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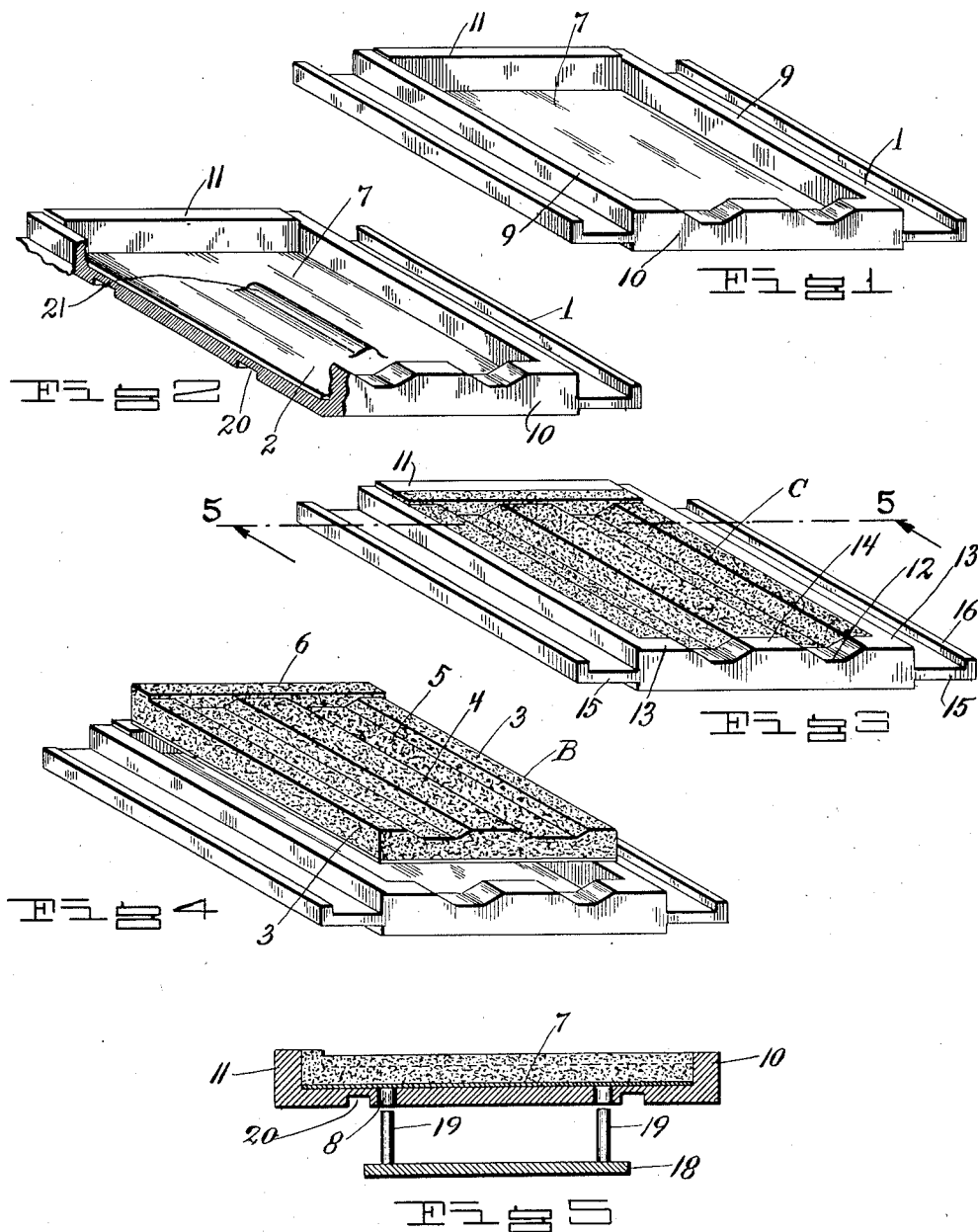
E. WIDIN

1,733,706

MACHINE FOR MAKING CONCRETE BLOCKS

Filed March 29, 1928

7 Sheets-Sheet 1



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Oct. 29, 1929.

