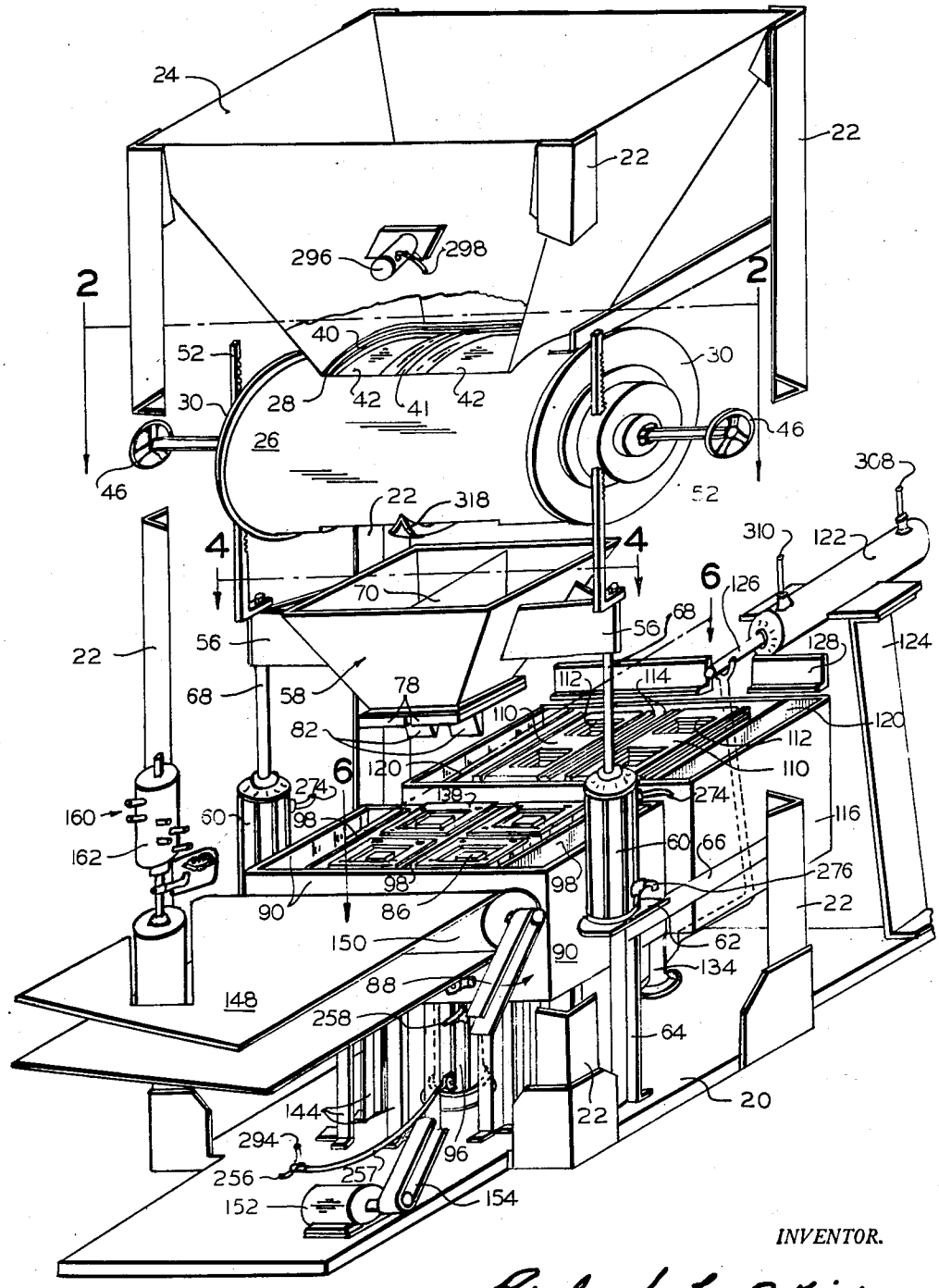
Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 1




INVENTOR.

