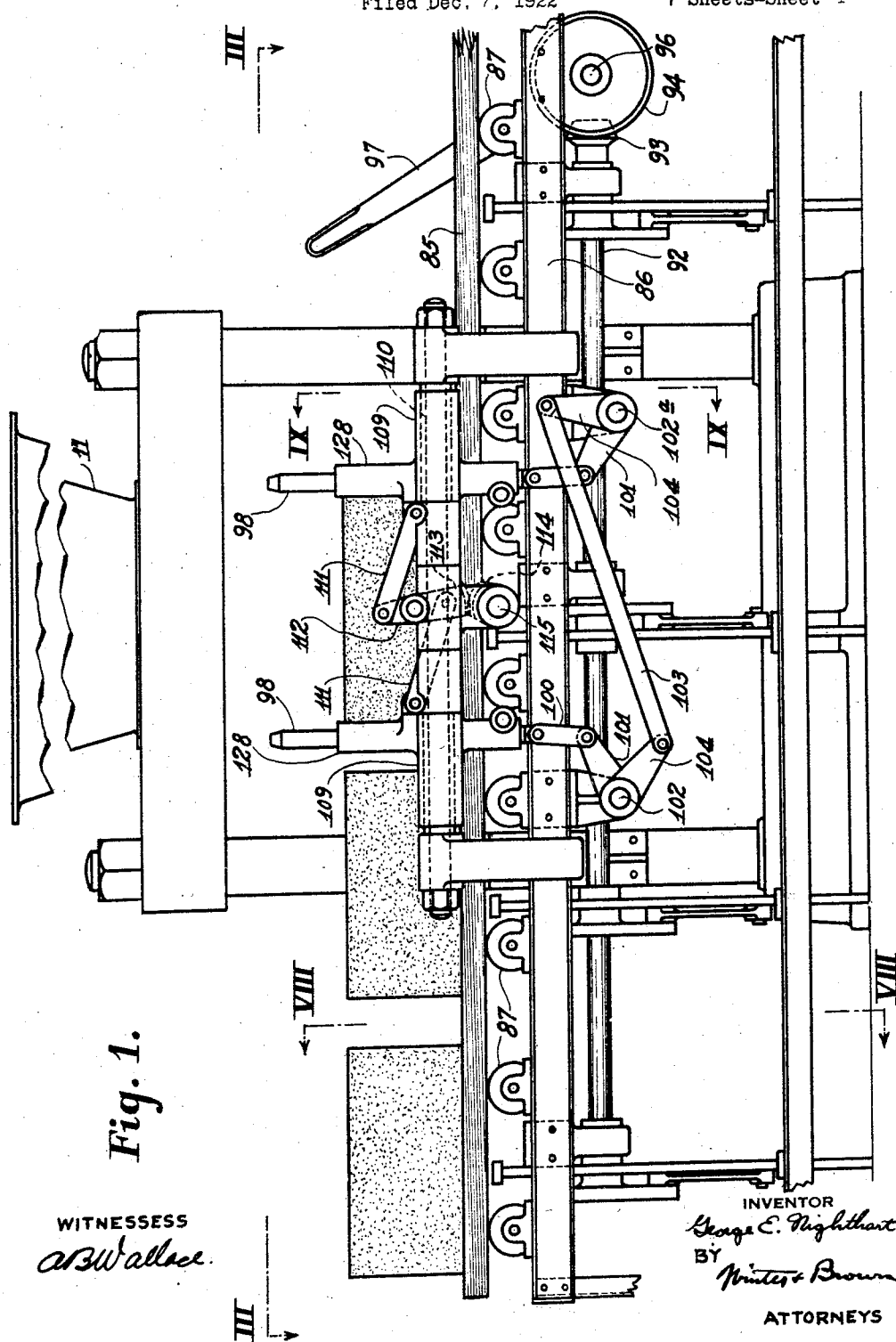
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G. E. NIGHTHART

MACHINE FOR FORMING BUILDING BLOCKS

Filed Dec. 7, 1922

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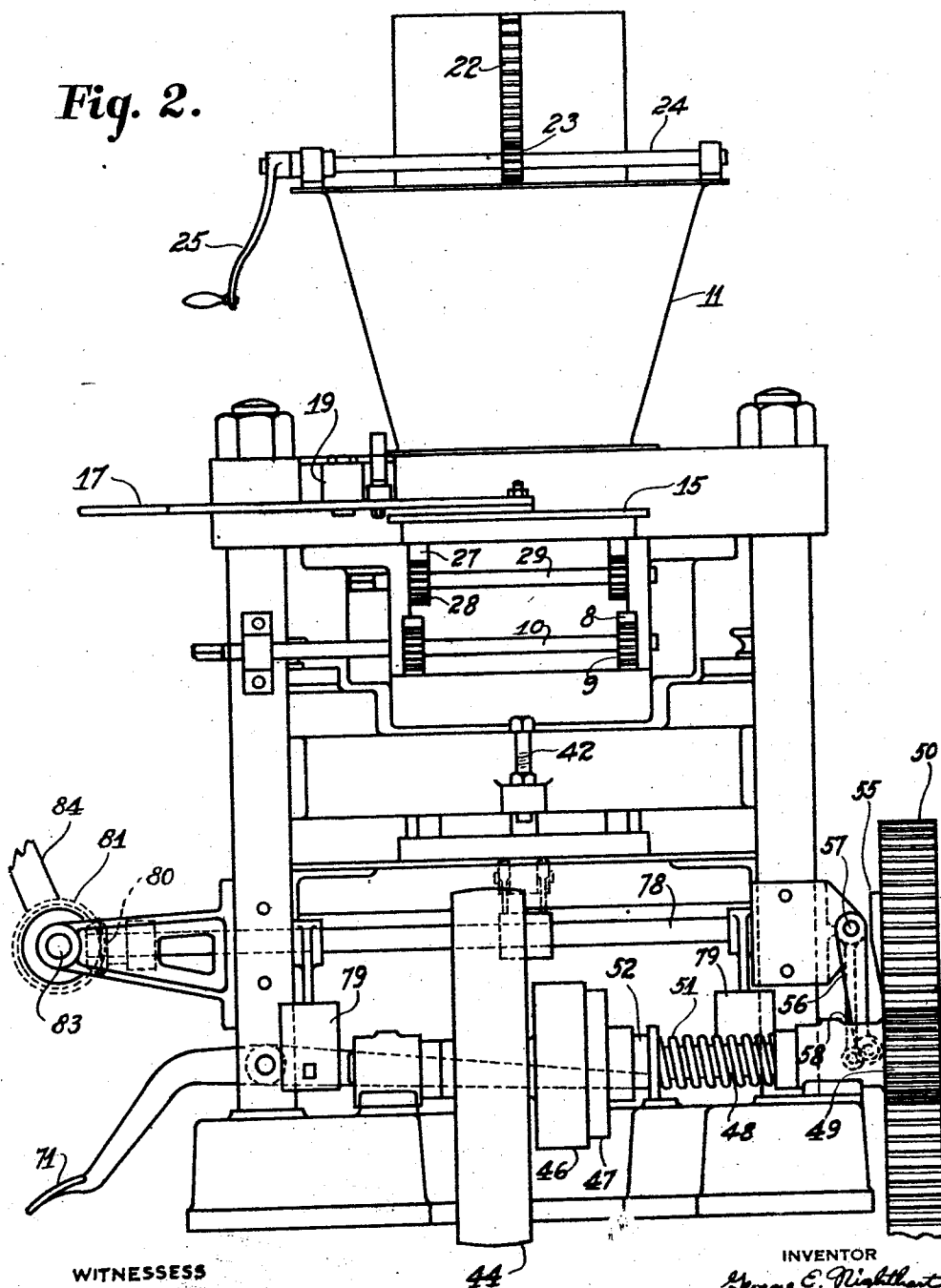
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Fig. 2.