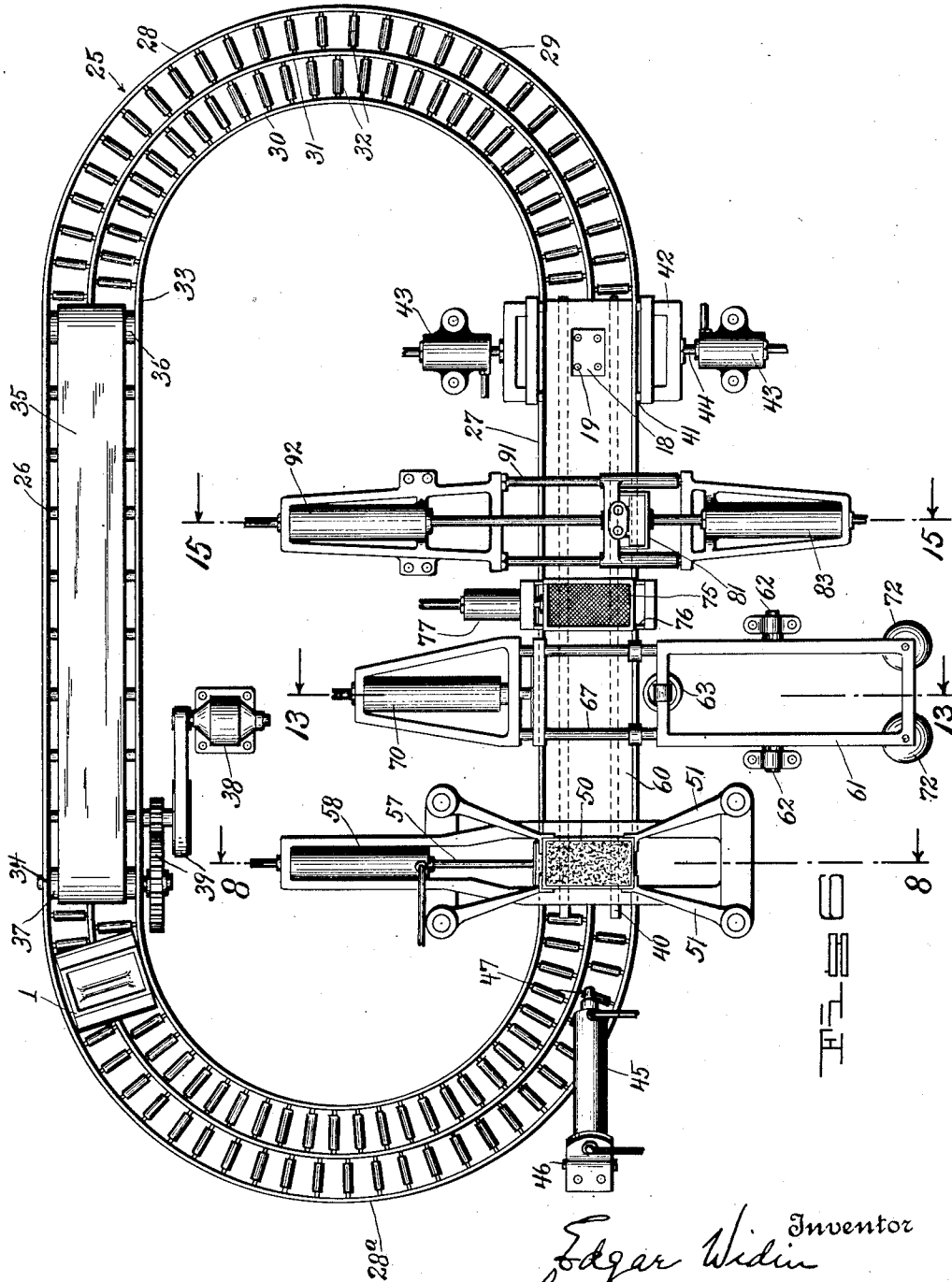
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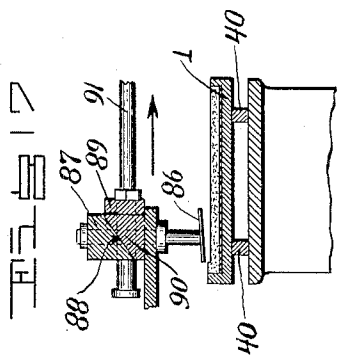
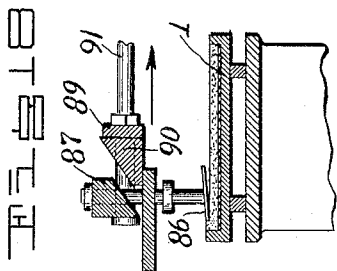
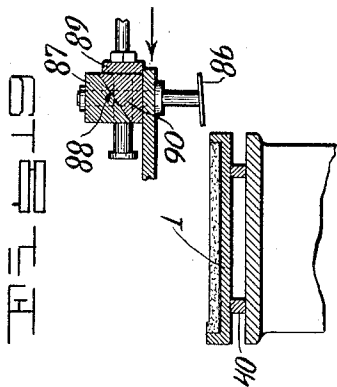
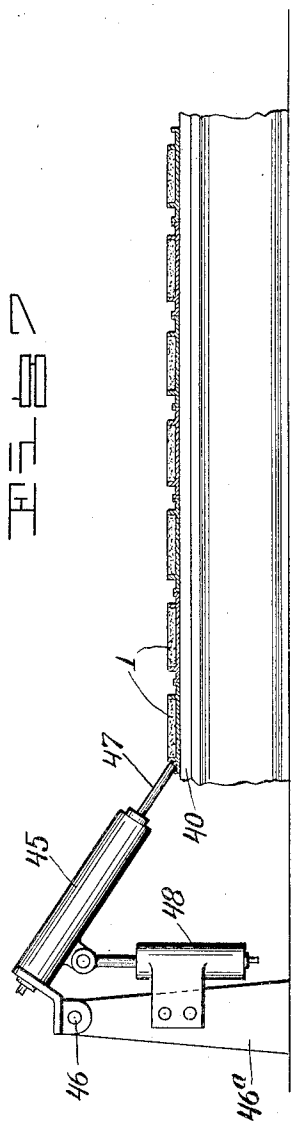
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7 Sheets-Sheet 3