Richard L. Weir

FIG. 1

Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 2

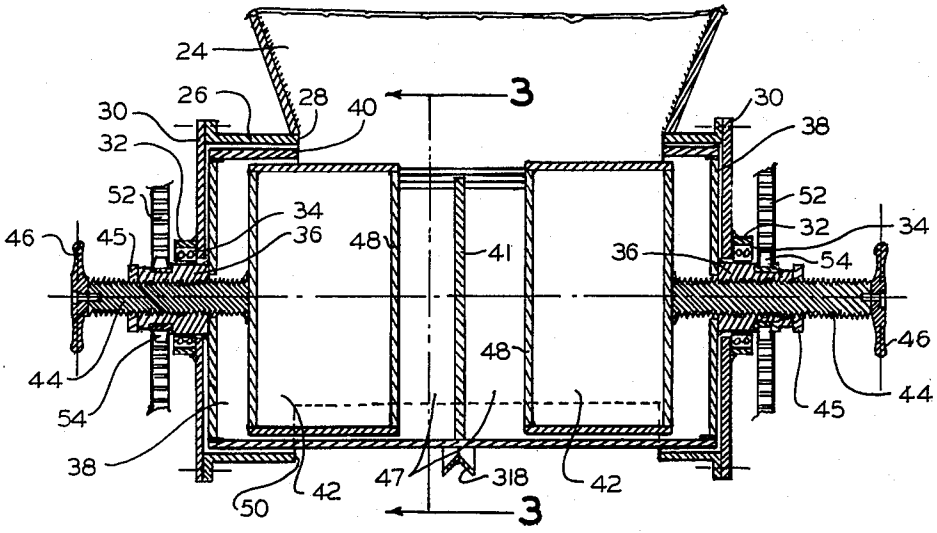



FIG. 2

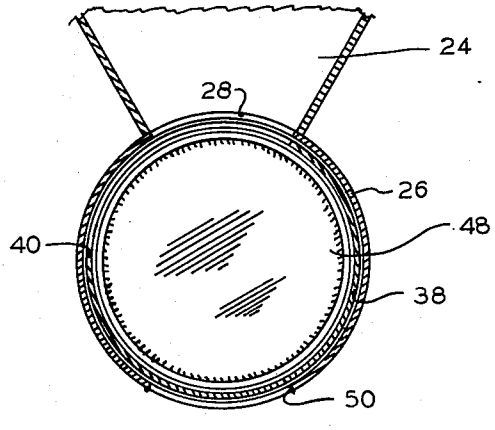



FIG. 3

*INVENTOR.*

Richard L. Weir

Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 3

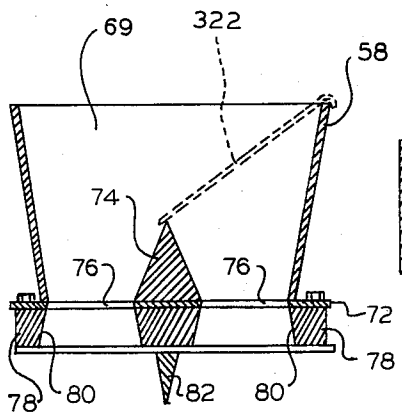