WITNESSES

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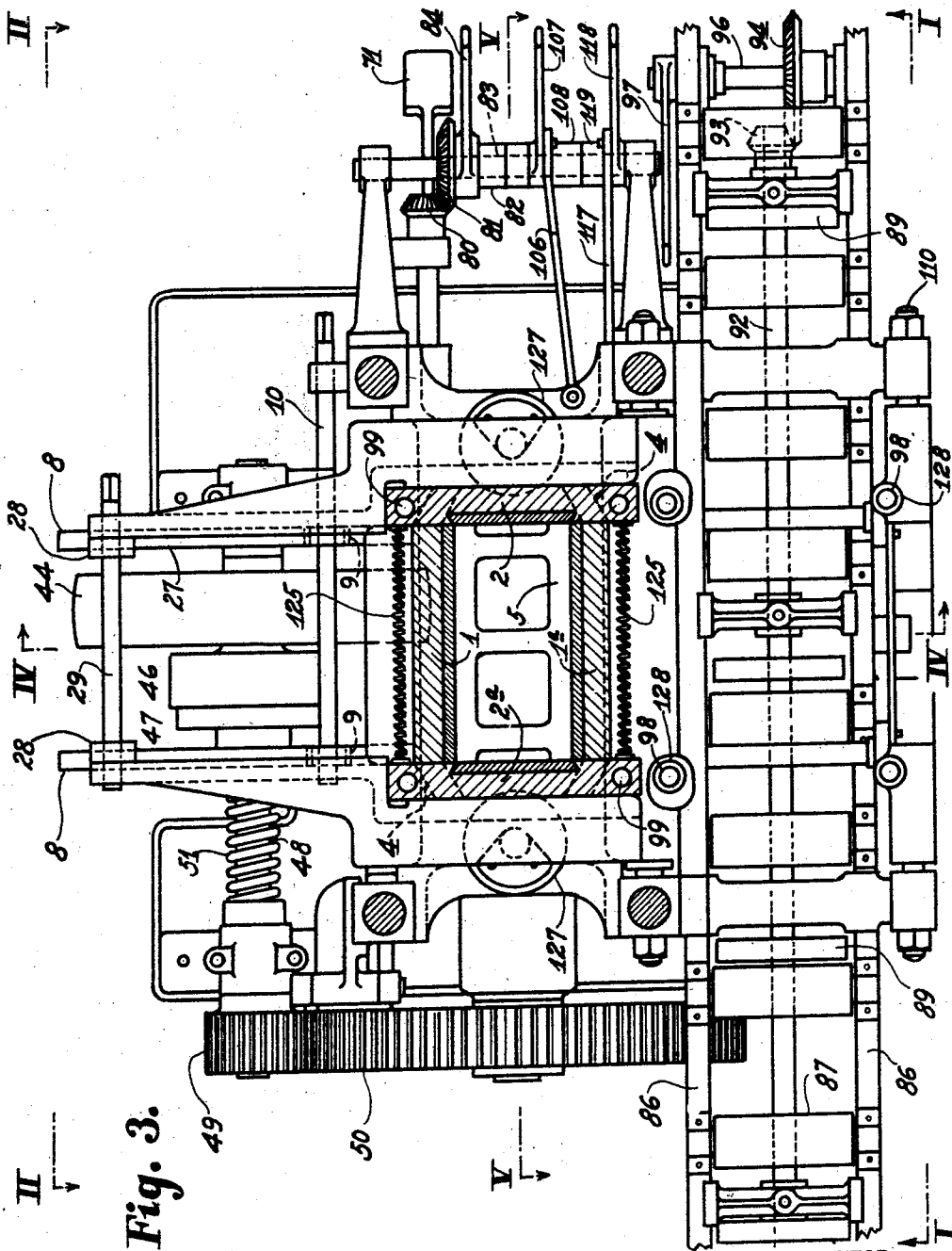


Fig. 3.