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7 Sheets-Sheet 4

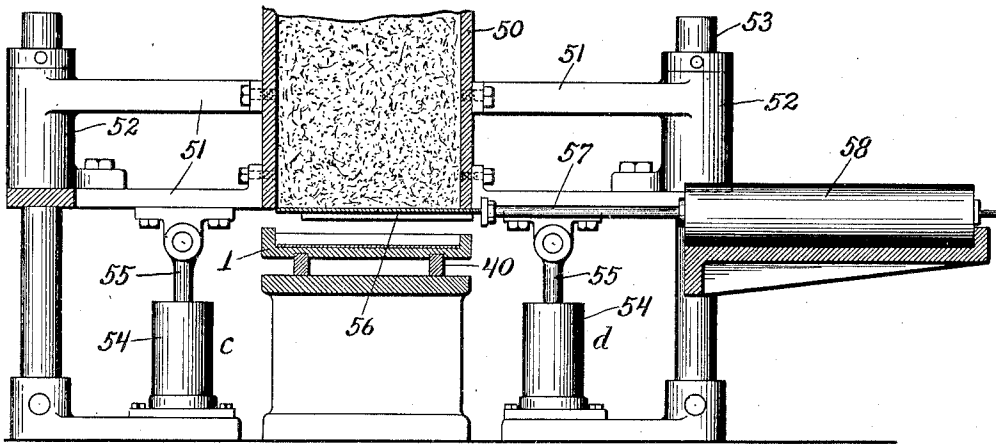


FIG. 8

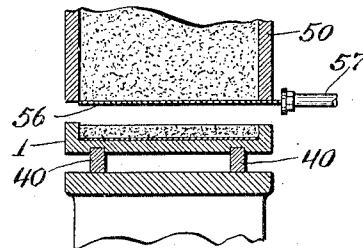
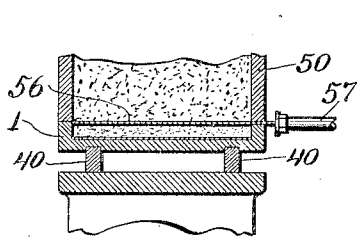
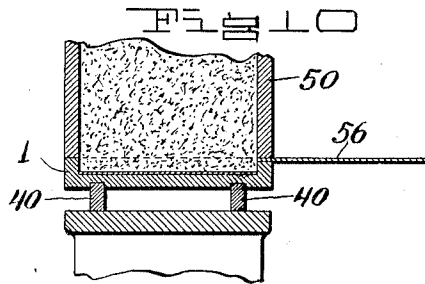
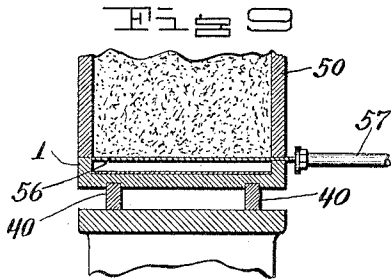


FIG. 11

FIG. 12

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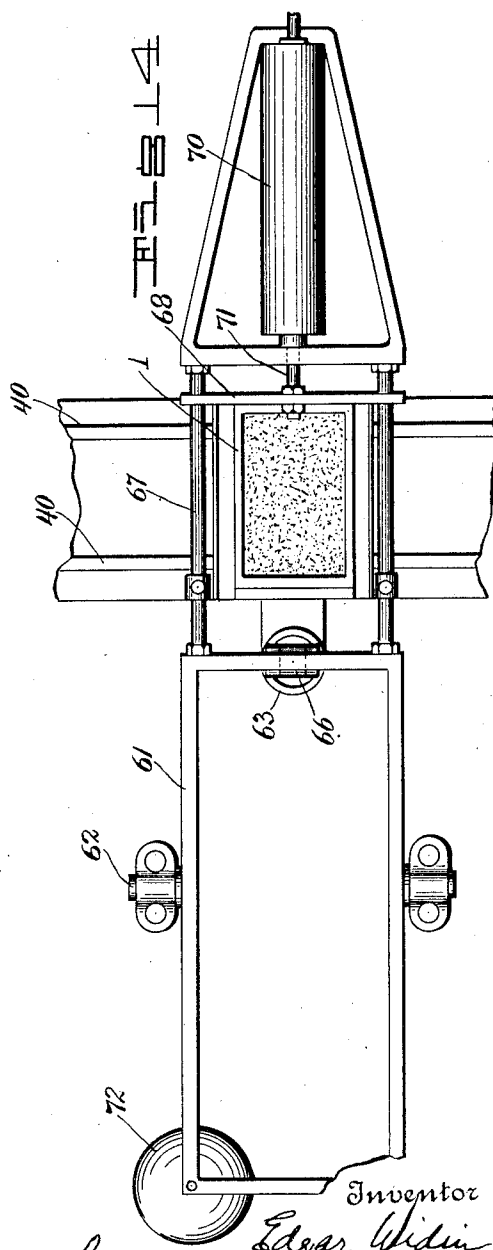
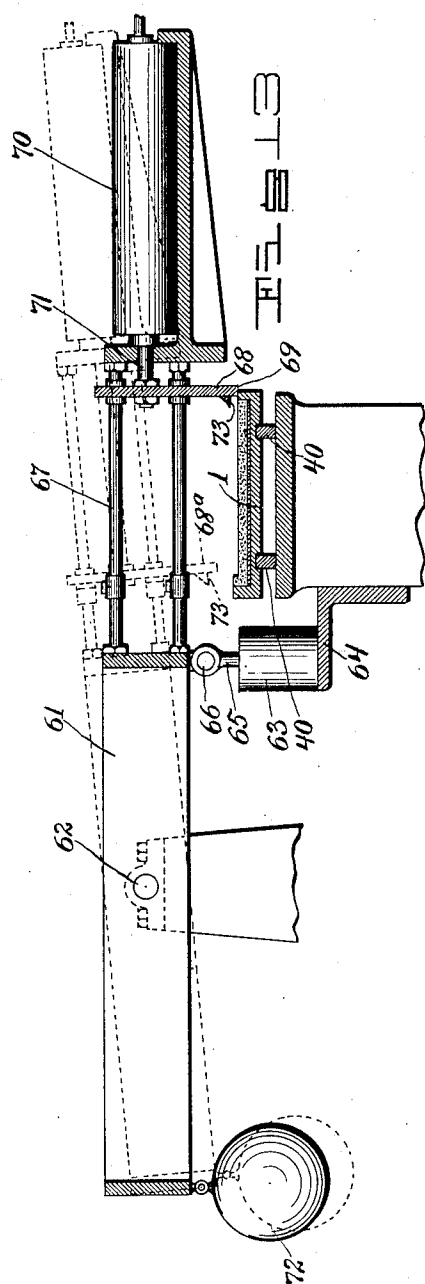
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7 Sheets-Sheet 5



