This invention relates to concrete block making machines, and has for its primary object the provision of certain novel features in such a machine wherein the movement of the parts, with the possible exception of the vibrating action, is pneumatically effected thereby, lessening liability of breakage should movement of any part be prevented or resisted to a considerable extent for any cause and to enhance the practicability and commercial value of the machine.

Another object of the invention is the provision of means whereby, during pressing, molded blocks may be maintained in proper size irrespective of the amount of pressure applied.

Another object of the invention is the provision of means for vibrating the mold box during block molding operations and to so mount the mold box on which the mold is attached so that the mold box may be vibrated in such a manner as to eliminate the high frequency vibrations of the mold box and by means whereby the mold box is vibrated in one direction above the die and below the die, the mold box is vibrated in a direction substantially uniform for a pressure applied to the mold box whereby the density of the mold box is controlled.

Another object of the invention is the provision, in connection with the tamping operation, of means for regulating and determining the number of blows to be delivered during the tamping of each block, thereby suitably the tamping action to the densities desired and the type of material used.

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of the pneumatic operating means and control for the tamping means, with the parts in the position they assume immediately before a tamping operation; Fig. 14 is an elevation of the tamping means with parts broken away, and with the pneumatic pressure gauge means in connection therewith; Fig. 15 is a wiring diagram for the vibrator motors; Fig. 16 is a fragmentary front end elevation of the machine equipped with automatic mesh for operating the take-off carriage, and Fig. 17 is a fragmentary side elevation of the front end portion of the machine showing such equipment and with parts shown in diagram.

Referring to the drawings, the frame in its illustrated embodiment includes a base structure composed of cross members 1 and longitudinally extending connecting members 2, rising from which at the rear are a pair of opposed short side uprights 3, and forwardly thereof at spaced intervals are pairs of opposing tail side uprights 4, 5, and 6. The uprights 5 and 6 at their upper portions are connected together in pairs and longitudinally of the frame by suitable bars 7 to cooperate therewith to form a well or space A in which the tamping means is disposed and operates and a well or space B in which the pressing means is disposed and operates. A cross-bar 8 (Fig. 5) rigidly connects the lower end portions of the two uprights 5, 6. Longitudinally extending bars 9 are rigidly secured in transversely spaced relation within the frame, one adjacent to each side thereof, and, in the present instance, are attached, as by welding, to bosses 10 projecting from the inner side of each frame upright, as best shown in Fig. 5. The bars 8 extend over the cross-bar 8.

A U-bar 11 is mounted on each bar 9 lengthwise thereof by a plurality of adjustable supports 12 and forms a track bar in which are mounted a series of transversely spaced rollers 13 with their top peripheral surfaces exposed thereabove. A mold carriage is mounted for reciprocatory movements lengthwise of the frame over the track bars 14 and includes at each side thereof a runner bar 14 of channel form, which is guided for movements lengthwise of the frame by the respective track bar 11 and rides on the rollers 13 of the associated series. Each bar 14 is faced on its top with a runner plate 15, the outer edge of which is projected beyond the bar 14 to form a side flange thereon. A mold box 16 is mounted at each side thereof on the forward end portion of the respective runner plate 15, as hereinafter described, and is adapted to receive and hold a mold 17 of any suitable form, depending on the shape, size and number of blocks or other articles to be molded. The construction and form of the mold 17 and its manner of mounting in the mold box 16 are immaterial so far as the present invention is concerned, and need not, therefore, be described.

The mold carriage at the rear of the mold box 16 includes side upright members 18 which are mounted on and rise from the rearward end portions of the runners plates 15 and are connected at their upper edges by a strike-off plate 19, which has its forward edge terminating adjacent to the upper rear edge of the mold and has its top surface in the horizontal plane of the top surface of the mold, as shown in Fig. 3. The plate 18 is of sufficient length to extend rearwardly across and slightly beyond the well A when the mold is in register with the well B in pressing position, as shown in Fig. 2.

A material charge box 23, open at top and bottom, is mounted for reciprocatory movements lengthwise of the machine over the plate 18 and mold 17 with the plate 18 forming a box closed for the box when the latter is thereover. In the operation of the machine the charge box is filled when the parts are in the position shown in Fig. 2, with the plate 18 under the box and with the mold 17 at the extreme forward end of its movement in pressing position. When the mold 17 is moved to tamping position in the bottom of the well A, the box 23 at the same time is moved into superimposed relation to the mold so that the mold cavities may be filled by material contained in the box and the tamping action take place through the box, as shown in Fig. 3. The charge box 23 is supported for its transfer movements by a set of rollers 24 at each side thereof, bearing upward against horizontally disposed side flanges 25 on the box, as best shown in Fig. 5. These rollers operate in guide grooves on the under sides of said flanges 25 and are supported by stub shafts 26 projecting inward from horizontally disposed bars 27 secured to the inner sides of the uprights 5 and 4 (Figs. 1, 2, 3, 4, and 5).

A material supply hopper 30 is disposed in the rear portion of the frame between the uprights 4, 5 and is positioned to have its bottom open to the top of the charge box 23, so as to deliver material thereto, when the charge box is at the rear end of its stroke in material receiving position, as shown in Fig. 2. The charge box has a rearward extension 31 which moves under, and completely closes the bottom discharge opening of the hopper when the box is in mold charging position. The hopper is preferably provided at its rear side near its bottom with a secondary opening 32 (Fig. 2), which may be used either to supply material to the bottom portion of the hopper or for the insertion of a tool for agitating the material to the hopper.

A common means, preferably having a pneumatic power source, is employed to operate the mold carriage and charge box in proper relation and will now be described. In the present instance, the various pneumatically operated parts of the machine are adapted to be operated by air pressure, and reference will therefore be made to "air" in the subsequent description of the machine operation. It will be understood, however, that a fluid pressure medium other than air may be employed if desired.