WITNESSES

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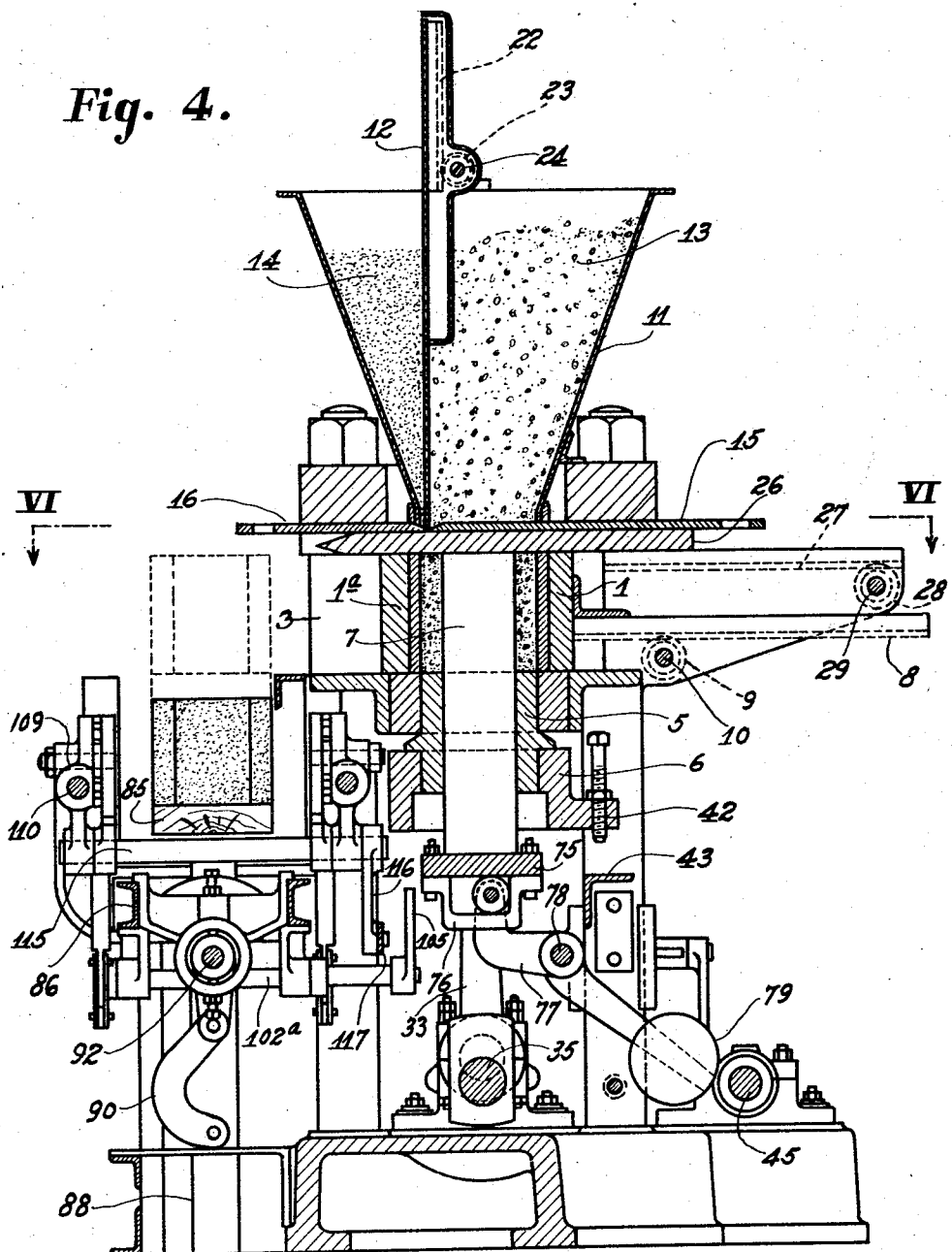
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Fig. 4.



WITNESSES

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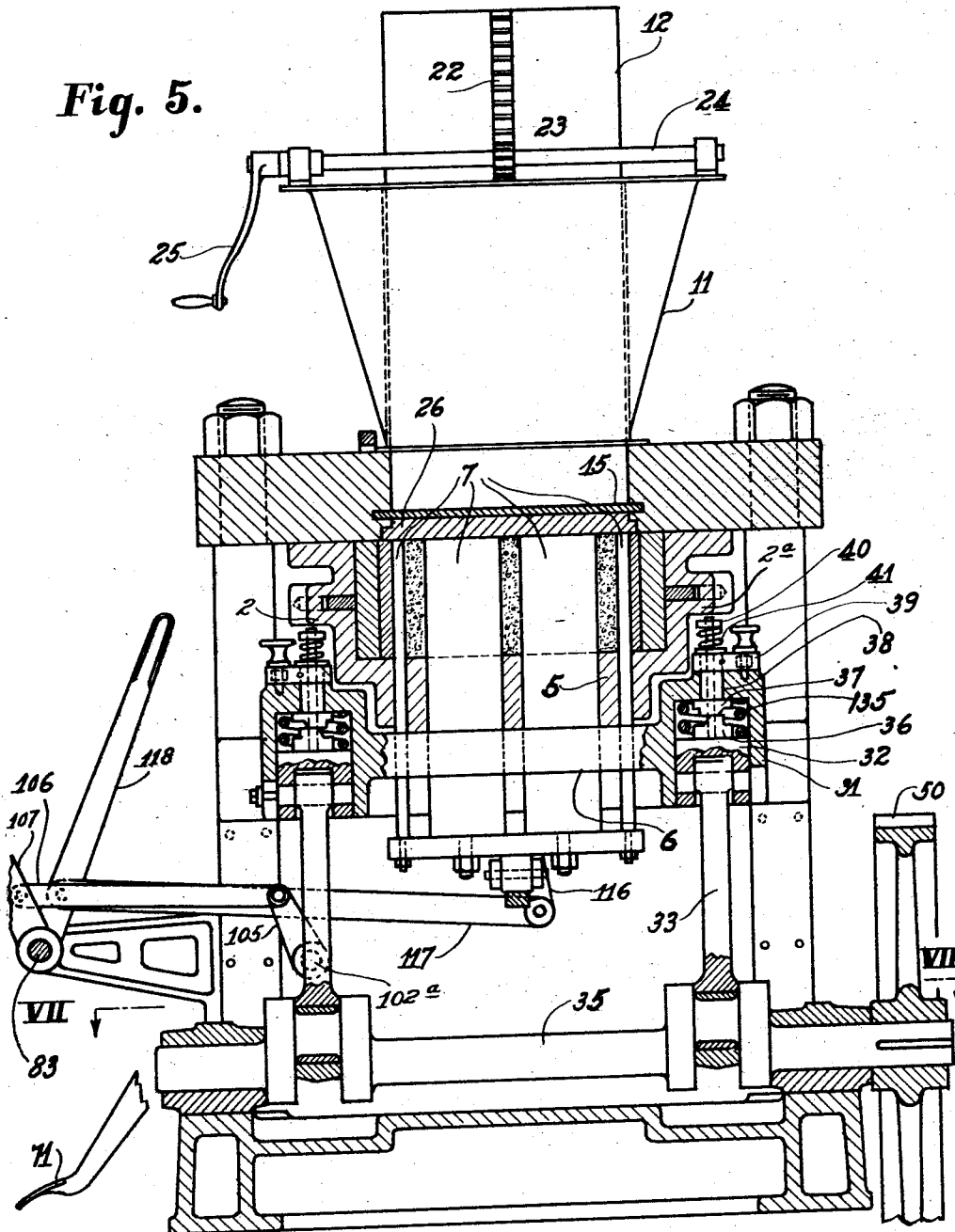
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Fig. 5.