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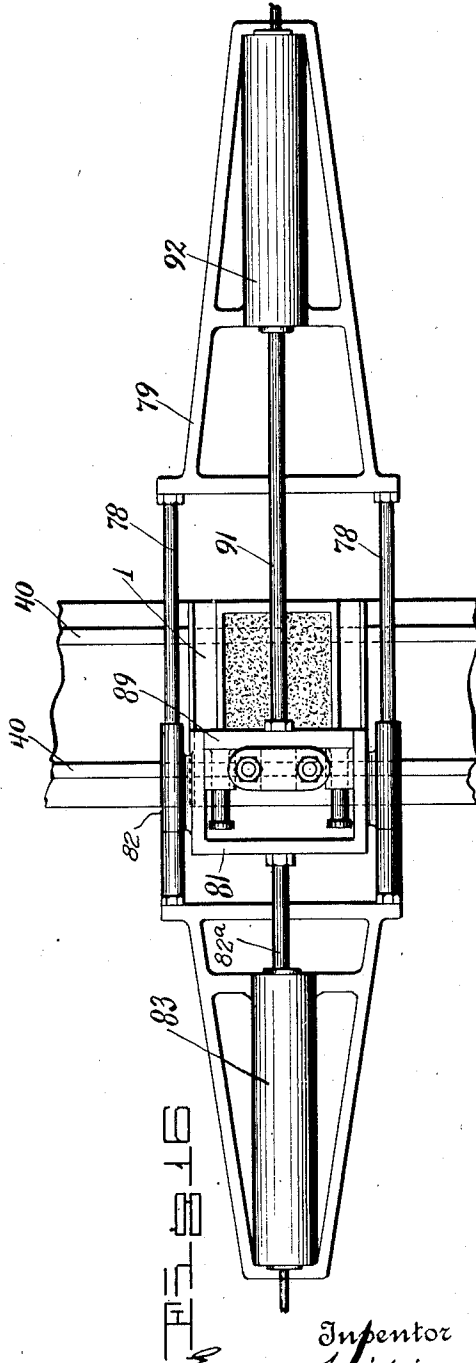
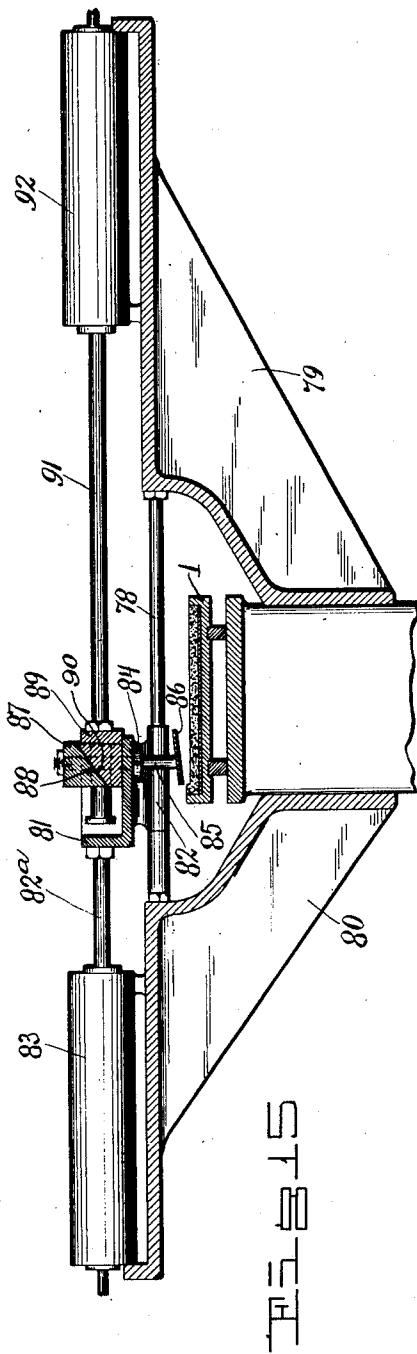
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7 Sheets-Sheet 6