An air cylinder 35 is suitably mounted at the rear end of the machine below the plane of movement of the strike-off plate 18 on suitable cross members 36 mounted on and connecting the track bars 9 and substantially aligned horizontally with the mold box 16. A piston 37 operates in the cylinder and has a rod 38 projecting therefrom through the forward end of the cylinder and connected to a cross-bar 70 between the carriage uprights 18, as best shown in Figs. 2 and 3, so that reciprocation of the piston 37 within the cylinder will impart requisite movement to the mold carriage. The control for the admission of air under pressure to first one end and then the other of the cylinder 35, at opposite sides of the piston, will be hereinafter described.

Disposed in the rear end portion of the frame at each side of the path of travel of the charge box 23 and strike-off plate 19 is an endless power chain 40 guided by a pair of sprocket-wheels 41.
which are spaced longitudinally of the frame to provide a lower run a and an upper run b for the chain. When the mold 17 and charge box 23 are in the separated positions shown in Fig. 2, the lower run a of each chain is attached near its forward end c to the rear end portion of the respective side member 18 of the mold carriage, while the upper run b is attached near its rear end, as at d, to the rearward extension 31 of the charge box 23. It is thus apparent that movement of the mold carriage in one direction will communicate movement through the chains 40 in the opposite direction to the charge box, so that a rearward movement of the mold box to tamping position will cause forward movement of the charge box into vertical register with the mold box in such position, and a return of the mold box to pressin position will cause a return of the charge box to material supplying register with the supply hopper.

In order to prevent a lifting of the mold carriage from the track rollers 18 during an operation of the machine, and particularly during an operation of the block ejecting means, as herein described, each runner plate 16 is engaged over its projecting side edge near the rear end thereof when in pressing and ejecting position by a guide finger 42 (Fig. 5) and is engaged at its forward end when in such position by fingers 43 (Fig. 2).

**Tamping means**

The tamping means is disposed in the well A of the frame and includes a vertical air cylinder 45 in which a piston 46 operates. The piston rod 47 projects down through the bottom of the cylinder and carries a manifold head 48 from which a colony of air compression cylinders 49 downwardly project and are tied together at their lower ends by a perforated plate 50 through which the cylinders project. These cylinders, in the present instance, are twelve in number and are arranged in three longitudinally extending rows of four cylinders each. Each cylinder 49 contains a piston 51 downwardly from which a piston rod 52 projects through the bottom of the cylinder and carries at its lower end a tamping element 53. The number and arrangement of the tamping elements, and accordingly the order and arrangement shown in Fig. 4. This number and arrangement will, of course, vary in accordance with the shape and size and number of cavities in the mold. In the present instance, the mold, as shown in Fig. 4, is divided into three sections for forming three separate blocks and each section has three core members 54 therein. The tamping elements are intended to enter a mold cavity of each section at each end without the respective end core members 54 and also to enter the spaces between succeeding core members thus requiring four tamping elements for each mold section in order to secure satisfactory tamping. Each tamping element, in the present instance, is of I-form in cross-section. It will, of course, be understood that the form and number of the tamping elements may be changed to suit the cavity formation of a mold section.

The air in each cylinder 49 is intended to serve as a cushion for the respective tamping element and is regulatable as to pressure to suit the pressure desired to be exerted by the tamping element on the material during a tamping action. The several cylinders 49 at their upper ends have connection through manifold passages in the head 48 with a pipe 55 which extends up at a side of the power cylinder 45 and connects at its upper end through a connection 56 with a controllable pressure source. The pipe 55 has its upper end attached to the cylinder 45 and is of telescoping form to maintain the air connection during reciprocatory movements of the head 48. It is apparent that the transmission of the several tamping elements on the material is cushioned by the air pressure back of the pistons 51, and that while such pressure is sufficient to force the elements down through the loose material during the initial part of the tamping action, the pistons 51 will rise in the cylinders during successive tamping strokes and as the material in the mold box becomes more and more compressed from the bottom upward. Also, if an unusual obstruction is encountered by any tamping element during a tamping action, the air cushion back of the element will yield to prevent any breakage. The pistons and attached elements may assume different vertical positions when the tamping colony is at the limit of its down stroke, as shown in Fig. 3, due to a difference in density of the material at various points in a mold.

For the purpose of regulating the air pressure in the cylinders 49, the pipe 55 is adapted to have connection with a pressure tank 57 (Fig. 14), the supply line of which is provided with a pressure regulating valve 58. In this manner the blows delivered by the tamping elements may be regulated to suit the tamping pressure desired.

**Pressing and setting means**

When a mold with tamped material therein has been transferred to pressing position at the bottom of the well B, as shown in Fig. 2, the material is subjected to a predetermined pressure to impart the desired density thereto and to give the formed blocks the desired sizes. For this purpose, an air cylinder 60 is mounted in the upper end of the well B and has a piston 61 therein connected by a rod 62 to a presser head 63 below the cylinder. This presser head is in the form of a hollow cross-beam having a chamber 64 therein, and is provided at its under side with a series of presser plates 65 corresponding to the number of sections in the mold 19 and each fashioned to fit in the upper portion of the cavity of the respective section, whereby pressure applied to the plates is uniformly distributed downwardly on the top of the material in the mold when the presser head is substantially at the limit of its down stroke, as shown in Fig. 2. The means for controlling the admission of air to one or the other end of the cylinder 60, to effect a raising or lowering of the presser head, is automatic and will be later described.

The presser head 63, at each end thereof, is provided with a guide block 66 which projects into the space between the frame uprights 5 and 6 at the same side therewith and cooperates with guide strips 67 secured to said uprights (Figs. 1 and 5) to guide the reciprocatory movements of said head.