FIG. 5

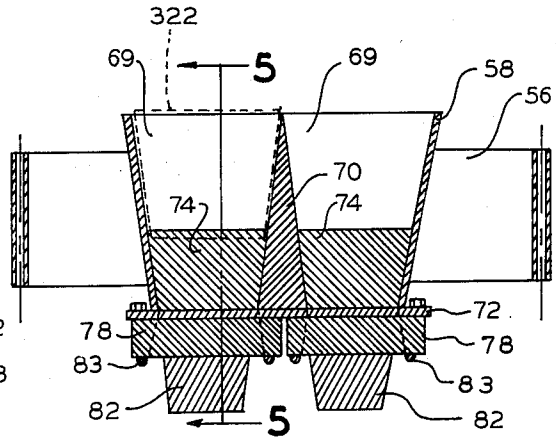



FIG. 4

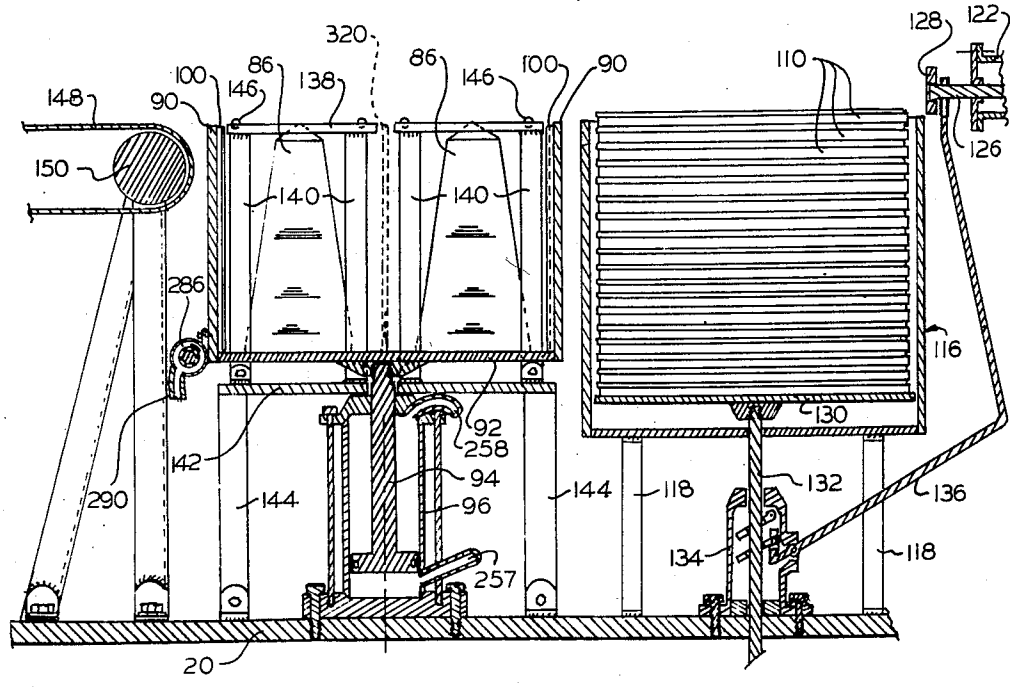



FIG. 6

*INVENTOR.*

Richard L. Weir

Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 4

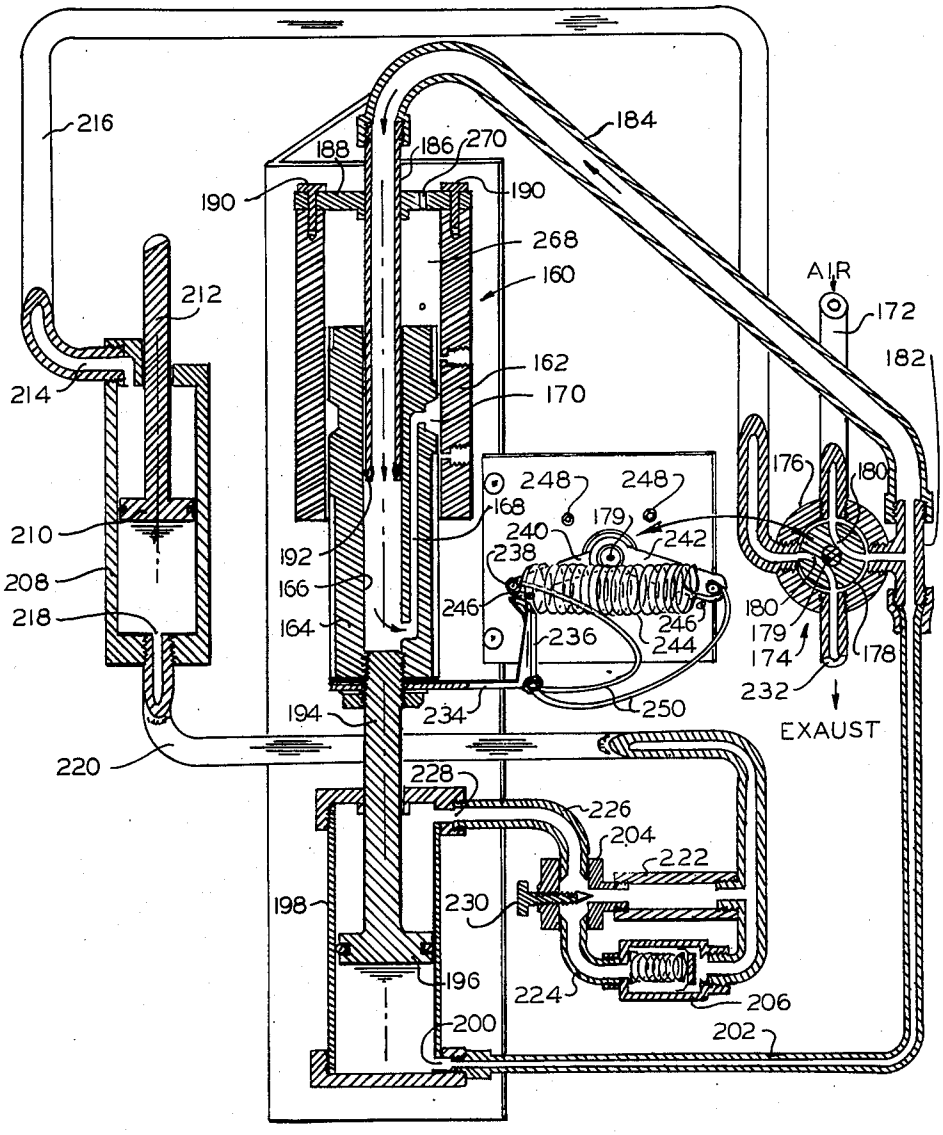



FIG. 7

*INVENTOR.*

Richard L. Weir

Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 5

FIG. 10

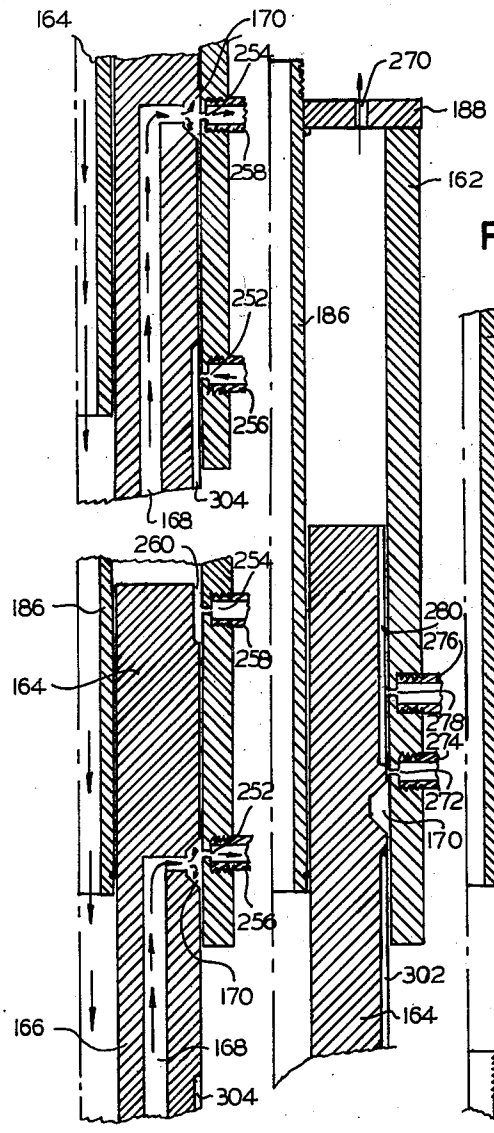



FIG. 9

FIG. 11

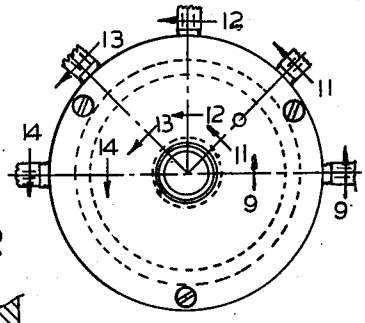



FIG. 8

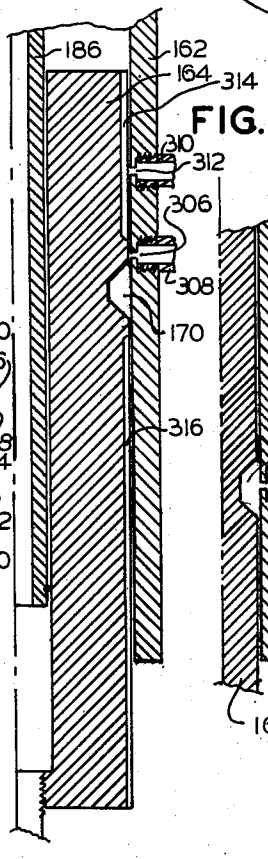



FIG. 12

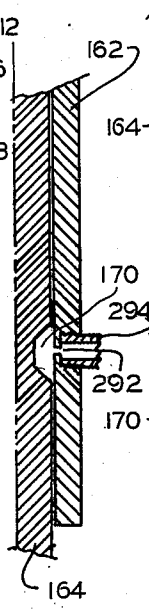



FIG. 13