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MACHINE FOR FORMING BUILDING BLOCKS

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Fig. 6.

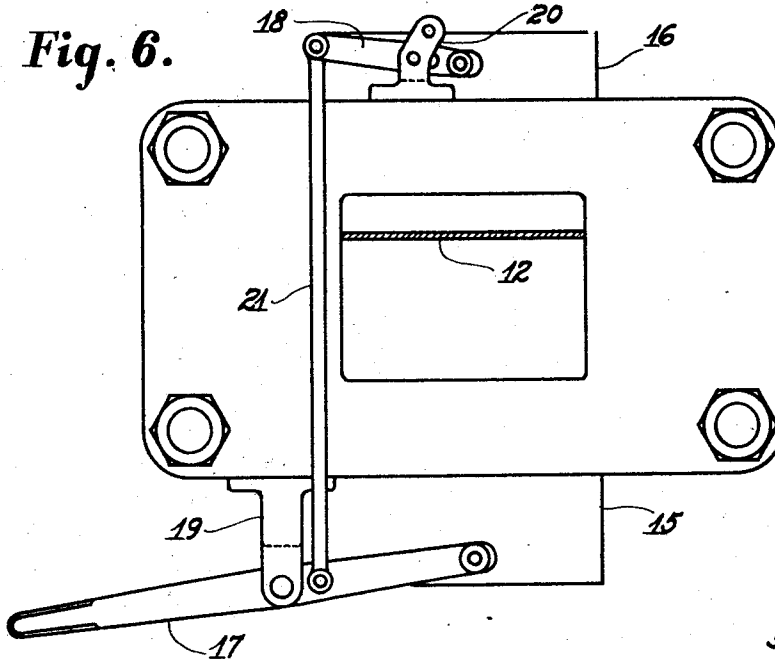
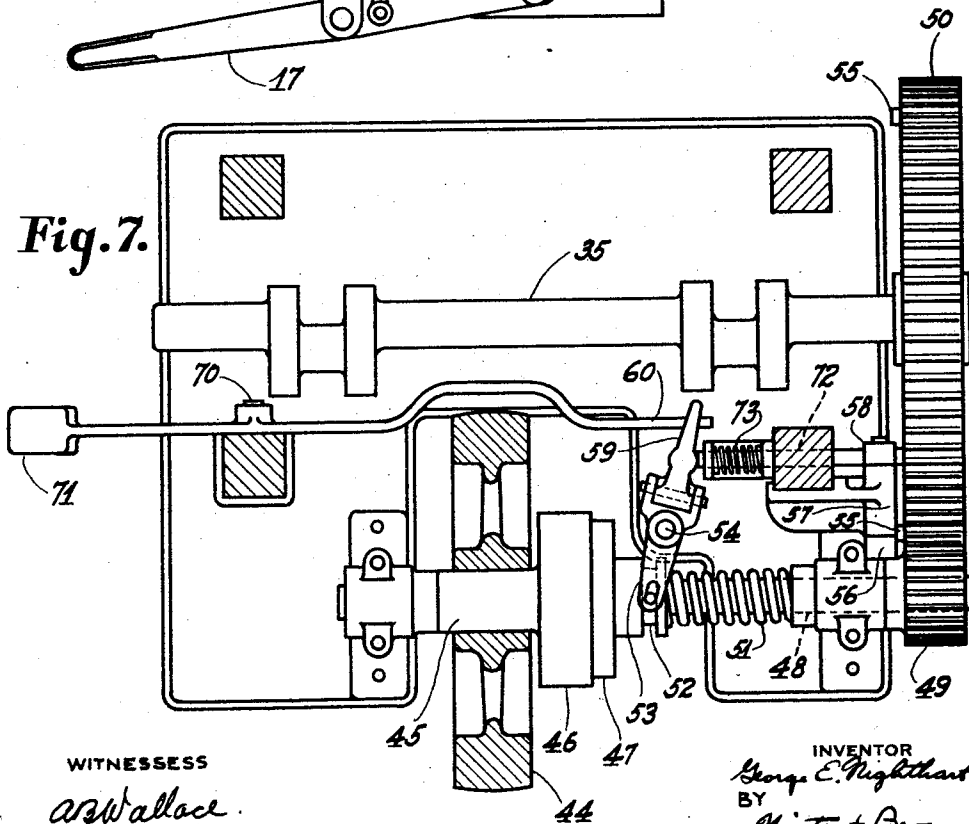


Fig. 7.