**Block ejecting means**

When the pressing operation has been completed, a block ejecting means is automatically operated to raise the molded block or blocks from the mold to "take-off" position and to permit the block supporting fingers of a "take-off" carriage to be moved thereunder. This ejecting means includes a cross-head 70 mounted in the
lower portion of the well B below the mold pressing position which carries a plurality of ejector fingers 71 that register opening 88 in the bottom plate of the mold 71, and during an upward movement of said cross-head engage pallets 73 in the bottom of the mold sections and force them upward with the molded blocks to “take-off” position (Figs. 1 and 7).

The cross-head 70 has its ends projected into the adjacent spaces between the respective sets of frame uprights 5 and 6 and cooperate with suitable guides 74 attached to said uprights (Figs. 1 and 4) to guide the vertical reciprocatory movements of the head. A bracket 75 projects upward from each end of the head within the space between the adjacent set of uprights 5 and 6 and has a pivot stud 76 projecting outward therefrom (Fig. 5). A vertically movable trip-bar 77 is disposed at each side of the frame without the guiding means for the head 70 and has its lower end provided with a vertical slot 78 receiving the adjacent stud 76. The upper end of the trip-bar 77 projects through a guide opening in the respective guide block 66 and has a vertically elongated opening through which straddles a pin 80 which attaches the guide block to the cross-head 63. The outer side of the bar 77 adjacent to the lower end of the opening 78 is provided with a cross notch 81 which, when the presser head 64 has lowered substantially to the limit of its pressing stroke, registers with and is locked firmly by a cam shaft 82, as shown in Fig. 6. This shaft is mounted in the guide block 66 crosswise thereof at its outer end and has one side cutaway to have “flat” engagement with the outer side of the trip-bar to permit relative reciprocatory movements of the bar and presser head, except when the presser head has been lowered to place the shaft 82 in register with the notch 81, which permits a turning of the shaft into locking engagement with the upper end wall of the notch to cause the trip-bar to be moved upward with the presser head when raised. The shaft 82 has an arm 83 projecting from one end thereof and connected by a coiled contractile spring 84 to a fixed part 85 on the guide block 66 to urge the shaft to normally turn into locking engagement with the trip-bar.

To each end of the cross-head 70 is fastened a lever 88 which is substantially horizontal and has the free end of its short arm (Figs. 1 and 4) positioned to bear downward on a frame block 89, so that an upward movement of the opposite arm of the lever will impart an initial forceful raising movement to the cross-head 70. The outer end of the long arm of the lever 88 is connected by a link 90 to the adjacent trip-bar 77 a distance above its slot 78, so that during an upward lost motion movement of the trip-bar 77 relative to the pin 76 the lever will operate to effect a starting movement of the cross-head. During the continued upward movement of the two trip-bars 77 with the presser head, the cross-head 70 is raised sufficiently to cause its fingers 71 to eject the blocks from the mold (Figs. 7 and 8).

When the ejection means has thus been raised by the presser head, a block forming, tapping, pressing and ejecting cycle of operations has been completed and the ejection means remains in such raised position until the shafts 82 have been tripped to release the trip-bars 77 and permit a lowering of the ejection means to the normal operative position shown in Fig. 5.

Each lock shaft 82, for the purpose of manual tripping, is provided at one end with an arm 93 carrying a roller 94 with which the cam portion 95 of a cam 106 is engaged to effect a release of the lock shaft from the respective trip-bar 77 when the trip-bar 86 has been lowered a predetermined extent from the raised position in which it is normally held by the spring 97 (Figs. 1 and 7). Each trip-bar 86 is connected by a respective link 98 (Figs. 1 and 4) and rocker arm 99 to a rocker-shaft 100 mounted at the front end of the machine crosswise therefor. Bar tripping movements may be imparted to the shaft 100 by a manually operable lever 101, or the shaft may be automatically operated as hereinafter described in connection with the automatic block take-off means.

In order to prevent a sudden dropping of the ejection means when the trip-bars 77 are released by the lock shafts 82, each trip-bar 77 has a rod 102 projecting upward therefrom and provided at its upper end with a plunger 103 operating in a dash pot 104 which is suitably supported at the upper end of the frame, as best shown in Fig. 5. The dash pot oil and this passes slowly through the passages in the plunger to cause a slow lowering of the ejection mechanism in a well-known manner.

**Block “take-off” means**

Fixed at its rear end to and projecting forward from each frame upright 6 (Figs. 3 and 4) is a horizontally disposed frame 105 supported at its outer end at each side by a brace 106 rising from the base portion of the frame. A horizontally disposed track-bar 107 is mounted at its forward end to the forward end of the frame 105 for vertical rocking movements, and in the present instance is of channel bar formation with its channel facing inward. The rear end portion of each track-bar is supported by a leg 108 carrying a roller 109 at its lower end which rests on a cam 110 on the rock-shaft 100. A movement of the shaft 100 to tripping position for the trip bars 86 causes the high portion of the cam 110 to turn under the rollers 109 and effect a slight raising of the rear end of the track-bar 107 for the purpose hereinafter described.

A “take-off” carriage 111 is mounted for horizontal reciprocatory movements on the track-bars 107 and has a body part 112 provided with rollers which travel in the channels of the respective track-bars 107. Movement and projecting rearward from this body part are a plurality of fingers 113 which, upon a rearward movement of the carriage, may be projected under the pallets 73 of the molded blocks which are being ejected from the mold. Each track-bar 107 is connected at its forward end to a rod 114 of the control plate 115 and engaged by a cam 116 on the control shaft 103 located in the lower position, thus permitting the forward end of the carriage fingers to pass under the raised blocks and their supporting pallets free from engagement therewith, as shown in Fig. 8. The movement of the control shaft 103 to release the ejection means and permit its lowering causes the cams 110 to be actuated to raise the rear ends of the track-bars 107, and consequently the carriage fingers, upward sufficiently to engage the underside of the block supporting pallets 73, so that any dropping of the newly molded blocks to engage the “take-off” carriage, and consequent jar to the blocks, is prevented when the ejection means is lowered. As previ-
ously described; the ejecting means immediately drops to normal position when the control trip is operated. Either after or during such dropping movement the "take-off" carriage 111 with the newly molded blocks thereon may be moved out to the "carrying-away" position shown in Fig. 3.