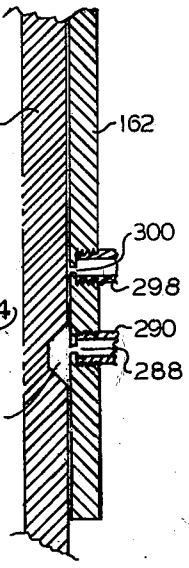



FIG. 14

INVENTOR.

Richard L. Weir

Dec. 9, 1952 R. L. WEIR 2,620,540

BLOCK MAKING MACHINE

Filed Jan. 3, 1948 6 Sheets-Sheet 6

FIG. 15

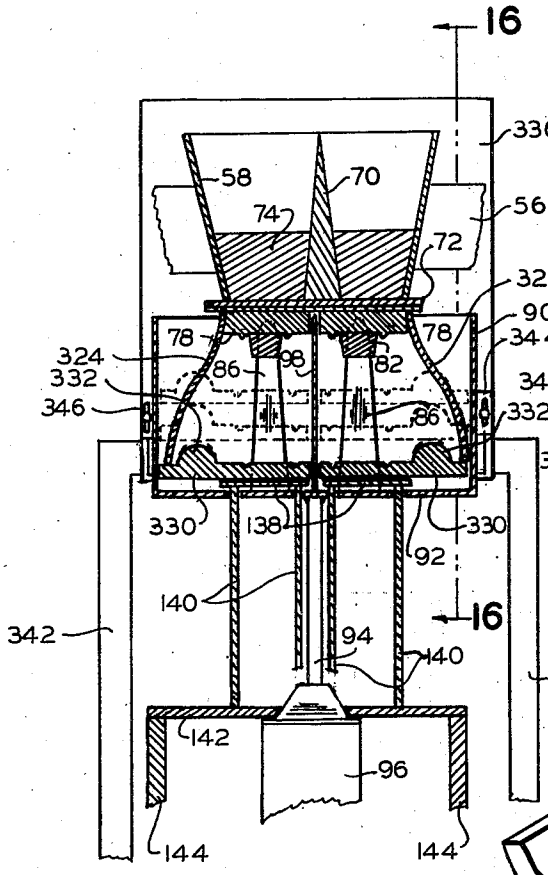



FIG. 16

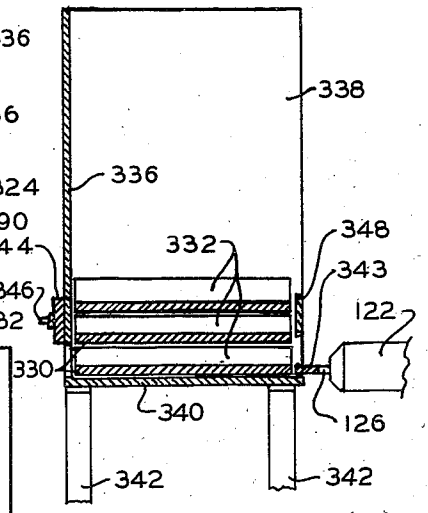
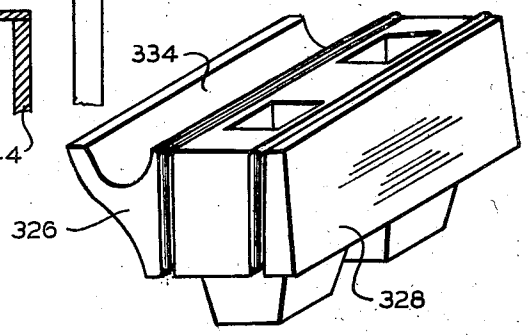