WITNESSES

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MACHINE FOR FORMING BUILDING BLOCKS

Filed Dec. 7, 1922

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Fig. 8.

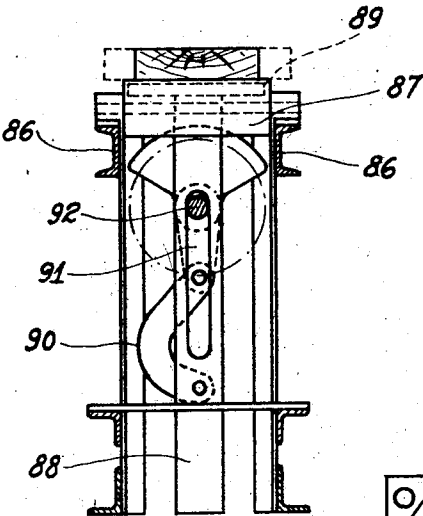


Fig. 10.

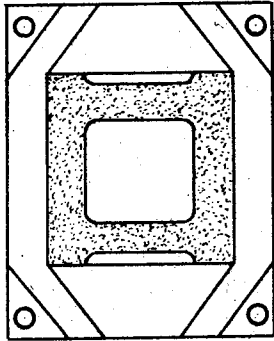
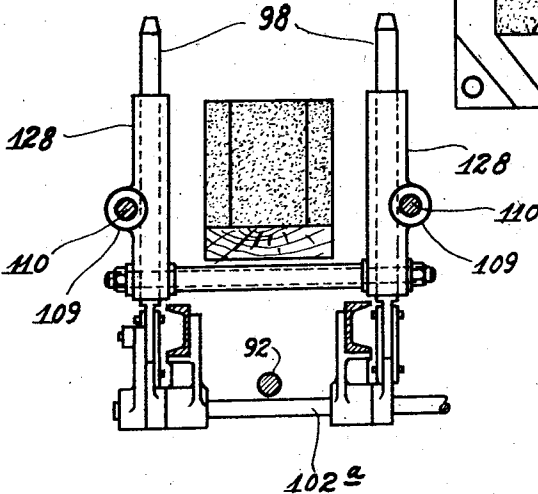


Fig. 9.



WITNESSES
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UNITED STATES PATENT OFFICE.

GEORGE E. NIGHTHART, OF PARNASSUS, PENNSYLVANIA.

MACHINE FOR FORMING BUILDING BLOCKS.

Application filed December 7, 1922. Serial No. 605,378.

To all whom it may concern:

Be it known that I, GEORGE E. NIGHTHART, a citizen of the United States, and a resident of Parnassus, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Machines for Forming Building Blocks, of which the following is a specification.

The invention relates to apparatus for forming building blocks of plastic materials such as cement, gypsum, and various special compositions. While applicable to the forming of either hollow or solid building blocks of various materials, it is particularly well adapted to the formation of hollow building blocks made of concrete, and is so illustrated and described herein.

Hollow building blocks are commonly manufactured in one of four ways, namely, pressing, tamping, rolling, and shaking or jarring. Ordinarily pressure is not, and with the apparatus now used cannot be, applied uniformly throughout an entire block, nor is it, as it should be to obtain maximum strength, applied in the direction in which the block carries a load when in service. Also, as such blocks are commonly manufactured, the blocks are formed or deposited on individual pallets where they remain until the plastic material has set sufficiently to permit removal of the blocks. This necessitates the use of a large number of pallets because it requires at least a day for a block to become sufficiently set to be removed from its supporting pallet. The initial outlay for pallets, and the expense of operation involved in handling them adds materially to the cost of manufacture of the blocks.

It is frequently desired to provide building blocks with a special facing of material which may be plastic and which is different than the main body of the blocks. In the customary manner of manufacturing such blocks the facing material is placed in and distributed upon the bottom of a mold by hand, the procedure being slow and expensive, and resulting in uneven thickness. The concrete for forming the main body of the block is then fed into the mold and the facing material and main body simultaneously pressed or otherwise compacted.

Objects of the present invention are to provide apparatus for forming building blocks of plastic material in which the use of a supporting pallet is dispensed with, in which the plastic material is compressed in

the line of direction in which the blocks ordinarily sustain their loads when in use, and in which blocks may be provided with special faces without performing a separate operation.

A further object is to provide an apparatus for the purpose stated which may be readily adjusted to effect any desired pressure upon the plastic material of which blocks are formed, and in which the pressure may be observed while adjustment is being made.

A further object is to provide an apparatus which automatically measures the volume of plastic material required for forming a block of a given size so that all blocks will be formed of the same volume of plastic material and be uniformly subjected to the same pressure.

A further object is to improve the general construction and arrangement of machines for the purpose stated to the end that building blocks of superior quality may be more economically manufactured.

The invention is illustrated in the accompanying drawings in its applicability to the forming of building blocks from plastic concrete. Fig. 1 is an elevation of the front of the machine, the plane of view being indicated by the line I—I, Fig. 3; Fig. 2 an elevation of the back of the machine, the plane of view being indicated by the line II—II, Fig. 3; Fig. 3 a horizontal section taken on the line III—III, Fig. 1; Figs. 4 and 5 vertical sectional views taken, respectively, on the lines IV—IV, and V—V, Fig. 3; Fig. 6 a plan view of the hopper-closing plates and their operating mechanism, the plane of view being indicated by the line VI—VI, Fig. 4; Fig. 7 a plan view of driving mechanism in the lower portion of the machine, the plane of view being indicated by the line VII—VII, Fig. 5; Fig. 8 a vertical sectional view of a transfer table, taken on the line VIII—VIII, Fig. 1; Fig. 9 a detached vertical sectional view taken on the line IX—IX, Fig. 1; and Fig. 10 a plan view of a mold for forming a block differing in shape from that formed by the mold illustrated with the machine.

The machine illustrated in the drawings is constructed and arranged for forming standard building blocks having two openings extending through them and recesses at their ends, although by proper substitution of parts it may be used for forming

differently shaped blocks. Also, the illustrated machine is constructed to form blocks having special faces, although it will be understood that by merely omitting the operation of the mechanism for forming a special face the machine may be used to form blocks of the same material throughout.