This raising of the "take-off" carriage into supporting engagement with the block carrying pallets after the carriage moves thereunder and before the ejecting means starts its lowering or return movement to normal position, imparts to the part being formed and the associated blocks, the far and possible injury to the newly molded blocks which has been found in practice to occur when such blocks are lowered into engagement with a "take-off" table during a lowering action of the ejecting means.

The take-off carriage 111 may be manually moved to and from block taking-off position as indicated by reference to Fig. 3, or it may be automatically effected at predetermined stages in a raising or lowering of the block ejecting means, 70, 71, as shown in Figs. 16 and 27. For this latter purpose the take-off carriage 111 is yieldingly connected by a downwardly and rearwardly projecting bar 250 to a horizontally disposed arm or rod 251 which is parallel with and attached at its rearward end to the forward end of a piston rod 252. The yieldning connection of the bar 250 with the rod 251 is through two opposing springs 253 acting outwardly against nuts or stops 254 on the rod. The piston rod 252 has its piston 254 operating in a long air cylinder 255 projecting forwardly from the rear end of the machine frame. The admission to and exhaust of air from one end or the other of said cylinder is controlled by a four-way valve 256 having an operating rocker arm 257 projecting therefrom and carrying a roller at its free end. The valve has an air pressure supply line (not shown), and has connection with the forward end of the cylinder through a line u and with the rear end of the cylinder through a connection w. The valve arm 257 is normally held by a spring 258 in the lowered position shown, in which position the line w to the rear end of the cylinder is open to the pressure supply line, and the line u to the forward end of the cylinder is closed to the supply line and is open for exhaustion.

When the ejector cross-bar 70 is raised from its lowered position, an arm 269 thereon engages the roller on the valve arm and effects a movement of the valve to reverse the air action, that is, opening the rear end of the cylinder to the exhaust and its forward end to the air pressure supply. This latter control action, however, is not effected until the ejector means is very nearly at the end of its ejecting stroke, so that the fingers 113 of the take-off carriage may be advanced under the raised blocks.

When the take-off carriage 112 has approximately reached the limit of its rearward stroke, the forward end of the rod 251, which is tapered or inclined for the purpose, passes under the plunger of a normally closed valve 260 in the air pressure supply line z and moves the valve to open such line and admit air under pressure to the lower end of an upright cylinder 261 beneath a plunger therein. This plunger has its rod 262 connected by a link with a rocker arm 263 projecting forwardly and downwardly from the cam shaft 100 carrying the cam 110. The raising of the rocker arm 263 actuates the cam 110 to raise the carriage fingers 118 up under the elevated blocks into engagement therewith, as hereinbefore described.

When the ejector parts have returned to their normal lowered position by a tripping of the bars 71, as hereinbefore described, the valve supply line 260 will be permitted to return to its lowered position under the action of the spring 258, thereby reversing the action of the air in the cylinder 255 and causing the plunger to be returned to its forwardly extended position and to draw the ejector carriage forwardly therewith. As the plunger begins its forward movement, the rod 251 releases the plunger of the air valve 260 and permits such valve to close the communication of the pressure supply line with the cylinder 261. This permits movement of the cams 110 and a consequent slight lowering of the rear end of the carriage with the formed blocks thereon.

Vibrating means

Vibration of the block material in the mold is intended to take place during both the tamping and the pressing operations; to be discontinued during a transfer of the mold from tamping position to pressing position, during which transfer the material in the charge box 98 is stripped from the material in the mold, and to be of a dual nature during the pressing operation.

It is found that if the vibration of the mold continues during the retracting movement of the charge box from over the mold, the material in the mold becomes progressively of greater density from front to rear due to the progressively longer period of register of the charge box with the mold during such movement. In other words, more material will be discharged into the rear end of the mold than into its front end. It is, therefore, desirable to have the vibration action stop substantially simultaneous with the breaking of the motor circuit, which can be accomplished by the type of motor used, as well understood in the art.

It is also found desirable during the pressing operation to effect a dual vibration of the material, whereby it is vibrated both at top and bottom in order to impart a smooth top surface to the material in the mold and eliminate voids therein during a single pressing action. In practice, the block is subjected to a finishing pressure of approximately 2000 pounds, and if vibration does not occur on the top of the material during such pressing action, it is found that the top surface has many voids therein due to the coarse nature of the material and to the fact that the material cannot properly adjust itself to eliminate the voids during the pressing action. By vibrating the top surface of the material during the pressing action, the material is given a more finished smoothness on top as would otherwise only occur under a longer and greater pressing action or under repeated pressing operations. The vibrating the top surface of the mold material, therefore, not only produces a smooth top surface, but effects such smoothness in a shorter line and with less pressure than would otherwise be the case.

In order to effect vibration of the mold in both stages of its transfer movements, a cross shaft 115 is mounted in brackets 116 at each end of the box 16 and an endless chain 117 is mounted around sprockets 118, 119, on said shafts at one end thereof and is thence looped down between a pair of sheaves 119 and around a drive shaft 120.
on a shaft of a drive motor 121. The shafts 115 are provided with one or more eccentric weights 122 (Fig. 4), which, when rapidly rotated with the shafts, create violent vibration to the mold box. The sheaves 119 have their shafts stationary with respect to the machine frame, being connected in the present instance to one of the longitudinally extending bars 5, so that the transfer movements of the mold box take place relative to the longed portion of the bars in the manner described. The sheave 119 is also pivotable relative to the frame, as is apparent by reference to Figs. 2 and 3. The motor 121, in the present instance, is mounted on a bracket 122 which is pivoted at one end to the base portion of the frame so that its tendency to swing downward under the weight of the motor serves as a simple means for maintaining the vibrator belt taut.