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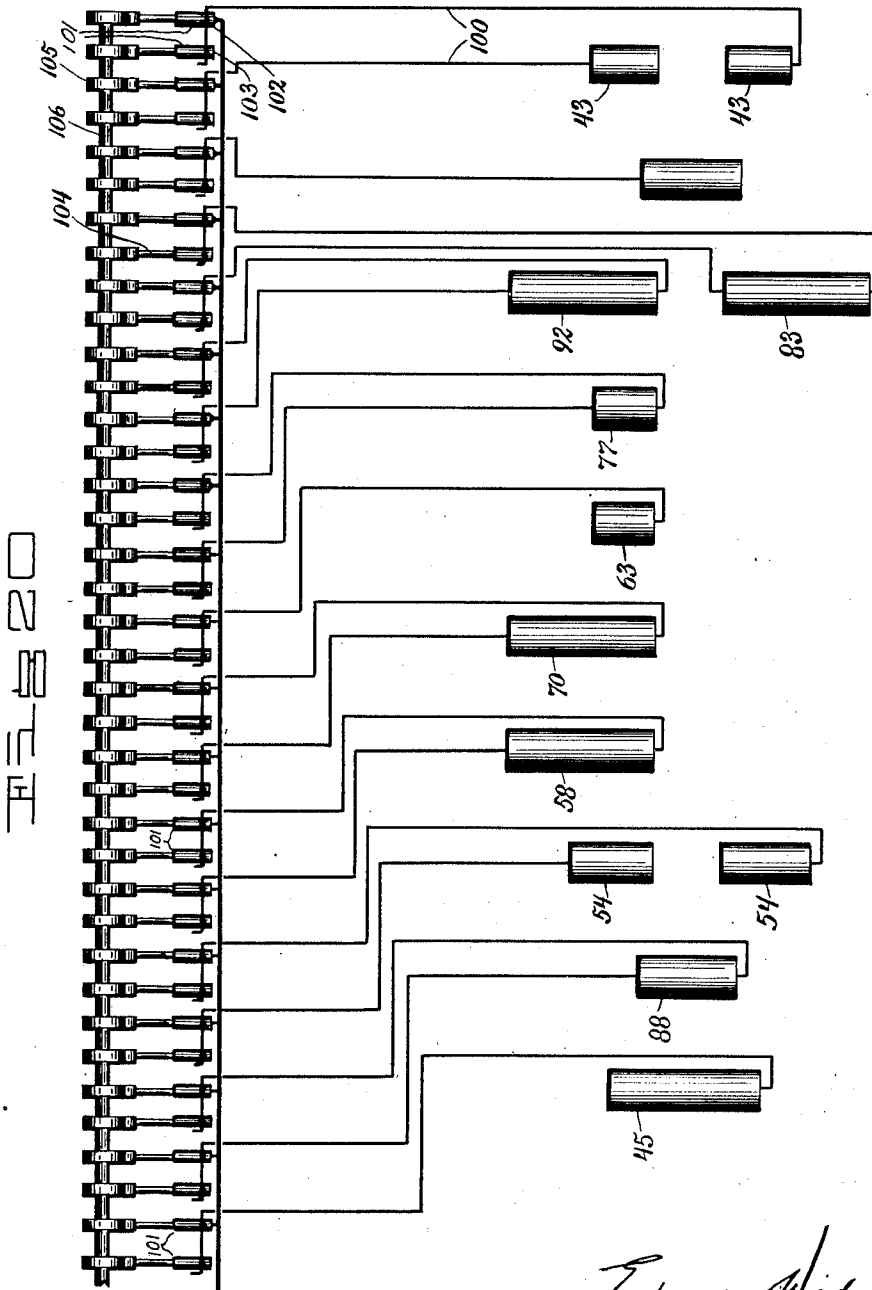
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MACHINE FOR MAKING CONCRETE BLOCKS

Filed March 29, 1928

7 Sheets-Sheet 7



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MACHINE FOR MAKING CONCRETE BLOCKS

Application filed March 29, 1928. Serial No. 265,585.

My invention relates to a method and mechanism for producing blocks from plastic material such as concrete mixtures.

The general object is to provide improved apparatus and methods for the economical production of blocks of concrete or analogous material, of variable forms, and more particularly blocks having on one face ribs or corrugations, and also when desired having at one end transverse shoulders or interlocking formations, such blocks being used, for example, as roofing tiles.

The method comprises charging a mold or a series of molds with the plastic material such as concrete mixture, and preferably at the same time preliminarily shaping the upper block surface, and subsequently additionally finishing or shaping the upper surface material by scraping or "sleeking" operations, to produce the desired final top surface formations, without necessity for using upper mold sections or delay and expense which would be incidental to the manipulating of such mold parts. In a preferred form the method also comprises placing a removable plate in the mold bottom before charging, and after the scraping or sleeking operations, freeing or ejecting the plate from the mold, so that the formed plastic block may conveniently be placed in a drying rack where the concrete sets while supported by the plate without possibility of deformation of the block. The method also includes, when desired, application of coloring material to the block, preferably before one of the shaping or sleeking operations.

The mechanism in a preferred form, as here disclosed, comprises a conveyor, preferably of circuitous form, means for accurately locating or registering a series of molds thereon at a succession of work positions, and means at successive stations for charging the molds, for sleeking scraping or shaping the upper surface of the plastic material, for applying pulverized material such as paint or other pigment to the block surface, for additionally scraping or sleeking the upper face of the block, and for then freeing or ejecting the shaped block from the mold by lifting the block-supporting plate therefrom.

In the broader aspect of the invention the stated means or instrumentalities may be operated in various ways, but as specifically shown herein the principal operating medium is compressed air utilized in cylinders to move pistons, under the control of valves, so that the apparatus in its preferred form is entirely automatic.

The characteristics and advantages of the invention are further sufficiently explained in connection with the following description of the accompanying drawings, which illustrate one representative embodiment. After considering this example, skilled persons will understand that many variations may be made without departing from the principles involved, and I contemplate the employment of any method steps or structures that are properly within the scope of the appended claims.

Figs. 1 to 4 are perspective views of one suitable mold and bottom plate, explaining also the operating method.

Fig. 5 is a vertical section of the mold, showing also the ejector plate and pins.

Fig. 6 is a plan view, partly diagrammatic, of the complete machine.

Fig. 7 is a fragmentary elevation of a stretch of the conveyor corresponding to the various work stations, with a series of molds aligned thereat, and showing also the mold-pushing mechanism.

Fig. 8 is a section at 8—8, Fig. 6.

Figs. 9 to 12 are fragmentary, sectional positional views of the mechanism of Fig. 8.

Fig. 13 is a section at 13—13, Fig. 6.

Fig. 14 is a plan of that part of the machine.

Fig. 15 is a section at 15—15, Fig. 6.

Fig. 16 is a plan of that part of the machine.

Figs. 17 to 19 are fragmentary, sectional, positional views, explanatory of the mechanism of Fig. 16.

Fig. 20 is a view of one suitable control system, or valve mechanism.