The machine includes a mold into which plastic concrete flows from a hopper around removable plungers arranged within the mold. The bottom of the mold is movable, and while concrete is being placed in the mold the bottom is at such position that when the mold is filled the bottom will, by being moved a predetermined amount, effect the required compression of the concrete to form a block of the desired size. After the concrete has been compressed to form a block in the mold, the plungers are withdrawn and the mold with its contained block moved laterally until it rests upon a vertically and horizontally movable transfer tray. The mold is then opened, and the transfer tray moved downwardly to permit the mold to be returned to filling position.

With this brief preliminary explanation of the general construction and operation of the machine, its further detailed description may be more easily understood, it being premised, however, that the particular machine illustrated and described is merely illustrative of the invention.

The mold includes four side members 1, 1^a and 2, 2^a arranged for lateral movement within a channelway 3 which forms a part of the machine frame (Fig. 4). The sides 1 and 1^a of the mold are provided with tongues 4 arranged in angular grooves formed in the sides 2 and 2^a so that when the latter sides are moved away from each other in the manner hereinafter described the sides 1 and 1^a will also be caused to move away from each other. The sides 2 and 2^a are normally held yieldingly toward each other by means of springs 125 arranged as shown. The bottom 5 of the mold conforms in shape to the cross section of the block to be formed and is mounted upon a vertically movable platen 6 (Figs. 4 and 5), through which and the mold bottom 5 there extend plungers 7 which are movable independently of platen 6. For effecting the lateral movements of the sides of the mold, the side 1 has attached to it racks 8 which mesh with pinions 9 mounted on a shaft 10 which may be rotated in any desired manner, as for example by means of a crank. The mold sides being attached to each other by the tongue and groove connections previously explained the entire mold may be supported by the attachment of its side 1 to the racks 8.

On the top of the machine and above the filling position of the mold there is a hopper

11 which may be divided by a vertically movable partition 12 into two compartments, one for holding a body of plastic material 13 for forming the main body of the block, and the other for holding a body of plastic material 14 for forming a special face. The bottom of the hopper is closed by means of a pair of laterally movable plates 15 and 16, the former for closing the concrete hopper section and the other the facing material section. To simultaneously operate the hopper closures 15 and 16, they are connected by transverse slots to the ends of levers 17 and 18 pivoted to brackets 19 and 20, respectively (Fig. 6). The levers are connected to each other by a rod 21 so that by swinging lever 17 on its fixed pivot both closure plates will move simultaneously to either open or close the hopper. The hopper partition plate 12 is provided with a rack 22 which meshes with a pinion 23 attached to a shaft 24 which may be rotated by a crank 25. Between the hopper closure plates and the top of the mold sides there is arranged a laterally slidable plate 26 which forms the top of the mold. This plate is attached to racks 27 which mesh with pinions 28 mounted on a shaft 29 which may be rotated by a suitable crank.

In filling a mold, plate 26 is first moved from beneath the hopper, partition plate 12 is then lowered until its lower edge rests upon the mold bottom 5, and then the hopper closure plates 15 and 16 are opened to permit flow of the materials 13 and 14 into the mold. Partition plate 12 is then moved upwardly, hopper plates 15 and 16 closed, and plate 26 moved across the top of the mold.

The mechanism for moving mold bottom 5 for effecting the desired compression of the plastic material will now be explained. As previously stated, the mold bottom is attached to a vertically movable platen 6. The outer ends of the platen are provided with sockets 31 (Fig. 5) which receive pistons 32 pivotally connected to the upper ends of pitmen 33 eccentrically connected at their lower ends to a rotatable driven shaft 35. For adjusting the machine to effect the desired compression of the plastic material in the manner presently to be explained, a spring 135 is arranged between the upper end of each piston 32 and the bottom of socket 31. Also the top of each piston is provided centrally with a member 36 having a serrated top adapted to cooperate with a corresponding member 37 having a serrated bottom to directly and positively move platen 6 upwardly during the normal operation of the machine after it has been adjusted. Serrated member 37 is rigidly attached to a rotatable sleeve 38 adapted to be turned by an arm 39 to a position in which the tops of the projections

or serrations formed on member 37 register with the bottoms of those formed on member 36, this being for the purpose of permitting spring 135 to register the pressure being applied to a body of plastic material. The upper end of each piston 32 is held within its socket 31 by means of a rod 40 extending downwardly through sleeve 38 and member 37 to member 36 to which rod 40 is rigidly attached. Between the head of rod 40 and the top of the hub of arm 39 there is a compression spring 41 through which rod 40 acts to cause the platen to move downwardly to variable horizontal positions, any one of which may be fixed to effect a certain filling of the mold to obtain the required pressure when the bottom is moved upwardly. This lowermost position of the platen may be fixed by means of vertically adjustable set screws or bolts 42, the lower ends of which are arranged to strike stops 43, one of which is indicated in Fig. 4 as an angle.

It is desirable to stop the movements of platen 6 each time mold bottom 5 is moved to its upper and lower positions. For this purpose the machine includes mechanism for automatically disconnecting the source of power from driven shaft 34 at the required times. The mechanism for this purpose is illustrated in Figs. 2 and 7, but chiefly in the latter. A power wheel 44 is mounted on a shaft 45 which has connected to it a member 46 of a suitable clutch. A cooperating clutch member 47 is feathered to a shaft 48 which is provided with a pinion 49 meshing with a gear 50 attached to driven shaft 35. Clutch member 47 is normally urged towards clutch-closing position by means of a spring 51, and is provided with a groove 52 adapted to receive the end of a control yoke 53 pivoted as at 54. The side of gear 50 is provided with a pair of projections 55 each adapted to move an arm 56 of a bell-crank lever pivoted as at 57, the other end thereof consisting of a finger 58. The outer end of control yoke 53 is provided with a pivoted finger 59, which has its downward movement limited to substantially a horizontal position, but which may be elevated by means of a lever 60 pivoted at 70 and having a foot treadle 71 formed on its outer end. A longitudinal slidable rod 72 is arranged so that one of its ends may bear against finger 59 and its other end against finger 58. This rod is normally urged by means of a spring 73 towards finger 58 and hence away from finger 59.