It is found desirable in practice to use a chain 137 instead of a belt and to use sprockets 118 on the shafts 115 in place of sheaves, so as to effect a synchronized running of the weighted shafts and thereby prevent unbalanced action.

To facilitate the vibrating action, the mold box 6 is provided at each side centrally thereof with a trunnion 125 (Figs. 5, 9, and 10), in the present instance of hexagonal form in cross-section, and each trunnion is mounted in a correspondingly shaped opening of a bearing block 126 with a rubber cushion 127 therebetween, so that the trunnion has a yielding floating support in the bearing, which is mounted on and rises from the runner plate 15. The mold box at each side of the trunnion 125 and its bearing is provided with a lug 128 which rests on and is spaced from the plate 15 by a rubber cushion block 129. A bolt 130 projects up from the plate 15 through the cushion block and lug and holds the parts in assembled relation. A shoulder 131 on the lower end portion of the bolt, which is normally countersunk relative to the top surface of the cushion block, coacts with the lug 128 to limit the compressing action of the cushion blocks during a mold pressing operation.

For the purpose of vibrating the presser plates 65 and effecting vibration on the top of the block material, a vibrator motor 138 (Figs. 5 and 5) is mounted in the chamber 64 be the cross-beam 53 and transfers its vibrations to the presser plates 65 through cushion members. In the present instance, the motor shaft, on which eccentric weights 136 are provided, is mounted at its ends in standards 137 rising from a base plate 138, and the motor itself is cushioned and supported by an interposed rubber mat 139. The plate 138 in turn is mounted through intermediate rubber cushions 140 on a plate 141, which serves as a closure plate for an opening in the bottom of the beam 53 through which the motor may be inserted. The presser plates 65 are attached to the under side of the plate 141 through the medium of interposed rubber spacers 142. The several mounting parts are held in assembled relation by suitable bolts. It is apparent that vibration set up by rapid rotation of the weights 136 is communicated through cushions to the presser plates 65.

Both motors 121 and 138 preferably should be of the substantially instantaneous stopping or brake type.

Transfer, tamping and pressing controls

These various controls are so interconnected and interdependent that they must be considered more or less together.

It will be understood that at the end of each cycle of operations of the machine the parts are in the position shown in Figs. 1 and 2, except in the latter the presser means is raised and the cylinder 45 is extended. At the point of transfer the charge box 23 stands at the right below the hopper 30 from which it is filled and the mold stands at the left in pressing position. In order to start a cycle of operations, the operator presses a starter button 130 located on one of the sides of the front of the machine, and this effects the opening of an air pressure valve 151 (Fig. 11), which permits air under air line pressure to enter the transfer line 152 from the supply line 153. This supply line includes a valve 154 which is only open when the ejector means, including the trip-bar 77, is in its normal lowered inoperative position. For this purpose, one of the trip-rods 77 carries at its upper end a stud 155 which, when the trip-rod is in its completely lowered or at-rest position, engages a lever 156 mounted on the upright 5, and moves it to effect an opening of the valve 154 against the tension of a closing spring, as shown in Fig. 8 and more or less diagrammatically in Fig. 11. It is thus apparent that an operation of the press cannot be started until the ejector means has returned to its normal inoperative position.

The opening of the starter valve 151 permits air under operating pressure to pass through the line 152 to one end of a cylinder type reverse valve 151 in which a plunger 152 operates in the air pressure from the line 152 on one end of the plunger to the left, cutting off the connection of a supply line 159 to the right end of the transfer cylinder 35 and causing air from such line to enter the left end of the cylinder and permitting exhaust from the opposite end. This causes a movement of the plunger 37 to the right in cylinder 35, which in turn draws the mold box to charging and tamping position in the well A, as shown in Fig. 3. This movement in turn of the mold box and its strike-off plate 19 acts through the chains 40 to move the charge box 23 into superposed charging relation to the mold box and in register with the tamping means.

When the mold box has reached its tamping position a pivoted trip finger 160 thereon (Fig. 13) passes over and operates a valve plunger 161 to momentarily open a pilot valve 162 which in turn opens a pilot supply line 163 to and through a trip valve 164, then open, to the end of the cylinder 45 of reverse valve 151. The opening of the line 163 moves the plunger of the reverse valve 165 in a direction to permit admission of operating air through the line 165 to the upper end of the power tamping cylinder 45 and permits exhaust from its opposite end. When the tamping colony associated with the cylinder 45 is in its raised position, a projection 167 thereon acts on and holds the valve 164 open. The admission of air pressure to the upper end of the cylinder 45 imparts a down stroke to the tamping colony, thus releasing the trip valve 164 and permitting it to close. When such colony has reached the limit of its down stroke the extension 167 will have engaged and opened a companion trip valve 165 which opens a pilot supply of air through the line 163 to and through the end of the reverse valve 165 and effects a reversal thereof, so that air pressure to the upper end of the cylinder is cut off and air pressure admitted to the lower end through the line 170 from the main power supply line 171.

In order to prevent stopping of the tamping
action when the tampering colony has returned to its raised position and opened the trip valve 164, a repeater control is automatically brought into operation so as to cause the tampering colony to make a predetermined number of strokes before being stopped. For this purpose, at each down stroke of the tampering colony a roller 175 thereon engages and imparts movement to a lever 176 (Fig. 1), which lever in turn actuates a pawl 177 to move a ratchet wheel 178 the length of one tooth. This wheel is mounted on a cross shaft 179 mounted crosswise in the upper portion of the frame and carries a repeater cam 180 and a safety stop cam 181 (Fig. 11).

The repeater cam 180 has a number of equidistantly spaced depressions 182 in its periphery, which determine the number of stops of the tampering means in a complete rotation of the ratchet wheel and the spacing between these recesses, considered in connection with the number of teeth in the ratchet disposed in the same length arc, determine the number of repeating strokes of the tampering means for each cycle of operations. For instance, the ratchet has twenty-four teeth cam and the cam has twenty-four depressions. There will, therefore, be six strokes of the tampering colony during each machine cycle or for each tampering operation. The action and purpose of the stop cam 181 will later be described.