Figs. 1 to 5 illustrate one suitable form of mold 1 and removable bottom plate or block supporting plate 2. The mold form and dimensions may vary substantially in accordance

with the article to be produced. In the present example where the block B is a rectangular, relatively thin roofing tile having parallel side and central ribs or corrugations 3 and 4 respectively, with intermediate grooves or channels 5, and a transverse end flange or locking rib 6, the upper face of which is in some cases located above the upper faces of the ribs 3 and 4, the mold is of generally similar contour, including a flat bottom 7 having ejecting apertures 8, shallow side walls 9, a front wall 10 and a rear wall 11. The top of the front wall is shaped in accordance with the surface formation of the block B; i. e. it has recesses 12 corresponding to the block grooves 5, and upper surfaces 13 and 14 corresponding, respectively, to the block ribs 3 and 4. The side walls are provided with flanges 15 terminating in lips 16, forming open-ended sockets in which registering stops fit, in the operation of the machine, as later described. An ejector plate 18, forming a part of the machine, is provided with pins 19 to pass through the ejector holes 8. The under face of the mold is provided with channels 20 to cooperate with guide rails of the machine, as later explained.

The method of producing the blocks, as carried out in one preferred manner by the operation of the machine, as later explained, comprises placing a supporting plate 2 in the bottom of a mold (Fig. 2) and charging the mold (Fig. 3) with an approximately accurate quantity of plastic material, such as a suitable concrete mixture C, and in the operation of charging the upper surface of the material may in some cases be approximately shaped, as more fully described in the operation of the machine. The surface formation, including the ribs and channels 3, 4 and 5, and the transverse rib or shoulder 6, are then accurately formed by scraping or "sleeking" operations, and before the final smoothing or sleeking operation, if desired, suitable coloring material, such as pulverized paint, is applied to the upper surface of the block; and then in the final smoothing or sleeking operations this material is substantially incorporated in the moist upper surface of the concrete. The ejecting pins 19 are then applied through the mold holes 8, and the bottom plate 2 carrying the block is elevated for convenient removal from the mold and placing upon a drying rack, where the block dries accurately in true form, being supported by the bottom plate without possibility of deformation. The bottom plate may, when desired, have on its upper surface a rib formation 21 (Fig. 2) to produce a corresponding recess in the bottom of the block.

The machine, as illustrated in Figs. 6 to 20, comprises a continuous or circuitous conveyor 25, the structure or arrangement of which may vary. In a preferred form the conveyor is, as shown substantially elliptical with straight stretches 26 and 27 connected by

semi-circular end portions 28 and 28^a. The curved portions of the conveyor comprise side frame strips 29 and 30 and a center strip 31, and rollers 32 mounted between the strips. The conveyor is designed to circulate the molds largely by gravity, and for that purpose it has its lowest point at 33 at the beginning of the straight stretch 26, and its highest point, at 34 at the end of the straight stretch 26, and this portion of the conveyor is arranged as an elevator consisting of a belt 35 running over pulleys 36 and 37, the latter being driven in any convenient way, as by an electric motor 38 and gearing 39. From the upper end of the conveyor 35 the curved portion 28^a of the conveyor constitutes a descending run-way to the beginning of the straight conveyor stretch 27. This portion of the conveyor is horizontal and is provided with longitudinal rails 40 to co-operate with the mold channels 20 above mentioned. From the other end of the straight conveyor portion 27 the curved portion 28 descends to the point 33, i. e. the take-up end of the elevator 25.

The molds remain on the conveyor in a practically continuous series, one of the molds being shown at the beginning of its descent from the discharge end of the elevator, and seven of the molds being shown in proper registry and alignment, occupying the straight stretch 27 of the conveyor where the charging, shaping, discharging and other operations are performed. The other molds are omitted in Fig. 6 for the sake of illustrative clearness.

The series of molds occupying the straight conveyor stretch 26 at any time consists, in the present arrangement, of seven molds in end-wise contact and properly registered in relation to the charging and other mechanisms by bolts 41 arranged in pairs, each pair being carried by a yoke 42 operated by pneumatic mechanism, including a cylinder 43 containing a piston (not shown), which is connected to the yoke by a piston rod 44. To properly register the series of molds in cooperation with the stops or bolts 41, a cylinder 45 is mounted above the conveyor and in advance of the straight stretch 27. This cylinder is pivotally supported, (Fig. 7) as at 46, on a column 46^a, and has a piston connected with a mold-pushing plunger 47. Another cylinder 48, is provided to raise and lower the free end of the cylinder 45. After the performance of each set of operations with relation to the molds located on the straight conveyor stretch 27, the registering bolts 41 are retracted and the plunger 47 is operated to engage an adjacent mold and push the entire series forward a distance of one mold length, whereupon the bolts 41 are advanced and enter the ends of the socket formations consisting of flanges 15 and lips 16 of the mold, which is then locked in a position between the cylinders 43, this locking action

occurring just before the plunger 47 completes its forward stroke, and thereupon the entire series of seven molds is properly located at work stations, ready for another set of charging and shaping operations to be performed simultaneously upon them. In the stated mold-advancing operation one mold is discharged at the end of the series, and this travels by gravity around the curved stretch 28, running upon the rollers 32 and guided by the outer and inner strips 29 and 30. A formed block was removed from the mold after an ejecting action at the last work station and when the empty mold reaches the point 33 a fresh bottom plate 7 is placed in it, and the mold is then carried by the elevator 35 to its discharge point and descends by gravity around the curved stretch 28^a to a point adjacent to the beginning of the conveyor stretch 27, ready for another advancing operation by the pushing plunger 47, and so on.