In the operation of the automatic cut-out for the drive mechanism, driving shaft 45 is normally rotating continuously, and spring 51 normally holds clutch member 47 in engagement with clutch member 46 so that driven shaft 35 may be rotated. When a lug 55 engages bell-crank lever arm 56,

such arm is moved outwardly and this causes bell-crank lever arm 58 to press against rod 72, which rod, acting upon finger 59, causes clutch control yoke 53 to disengage clutch member 47. This disconnects the driving from the driven shaft, and in view of the fact that lug 55 still presses lever arm 56 outwardly, the clutch remains disconnected. When it is desired to effect a reverse movement of the mold bottom, treadle 71 is pressed downwardly to raise finger 59 above rod 72. Spring 51 then causes clutch member 47 to engage clutch member 46, thus re-establishing the driving connection. The lugs 55 on gear 50 are so positioned that the movement of the mold bottom is arrested when it reaches its upper and its lower positions.

After the compression of the plastic material to form a block, plungers 7 are moved downwardly to permit the side members of the mold and its contained block to be moved laterally. The mechanism for this purpose is illustrated particularly in Figs. 3 and 4. As seen in the latter, the plungers are mounted on a base 75 having yokes 76 attached to its bottom and adapted to receive the ends of arms 77 attached to a rock shaft 78. Normally base 75 is urged upwardly by a weighted lever 79 attached to shaft 78. For moving the plungers downwardly against the action of the weighted lever, shaft 78 is provided at its end with a bevelled pinion 80 which meshes with a bevelled gear 81 secured to a sleeve 82 rotatably mounted on a rod 83, which sleeve is provided with an operating lever 84. By moving this lever towards the machine, shaft 78 will be rocked to lower the plungers.

The plungers being removed from the mold, its interlocked side members are moved laterally to deposit the formed block on a plank or other suitable tray 85 which rests upon a transfer table provided with means for raising the tray to a position for receiving the formed block and for subsequently lowering the tray and block so that the mold side members may be returned to their charging position. The transfer table is illustrated particularly in Figs. 1, 3 and 8, and comprises a suitable frame, the upper horizontal members of which may be a pair of channels 86 which support a series of rollers 87. For raising and lowering the tray there are between certain of the rollers and between channels 86 a series of vertically movable bars 88 provided at their upper ends with cross members 89, which, in the lowermost position of bars 88, lie just below tray 85 when the tray is supported on rollers 87. Each bar 88 is attached by means of a link 90 and an arm 91 to a rotatable shaft 92 in such manner that when the shaft is rotated a half revolution the bars will be elevated, and when reversely rotated the bars

will be lowered. For rotating shaft 92, it is provided at its end with a bevelled pinion 93 meshing with a bevelled gear 94 secured to a shaft 96 adapted to be rotated or rocked by a hand lever 97.

To move the side members of the mold laterally from a formed block, there are provided a series of vertically movable fingers 98 (Fig. 1) adapted to extend into holes 99 formed in the ends of side members 2 and 2^a, and these fingers are subsequently moved as pairs in a direction to cause the mold sides 2 and 2^a to move away from each other. For raising and lowering fingers 98, each is attached by means of a link 100 and arm 101 to one or the other of the shafts 102 and 102^a which are connected to each other for simultaneous rocking movement by means of a link 103 and arms 104 (Fig. 4). Shaft 102^a is provided at its inner end with an arm 105 (Fig. 4) which is connected by a link 106 (Fig. 3) to an operating lever 107 attached to a sleeve 108 rotatably mounted on shaft 83. By moving this operating lever away from the machine, pins 98 are moved upwardly into holes 99 of mold sides 2 and 2^a, and by moving the lever in the opposite direction the pins may be withdrawn from the holes.

The link connection of the lower ends of pins 98 to shafts 102 and 102^a are such as to permit sufficient lateral movement of the pins to open the mold side members. The pins are slidably mounted in vertical sleeves 128 which are attached to horizontal sleeve 109 mounted for sliding movement upon rods 110 (Figs. 1 and 9). The sleeve members are connected by links 111 to rocker arms 112 provided at their ends with segmental pinions 113 which mesh with segmental gears 114 attached to a rock shaft 115. As seen in Figs. 3 and 4, the inner end of shaft 115 is connected to an arm 116 which is attached to one end of a link 117, the other end of which is connected to an operating lever 118 secured to a sleeve 119 rotatably mounted on shaft 83. The movement of lever 118 away from the machine causes the pins 98 which engage mold side 2 and those which engage mold side 2^a to move as pairs away from each other against the resistance of springs 125. This lateral movement of mold sides 2 and 2^a simultaneously causes mold sides 1 and 1^a to move laterally by reason of the angular tongue and grooved connections 4.

The various parts of the machine are, as clearly illustrated in the drawings, mounted upon a suitable frame shaped to receive them. The mold is constructed to form standard building blocks having two openings through them, the form of the block being clearly indicated in the drawings. By changing the mold to the form indicated in Fig. 10 and by substituting the single center

plunger for the two shown in the machine, a standard building block having a single opening in it of a shape illustrated in Fig. 10 may be formed. The machine may obviously be constructed and arranged to form various other shapes and types of building blocks.