Upon the first down stroke of the tampering colony the ratchet 178 will be moved the length of one tooth, which is sufficient to throw the engaging roller of a plunger check valve 183 to open position (Fig. 13), which position is maintained until the next depression of the cam has moved into register with the roller. This valve is disposed in a pilot air pressure supply line 184 which connects with the line 163 and through it to the trip valve 164, so as to supply air pressure to the line 163 when the pilot valve 162, with which it was initially connected, has closed. This causes air pressure to be supplied to the right hand side of the reverse valve 165 each time the tampering colony returns to its raised position and opens the trip valve 164 so that the tampering stroke is repeated until the cam 180 has turned sufficiently for the roller of the valve 183 to drop into the next cam depression 182. No further tampering will then occur until the next cycle of operations of the machine. The line 184 connects with the line 163 between two oppositely closed check valves 190, 192 (Fig. 11).

A check valve 190 (Fig. 11) is disposed in an air supply line 191, which leads through a normally closed check valve 192 to the opposite end of the reverse valve 165 to that to which the initial start 195 is connected. When the machine is at rest between cycles, or when the roller of the check valve 193 (Fig. 13) in a depression of the cam 180, the roller of the plunger of the valve 190 stands on one of four equidistantly spaced high spots 193 of the stop cam 181, so that the valve 190 is then in open position. The high spots 193 correspond in number and spacing to the depression in the cam 180. The cams 180 and 181 move together so that as the plunger of the check valve 193 moves out of register with a depression in the cam 180 and to where the plunger of the valve 190 will drop from a raised point so as to close the valve. This closed position of the valve 190 will continue until its plunger moves on to the next high spot, which takes place at the same time the plunger of valve 193 drops into the depression of its cam. It is apparent that the valve 190 serves as a safety stop valve in the reverse supply line 151 to the transfer valve 187 so as to prevent a transfer of the mold box carriage and charge box from tampering position until the tampering operation is completed. Therefore, upon a completion of a tampering operation, both the safety stop valve 186 and the trip valve 182 are open to permit the passage of air pressure through the transfer valve 191 and effect movement of the plunger in the transfer valve 151 to the right, which admits air pressure to the left end of the transfer cylinder 35. This effects a return of the mold and charge box, respectively, to pressing and material supply position.

When the mold carriage starts its forward movement to pressing position, the trip finger 160 passes over the plunger 161 of the pilot valve 162 without opening such valve, and when the carriage has nearly reached the limit of its forward movement a similar trip finger 200 (Fig. 12) passes over the roller of a pilot valve plunger 201 to effect an opening of the air pressure line 202 to the right end, in the present instance, of a reverse valve 203, which controls the admission and exhaust of air to cylinder 204. Such admission of air pressure to the valve 203 opens an air pressure supply line 204 to the upper end of the cylinder through the line 205 and closes the supply line communicated to the lower end of the cylinder through the line 206. It is thus apparent that by the time the mold carriage has reached pressing position, the pressing means will be energized and the presser head 63 will have started its down or pressure stroke. When the presser head has approximately reached the limit of its down or pressing stroke, a trip pin 207 thereon will have engaged and moved a trip lever 208 mounted on one side of the press frame and effected a movement of such lever to open a trip valve 209 in a pressure supply line 210 to the left end of the reverse valve 203. This effects a movement of the reverse valve plunger to the right, so as to close the air pressure supply to the upper end of the cylinder and open the supply to its lower end. It is apparent that there is only one stroke of the pressing operation, and that pressure will not again be supplied to the upper end of the pressing cylinder until the next block forming operation of the machine. The trip pin 207 is preferably adjustable to vary its point of engagement with the lever 208 to suit the compressing action desired to be applied to the mold material and to determine the sizing of the molded blocks. In this manner, the reverse valve 203 is actuated to stop the pressing action and raise the pressing means when the formed blocks have been given a predetermined depth.

It will be understood that when the mold carriage is at the limit of its rearward stroke, the trip finger 160 will have passed over the valve plunger 161, and also that when the mold carriage is at the limit of its forward position, the trip finger 200 will have passed over the valve plunger 201. It is thus apparent that the valve plungers 161 and 201 will be only momentarily opened during respective rearward and forward movements of the mold box and will stand in valve closing position when the mold box is at either limit of its movement.

Vibration control

The vibrator motors 121 and 135 are both connected, in the present instance, in a single circuit (Fig. 15) and are controlled by two main switches
216 mounted on a side of the frame (Fig. 1) and operated by movements of the mold carriage, an auxiliary switch 217 operated by movement of the reverse valve 157, and an auxiliary switch 218 operated by movement of the presser means reverse valve 203.

The switch 215 is normally open and is closed by engagement therewith of a flange 219 on a side of the mold carriage immediately after the carriage has started its rearward movement from pressing to tamping position, and is maintained closed thereby until the carriage has returned to the end of its forward stroke. The switch 216 is normally closed and is opened by engagement therewith of a flange 220 on a side of the mold carriage and is held open thereby during the same period of operation that the switch 215 is held closed. The auxiliary switch 217 is disposed in circuit with the main switch 216, is normally closed, and is opened by engagement therewith of an extension 221 on the rear or right hand end of the plunger 159 of the reverse valve 157 when such plunger is at the rear end of its movement, or is in position for admitting air to the rear end of the transfer cylinder and move the mold carriage to and hold it in its forward position. The opening of the switch 217 thus occurs at the end of a tamping operation and continues until the commencement of the next cycle of operations. The auxiliary switch 218 is disposed in circuit with the main switch 216 and is normally closed. This switch is opened by engagement therewith of an extension 222 on the plunger of the reverse valve 203 for the presser cylinder when the valve plunger is at the end of its stroke, which admits air to the lower end of the presser cylinder 80.