At a first work station, at the beginning of the straight conveyor stretch 27, is charging mechanism, including an upright hopper 50 (Figs. 8 to 12). This is supported by a frame 51 having sleeves 52 guided for vertical reciprocation on upright bars 53. The hopper is raised and lowered by cylinders 54 having piston rods 55 connected to the frame. The lower end of the hopper co-operates substantially with the upper face of the mold 1, and is provided with a horizontally-reciprocating gate or blade 56, which may be flat, or otherwise may be shaped in substantial accordance with the upper face of the mold or block to be produced. The blade 56 is connected to a piston rod 57 operated by a cylinder 58 carried by frame 51. After the positioning of the mold beneath the hopper, while the latter is in elevated position, as shown in Fig. 8, the hopper is lowered until the gate or blade 56, which is at that time in active position closing the lower end of the hopper, rests upon the upper face of the mold, as shown in Fig. 9. The blade or gate is then withdrawn by suitable operation of the cylinder 58, permitting the concrete mixture in the hopper to descend and fill the mold, as shown in Fig. 10. The blade is then returned to active position, as shown in Fig. 11, in effect severing the mold charge from the mass contained in the hopper, and the hopper is then retracted upward, leaving the mold properly charged, as shown in Fig. 12. When the plate is conformed in accordance with the desired upper formation of the block (or substantially in accordance with the contour of the mold end wall 10) the upper surface of the plastic material is at the same time preliminarily shaped or formed, although this feature may be omitted, and in that case, the gate or blade 56 is flat.

The filled mold is then advanced by the pushing and registering operations previ-

ously explained, through an idle position, as at 60, to the next work station, (Figs. 13 and 14) where means are provided for scraping or sleeking operations to shape, or additionally shape, the upper face of the plastic material. At this station is a frame 61 extending across the conveyor and pivotally supported at 62. The frame is oscillated by a cylinder 63 supported on a bracket 64 and having a piston rod 65 pivotally connected to the frame at 66. The frame structure includes guide rods 67 slidably supporting a sleeker or scraper 68, the lower edge 69 of which is shaped in conformity with the upper face of the mold wall 10 and of the block. The scraper is reciprocated by a cylinder 70 supported by frame 61 having a piston rod 71 connected to the scraper. As the mold is advanced to a position beneath frame 61 the right hand portion of the frame, as viewed in Fig. 13, is elevated by proper operation of cylinder 63, the weight of the overhanging frame portion being suitably counterbalanced by weights 72, and these counter weights may be varied to regulate the pressure with which the scraper will bear upon the plastic material in the mold. The cylinder 63 is operated to lower the scraper or sleeker 68 to the level of the upper surface, and cylinder 70 is then operated to move the scraper to the left, as viewed in Fig. 13, thus scraping or sleeking to proper form the upper surface of the block. The stated movements of the scraper may be terminated at about the point indicated in dotted lines at 68^a; i. e., at a point spaced from the outer mold wall 11, to properly form the vertical inward face of the block rib 6; and, if desired, the scraper may have a horizontal flange or shoulder 73 to overlie and properly form the upper surface of rib 6. In accordance with one plan of operations the cylinder 70 may then be operated to return the scraper to its right hand position, thus performing two successive scraping or sleeking operations in opposite directions, after which the frame will be oscillated to raise the scraper and permit the mold to advance to the next station. Otherwise the cylinders 63 and 70 may be controlled to perform the above-described single scraping or sleeking operation upon a given block, i. e. by movement from its right hand position, as shown in Fig. 13, to the left hand position, as indicated in dotted lines, and then the frame may be oscillated to lift the scraper, the mold advanced and a fresh one positioned, and then the scraper may be lowered and moved to the right to perform its scraping or sleeking operation upon the stated block during its return or right hand movement; or, in brief, the scraping operations upon successive molds or blocks are in this case performed by alternately-directed movements of the scraper.

The mold is then advanced to another work

station, where coloring material is applied, if desired, to the upper face of the block. For this purpose a sieve or screen 75 is located above the conveyor and supported for reciprocation upon guides 76. A cylinder 77 has a piston rod connected to the screen, which is filled with suitable coloring material, such as pulverized paint; the screen is shaken by proper operation of the cylinder 77 to deposit a desired amount of the coloring material upon the upper surface of the moist block.

The mold is then advanced to the next work station, at which means is provided, when desired, for performing another and final smoothing or sleeking operation upon the block. Mechanism for this purpose includes, as shown in Figs. 15 to 19 guide rods 78 supported by transversely-extending brackets 79 and 80. Frame 81 is provided with sleeves 82 mounted for reciprocation upon rods 78. The frame is moved to and fro by a piston rod 82* operated by cylinder 83 supported on bracket 80. The frame has vertical guide ways 84 in which are mounted vertical rods 85, the lower ends of which support an angular sleeking or scraping blade 86. The upper ends of the rods are connected to a block 87, having an angular cam face 88. Another block 89 is mounted for reciprocation in relation to the frame 81 and has an angular cam face 90 co-operating with the cam face of block 87. Block 89 is connected to a piston rod 91 operated by a cylinder 92 supported on bracket 79. In a preferred operating method, by proper control of the cylinders 83 and 92 with the parts in the position shown in Figs. 15 and 17, block 89 is first moved to the right in relation to frame 81, permitting block 87 and the scraper 86 to descend, whereupon as in Fig. 18 the left hand edge of the scraper blade acts upon the vertical inward face of the block rib 6 and completes its proper formation, and then by co-operative movement of rods 19 and 82 the frame 81 is moved to the right, causing the scraper to smooth down and properly sleek or form the upper surface of the block, including the rib formation 3 and 4 and the grooves or channels 5; and thereafter block 89 is moved to the left in relation to frame 81 while the frame is in right hand position (Fig. 19) and the scraper is thus elevated, and thereafter the frame 81 is moved back to left hand position, as shown in Figs. 15 and 17, with the scraper out of contact with the block during such return movement.