In describing the construction of the machine, the operation of each unit has been explained after the detailed description of its construction. The operation of the machine as a whole will now be set forth. It is known that a given mix of concrete requires a certain compression, or at least a certain minimum compression, to give it maximum strength and other desirable physical properties when set. As previously explained, the invention contemplates an adjustment of the machine for effecting various desired compressions of the concrete or other plastic material of which the blocks are formed. Springs 135 arranged in sockets 31 are adapted to operate registers 125 mounted on sockets 31. In adjusting the machine to effect a required compression of the concrete, serrated or toothed member 37 is turned by arm 39 so that the ends of its teeth register with the openings between the teeth of member 36. By a series of trial adjustments of screws 42 which limit the downward movement of platen 6, the position of the upper end of mold bottom 5 when in its lowermost position is determined for causing the mold to contain the required volume of uncompressed concrete to give the required compression of the concrete when the bottom is moved to its uppermost position, the pressure being observed by the indicators 127 (Fig. 3). The required compression is effected when the indicators show the desired pressure coincident with the top of the mold bottom being flush with the bottom of channel-way 2. When this has been arrived at, arm 39 is turned to cause the ends of the serrations or teeth on member 37 to register with those on member 36. When it is desired to adjust the machine for a different compression, a different set of springs 135 is substituted, it being understood that the springs should show the requisite pressure when so compressed that the distance between the upper ends of pistons 32 and the tops of sockets 31 is equal to the combined depth of serrated members 36 and 37 when the tops of their teeth register with each other. It will be understood, however, that ordinarily one setting of a machine is sufficient, for usually the machines operate continuously upon a given plastic material which should be compressed a certain known amount.

The machine being thus adjusted for operation, and the plungers 7 being in their uppermost position and platen 6 in its lowermost position, mold top plate 26 is

moved laterally to open the top of the mold. When blocks having special faces are being formed, partition plate 12 is next lowered until its bottom rests upon the lowered mold
 5 bottom 5. Hopper closure plates 15 and 16 are then opened to permit the plastic materials 13 and 14 to flow into the mold on opposite sides of the partition plate. When the mold is thus filled, plates 15 and 16 are
 10 closed upon partition plate 12. This plate 12 is moved upwardly and mold top 26 moved to its position above the mold as indicated in Fig. 4. Treadle 71 is then depressed to trip finger 59 so that the driving
 15 mechanism will cause driven shaft 35 to rotate to move mold bottom 5 to its uppermost position, at which time the driving connection is automatically released. Plungers 7
 20 are then lowered by moving operating lever 84 to turn shaft 78. Tray 85 is arranged in its uppermost position by rotating shaft 92 which is operated by lever 97, the rotation of the shaft being effective to elevate bars
 25 88. Shaft 10 is then rotated to cause the mold side members to move laterally to a position upon tray 85. Mold-engaging pins 98 are then elevated by moving lever 107, and thereafter lever 118 is moved to cause the
 30 mold engaging fingers to move laterally to release the formed block. Finally, tray 85 is lowered, and the mold side members closed and moved to charging position for a second cycle of operation.

According to the provisions of the patent
 35 statute, I have described the principle and operation of my invention in connection with a usual form of apparatus on which it may be practiced. However, I desire to have it understood that, within the scope of the
 40 appended claims, the details of construction and operation may be varied within wide limits in accomplishing the several objects of the invention previously set forth.

I claim as my invention:

45 1. In a machine for forming hollow building blocks of plastic material, the combination of a mold having side members movable from mold charging to mold discharging position, a plunger movable to
 50 and from a position within the mold side members when they are in charging position, means for filling the mold with plastic material, and means for subsequently moving the mold bottom to compress the plastic
 55 material.

2. In a machine for forming building blocks of plastic material, the combination
 60 of a mold having side members movable from mold charging to mold discharging position and having a vertically movable bottom, means for moving said bottom downwardly to a predetermined variable position for charging the mold and for subsequently moving the mold bottom up-
 65 wardly to compress the plastic material.

3. In a machine for forming building blocks having its main body of one and a face of another plastic material, the combination of a mold, a hopper arranged above the mold and provided with a vertically
 70 movable partition for dividing the hopper into chambers for receiving each of said plastic materials, a movable bottom for the hopper means for moving said partition downwardly into said mold, means for subsequently moving said hopper bottom to
 75 open the hoppers to discharge material therefrom into mold compartments formed on the opposite side of the lowered partition, and means for compressing the plastic
 80 material in the mold after the said partition has been withdrawn.

4. In a machine for forming hollow building blocks of plastic material, the combination
 85 of a mold having side members and a bottom vertically movable to variable positions to determine the volume of material for forming a block, a core-forming plunger vertically movable through the mold bottom, means for adjusting the lowermost po-
 90 sition of said bottom to effect a predetermined compression upon the plastic material, and independent means for moving said plunger and mold bottom.

5. In a machine for forming building
 95 blocks of plastic material, the combination of a mold having sides and a vertically movable bottom, a continuously rotating driving shaft, connections from said shaft to said mold bottom for raising and lowering
 100 it, and means for automatically breaking said connections when said bottom has been moved to its uppermost position.

6. In a machine for forming building
 105 blocks of plastic material, the combination of a mold having side members laterally movable with relation to each other to remove a formed block and having a vertically movable bottom, means for positively
 110 moving the said mold bottom to its upper position, and means for variably limiting the lowermost position of said bottom.

7. In a machine for forming hollow build-
 115 ing blocks of plastic material, the combination of a mold having side members movable from mold-charging to mold-discharging position and having a vertically movable bottom, a plunger for forming a core in a block vertically movable through said
 120 bottom independently of the movement of the bottom, and means for moving said mold side members laterally and said bottom and plunger vertically.

8. In a machine for forming building
 125 blocks of plastic material, the combination of a mold having side members movable from charging to discharging position, and movable laterally with relation to each other at discharging position, vertically
 130 and laterally movable fingers for engaging

the side members at mold-discharging position, and means for moving said fingers first vertically and then laterally to engage and open the mold side members.

- 5 9. In a machine for forming building blocks of plastic material, the combination of a mold having side members movable from mold-charging to mold-discharging positions, a transfer table below the dis-
10 charging position of said mold members

and adapted to receive a block-supporting tray, means for moving said tray upwardly above said table to receive a block from said mold, and means for opening said mold to deposit a block therein upon said tray. 15

In testimony whereof, I sign my name.

GEORGE E. NIGHTHART.

Witnesses:

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D. L. ECKARD.