As the mold carriage moves rearward upon the starting of a cycle of operations of the machine, the flanges 219 and 220 thereon will respectively act on the main switches 215 and 216 to close the former and open the latter, and such position of these switches is maintained until the carriage has returned to pressing position or to the forward end of its stroke. During the rearward movement of the mold carriage the auxiliary switch 217 is closed. The wiring is such that when both of these switches are closed the mold box vibrating motor 212 alone is operated. During the transfer movements of the mold carriage and until it has returned to pressing position, the presser head vibrating motor 135 is dead, due to the control of such motor being through the switches 216 and 218, both of which are open during such transfer movements and during which period the presser means is inoperative.

At the end of the tamping operation and immediately before the mold carriage starts its forward or return stroke to pressing position, the auxiliary valve 217 is opened by movement of the transfer valve plunger to the right, thereby stopping the operation of the motor 124 and the vibrating of the box. When the mold carriage has substantially reached the limit of its forward movement to pressing position, the flange 220 will have moved from engagement with the switch 216 and permitted its closing. This switch is in circuit with both motors. The auxiliary switch 217, however, is disposed in series with the switch 216, so that the two motors will not be operated to start vibration of both the mold box and presser head until the reverse valve 203 has been moved to admit pressure to the upper end of the presser cylinder 80 at which stage the switch 216 is released by the plunger extension 222 on said valve and permitted to close. Inasmuch as both switches 216 and 218 are in circuit with both motors 212 and 135, vibration of both the mold box and presser head is effected and continues during the pressing operation and until the valve 203 has been operated, at the lower end of the presser stroke, to effect the setting of the presser head. When this occurs, the switch 218 is opened and the operation of both motors is stopped.

We wish it understood that our invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described our invention, what we claim as new, and desire to secure by United States Letters Patent, is:

1. In a machine of the class described having tamping and pressing positions, separate mold and charge boxes movable to superimposed tamping position and respectively from such position to pressing and material supply positions, pneumatic means operable to move one of said boxes to tamping position and then back to its other position, and means connecting said boxes and causing the movement of the other of said boxes to and from tamping position simultaneously with the movement of the pneumatic means operated box respectively to and from tamping position.

2. In a machine of the class described having tamping and pressing positions, a mold box movable from pressing to tamping position and vice versa, means operable to impart said movements to the mold box, a charge box movable from material supply position to charging position over the mold box when in tamping position, and means connecting the mold and charge boxes and operable to move the charge box to mold charging and supply positions when the mold box is moved respectively to tamping and pressing positions.

3. In a machine of the class described having tamping and pressing positions, a mold box reciprocally movable from pressing to tamping position and vice versa, and having a cut-off plate projecting therefrom, a charge box movable from material supply to tamping positions, and when in tamping position being disposed in charging position over the mold box, said cut-off plate closing the bottom of the charge box except when said boxes are in tamping position, means operable to impart transfer movements to one of said boxes, and means operable to cause transfer movements to be imparted in unison from one box to the other whereby the boxes are simultaneously moved to and from tamping position.

4. In a machine of the class described having a material supply position and a tamping position, a mold box movable to and from tamping position, means for imparting such movement to the mold box, a charge box movable from material supply position to tamping position over the mold box when in such position, and chain and sprocket means connecting the mold and charge boxes and operable to move the charge box to tamping position when the mold is moved to such position and to move the charge box to supply position when the mold is moved from tamping position.

5. In a machine of the class described, a reciprocally movable tamping head having a tamping element projecting downward therefrom for cushioned tamping movements, fluid pressure means regulable as to pressure for cushioning...
the tamping movements of said element relative to the head, and means for imparting reciprocatory movements to said head.

6. In a machine of the class described, a power cylinder, a plunger operable in said cylinder and carrying a tamping head below the cylinder, a tamping element movable with said head and having cushioned connection therewith to permit a yielding movement of the tamping element relative to the head under predetermined pressure, regulable fluid pressure means for controlling the cushioned movements of the tamping element relative to the head, and means operable to admit fluid pressure to either end of said cylinder and exhaust from the other to effect first an outward and then an inward stroke of the plunger and head.

7. In a machine of the class described, a reciprocally movable tamping head having a plurality of tamping elements projecting downward therefrom in the direction of tamping movements, regulable fluid pressure means for controlling the tamping action of the several elements relative to the head, and means operable to impart reciprocatory tamping movements to the head.

8. In a machine of the class described, a vertically movable tamping head having a plurality of tamping elements projecting downward therefrom for movements with the head and for movements relative thereto in the plane of the tamping force, regulable fluid pressure means for normally holding said elements extended relative to the head and permitting cushioned inward movements thereof relative to each other and to the head, and means operable to impart downward and upward strokes to the head.

9. In a machine of the class described having tamping and pressing positions, a mold movable from pressing to tamping position and vice versa, means operable to vibrate the mold when in tamping position and during movement from pressing to tamping position, and means automatically operable to stop the action of said vibrating means immediately after the tamping operation.

10. In a machine of the class described having tamping and pressing positions, a mold movable from pressing to tamping positions and vice versa, means for supplying material to the mold when in tamping position, means operable to strike off said supply from the mold when the latter is being moved from tamping to pressing positions, means operable to vibrate the molds in both pressing and tamping positions, and means for rendering said vibrating means inoperative during a strike-off movement of the mold.

11. In a machine of the class described having tamping and pressing positions, a mold movable from pressing to tamping position and vice versa and having a material strike-off member projecting therefrom, a charge box movable with said strike-off member and into superimposed relation to the mold when in tamping position and vice versa, means for imparting reciprocatory movements to the mold, means for imparting reciprocatory movements to the charge box, means operable to vibrate the mold box in both tamping and pressing positions and vice versa, means operable to vibrate said mold in both tamping and pressing positions and during which period the material in the charge box is struck off from the mold, and means automatically operable to cause the vibrating means when the mold box has returned to pressing position.