In the stated scraping operation the pulverized coloring material previously deposited upon the surface of the block is practically intermixed with or incorporated in the upper layer of the block material so that when the concrete sets the coloring material is permanently incorporated in the block surface. The mold is then advanced through an idle position, to the final or registering

position between cylinders 43, and at that point the ejecting action is performed.

For this purpose the ejector plate 18, as described with reference to Fig. 5 is located beneath the conveyor and its ejecting pins 19 arranged to reciprocate in guides aligned with the ejecting holes 8 of the mold. The plate is operated by a suitable pneumatic cylinder and this cylinder is operated to raise the plate and move the pins through the model holes, and thus to lift the bottom plate 7 to a convenient position, as shown in Fig. 4 for the removal of the plate carrying the formed block, which is placed in a rack for drying or setting.

The empty mold then proceeds around the curved conveyor stretch 28 to substantially the point 33, where a fresh bottom plate is inserted in it, and it is raised by the elevator 35, ready for another circuit of the machine, as sufficiently explained above.

Any known or suitable means may be provided for the proper control of the pneumatic cylinders above referred to. Fig. 20 sufficiently illustrates one suitable arrangement or system for cylinder control. In this figure the respective cylinders are identified by the same reference characters as in other figures. Each cylinder is provided with one or two air lines 100, each air line leading to suitable valve mechanism 101, the valve mechanism for each air line including, in the present example, two valves 102 and 103, which may be simple piston valves, the pistons 104 of which are operated by cam 105 fixed at suitable angles upon a cam shaft 106 driven by any suitable means. For each valve pair, one of the valves, as 102, controls air supply to the cylinder from any suitable source such as a tank or accumulator, (not shown) and the other valve, such as 103, controls exhaust of air from the cylinder to atmosphere, and thus by the provision of one or two air lines for each cylinder, depending upon whether the piston thereof is positively moved in only one or in two directions, the operation of the respective piston may be properly controlled for the various purposes described above.

While the mechanism described may be and preferably is entirely automatic in operation, it is not necessarily so, since in some cases where simplification and reduction in cost of equipment is desirable, the mechanism at some or all of the different work stations may evidently be independently or manually operated or controlled.

What I claim is:

1. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, means for definitely advancing and positioning a series of molds at the work stations, and means at

one work station for charging the molds with a measured quantity of plastic material and simultaneously approximately shaping the upper surface of the material, and means at a subsequent work station for scraping and shaping the upper surface of the plastic material in the molds, and means at a subsequent work station for depositing pulverized coloring material upon the surface of the plastic material, and means at a subsequent work station for scraping and finally shaping the upper surface of the plastic material and simultaneously incorporating the coloring material therein, and means at a final work station for lifting the shaped block of plastic material from the mold.

2. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold positioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same.

3. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a screen for pulverized coloring material located above the conveyor at a subsequent work station, and means for agitating the screen to deposit coloring material upon the plastic material in the mold.

4. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a screen for pulverized coloring material located above the conveyor

at a subsequent work station, and means for agitating the screen to deposit coloring material upon the plastic material in the mold, a scraper arranged for vertical and transverse reciprocation in relation to a mold positioned at a subsequent work station, and means for moving the scraper vertically and transversely to smooth and shape the upper surface of plastic material in the mold.

5. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold positioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same, an ejector plate arranged for vertical reciprocation beneath the conveyor at a subsequent work station, ejector pins on the plate to co-operate with apertures in the bottom of the mold and a bottom plate located in the mold to support the plastic material, and means for operating the ejector plate to raise the bottom plate from the mold for convenient removal of said plate with the plastic block supported thereon.

6. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, means for definitely advancing and positioning a series of molds at the work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold positioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same.

7. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, means for definitely advancing and positioning a series of molds at the work stations, a hopper at a first work station, means for raising and lowering the

hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold positioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same, a screen for pulverized coloring material located above the conveyor at a subsequent work station, and means for agitating the screen to deposit the coloring material upon the plastic material in the mold.

8. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, means for definitely advancing and positioning a series of molds at the work stations, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold positioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same, a screen for pulverized coloring material located above the conveyor at a subsequent work station, and means for agitating the screen to deposit the coloring material upon the plastic material in the mold, a scraper arranged for vertical and transverse reciprocation in relation to a mold positioned at a subsequent work station, and means for moving the scraper vertically and transversely to smooth and shape the upper surface of plastic material in the mold.

9. Mechanism of the class described, comprising a continuous conveyor for circulating a series of molds, said conveyor having a portion corresponding to a plurality of successive work stations, means for definitely advancing and positioning a series of molds at the work station, a hopper at a first work station, means for raising and lowering the hopper in relation to a mold positioned below it, a reciprocable gate normally closing the bottom of the hopper, and means for reciprocating the gate to charge the mold with plastic material from the hopper and to separate the mold charge from the superposed mass in the hopper, a scraper arranged for vertical and transverse reciprocating movements in relation to a mold po-

sitioned at a subsequent work station, and means for operating the scraper to traverse the surface of plastic material in the mold and shape the same, a screen for pulverized coloring material located above the conveyor at a subsequent work station, and means for agitating the screen to deposit the coloring material upon the plastic material in the mold, a scraper arranged for vertical and transverse reciprocation in relation to a mold positioned at a subsequent work station, and means for moving the scraper vertically and transversely to smooth and shape the upper surface of plastic material in the mold, an ejector plate arranged for vertical reciprocation beneath the conveyor at a subsequent work station, ejector pins on the plate to cooperate with ejector holes in the bottom of the mold and a bottom plate located in the mold to support the plastic material, and means for operating the ejector plate to raise the bottom plate from the mold for convenient removal of said plate with the plastic block supported thereon.

In testimony whereof I affix my signature.
EDGAR WIDIN.