12. In a machine of the class described having tamping and pressing positions, a mold box movable from pressing to tamping position and vice versa, means operable to vibrate the mold box when in both pressing and tamping positions, means operable to apply pressure to the top of material in the mold when in pressing position, and means operable to vibrate the pressing means during a pressing action.

13. In a machine of the class described having pressing and tamping positions, a mold box movable from one to the other of said positions and vice versa, means operable to impart transfer movements to said box from one position to the other and vice versa, means operable to apply a sizing pressure to material in the mold box when in pressing position, separate means operable to vibrate the mold box and pressing means, means automatically operable by the transfer means to cause operation of the box vibrating means while the box is in tamping position and operable to discontinue said vibrating action during movements of the box from tamping to pressing position, means automatically operable to cause operation of both vibrating means when the mold box has returned from tamping to pressing position, and means automatically operable at a predetermined point in the movement of the pressing means to render both vibrating means inoperative.

14. In a machine of the class described wherein a presser head vertically reciprocates over a mold box to press material into block form therein, an ejector means for the formed blocks including a cross head vertically movable beneath the mold box and having upwardly projecting fingers for moving upward through the mold box to eject the block therefrom when the cross head is raised, vertically reciprocatory trip means having lost motion connection with said cross head, means carried by the presser head for locking engagement with said trip means when the cross head is at the lower end of a pressing stroke and effecting a raising of the trip means with the presser head during its upward movement, said trip means during said upward movement first having lost motion movement relative to the cross head and then raising the cross head to effect an ejection of a formed block from the mold blocks, means operable by the trip means during said lost motion movement to effect a forced initial raising movement to the cross head prior to the raising thereof by the trip means, and said locking means being operable to release the trip means and permit a lowering of the cross head.

15. In a machine of the class described, means for raising a molded block to ejected position above a mold in which it is formed, means for holding the ejecting means in raised position, a take-off carriage mounted for movement under a raised block in spaced relation thereto, means operable to release said releasable means to permit a lowering of the ejector means, and means for gradually increasing the carriage movements and operable to raise the carriage into engaging with the block when thereunder preparatory to a lowering of the ejector means.

16. In a machine of the class described, means operable to raise a molded block to ejected position above a mold in which it is formed, releasable means for holding the ejector means in raised position, a take-off carriage mounted for
In a machine of the class described including a tamping means and wherein a mold box is horizontally movable to and from tamping position, transfer means operable to move the mold box to and from tamping position, control means automatically operable to effect operation of the tamping means when the mold box has been moved to tamping position, and means rendered operative by operation of the tamping means to cause the tamping means to have a predetermined number of tamping strokes and then to stop the tamping action.

22. In a machine of the class described including a vertically reciprocable tamping means and wherein a mold box is movable horizontally to and from tamping position, a fluid pressure operated transfer means operable to move the mold box to and from tamping position, fluid pressure operating means for the tamping means to impart a tamping stroke to the tamping means and then to retract it, and means cooperating with said last fluid pressure operating means to cause a predetermined number of tamping strokes to be imparted to the tamping means and then to stop the tamping action.

23. In a machine of the class described wherein a mold box is horizontally movable to and from tamping position and a tamping head operates over the mold box horizontally traversable to and from tamping position, fluid pressure operating means for imparting a tamping stroke to the tamping head and then to retract the head, control means for said fluid pressure operated means automatically operable by the transfer means to start actuation of said fluid pressure means to operate the tamping head when the mold box has been transferred to tamping position, and means automatically operable in cooperation with said control means to cause the tamping means to repeat its tamping stroke a predetermined number of times and then to discontinue the tamping action.

24. In a machine of the class described, the combination with a vertically reciprocable tamping head and a mold box horizontally traversable to and from tamping position beneath the head, of means including a cylinder and plunger operated by fluid pressure to impart reciprocatory movements to the tamping head, means operable by movements of the tamping head to and from tamping position, a reverse valve operable to admit fluid operating pressure first to one end and then the other of said cylinder to operate the pressure head, means operable by the transfer means when the box has been moved to tamping position to operate said valve to admit fluid pressure to the upper end of the cylinder to impart a down stroke to the presser head, means automatically operable at the end of the down stroke of the presser head to impart reverse movement to said valve to cause a raising of the presser head, and means automatically operable to cause a predetermined number of repeats of the tamping strokes of the presser head and then to stop the tamping action.

25. In a machine of the class described, a mold box horizontally shiftable from tamping position, a tamping head reciprocally movable vertically over the mold box when in tamping position, means operable by fluid pressure for imparting a tamping stroke to said head and then to return it to tamped position, means operable to transfer the mold box to and from tamping position, means automatically operable by
the transfer means at a predetermined point in
a transfer movement to render the fluid pressure
means active to impart a down stroke to the
presser head, means automatically operated at
the lower end of a tamping head stroke to admit
fluid pressure to said first means to effect a
raising of the tamping head, means operable by
the tamping head when at the limit of its upward
stroke to cause an actuation of the transfer
means to move the mold box from tamping posi-
tion, means rendered operative by a down stroke
of the tamping head to cause a predetermined
number of repeats of the tamping stroke of said
head, and means automatically operative for pre-
venting a transfer of the mold box from tamping
position until the tamping operation has been
repeated a predetermined number of times.

28. In a machine of the class described, means
for raising a molded block to ejected position
above a mold in which it is formed, releasable
means for holding the ejecting means in raised
position, a take-off carriage mounted for move-
ments to and from a position under a raised
block in vertically spaced relation thereto, a ver-
tically movable guide track for said carriage, and
means operable to move the track to raise the
carriage a predetermined extent when under a
raised block to have supporting engagement with
the block preparatory to a lowering of the ejector
means and whereby the carriage is engaged with
the block without jar.

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