FIG. 17




Inventor

Richard L. Weir

Patented Dec. 9, 1952 2,620,540

# UNITED STATES PATENT OFFICE

2,620,540

## BLOCK MAKING MACHINE

Richard L. Weir, Warren, Ohio

Application January 3, 1948, Serial No. 392

13 Claims. (Cl. 25—41)

1

This invention relates to an automatic block making machine which will greatly facilitate the production of building blocks generally and especially in the case of blocks of the type disclosed in my co-pending patent application, Serial No. 693,252, filed August 27, 1946, entitled, "Building Blocks System."

At the present time, there are no practical small block-making machines which are completely automatic in their operation and no standard machines which are adaptable to the forming of the type of blocks disclosed in the aforementioned patent application. In order to overcome this deficiency and also for the purpose of providing a new and improved method of constructing building blocks the machine hereinafter to be described has been developed.

Accordingly, it is an object of my invention to provide a machine for producing the interlocking type of blocks disclosed in the above-mentioned patent application or other blocks of special or standard shapes and sizes.

It is the further object of my invention to provide a fully automatic block making machine which will process the plastic block forming material into finished building blocks of the desired shape and size.

Another object of my invention is to provide a machine in which means is provided for causing a pre-determined quantity of the block forming material to be introduced into the block forms on each operation of the machine.

Another object of my invention is to provide an automatic block making machine in which the material flows under the force of gravity from one part of the machine to another during the processing of the block forming material into finished building blocks.

Still a further object of my invention is to provide an automatic block making machine which will operate through repeated cycles of operation so as to cause the formation of the blocks to be a continuous, uninterrupted process.

It is an additional object of my invention to provide a block making machine which may be operated from one source of power in order that several separate power sources will not be required in order to operate the machine.

Another object of my invention is to provide a block making machine having a hopper for receiving the plastic block forming material, a charge measuring device for receiving a predetermined amount of material from the hopper and and delivering it to the mold in which the blocks are to be formed, a device for stripping the blocks

2

from the molds, and a means for removing the blocks from the machine and conveying them to a preselected delivery point.

Still another object of my invention is to provide a novel mechanism for controlling the sequence and time of operation of various parts of the machine so as to enable it to carry out its block making functions without the intervention of a human operator.

An additional object of my invention is to provide a pneumatic control circuit for controlling the application of compressed air to the various air cylinders and vibrators, said circuit including a master valve for distributing the air to the cylinders and vibrators at the proper time and in the proper sequence, a hydraulic device for operating the valve, and a means for driving the hydraulic device by compressed air.

Still a further object of my invention is to provide a novel form of valve for controlling the time and sequence of operation of a plurality of pneumatically actuated devices.

With these and other objects in view which will become apparent from the following description, the invention includes certain novel features of design and combinations of parts the essential elements of which are set forth in the appended claims and a preferred form or imbodiment of which is hereinafter described with reference to the drawings which accompany and form a part of the specification.

In the drawings:

Figure 1 is a view of the complete machine with parts broken away to show certain details of the construction.

Figure 2 is a cross-sectional view through the adjustable charge measuring device taken along the line 2—2 in Figure 1.

Figure 3 is a cross-sectional elevation through the charge forming device taken along the line 3—3 in Figure 2.

Figure 4 is a cross-sectional elevation of the guide chute and header plate of the block form taken along the line 4—4 in Figure 1.

Figure 5 is a cross-sectional elevation taken along the line 5—5 in Figure 4.

Figure 6 is a cross-sectional view of the block form, pallets for supporting the block, and related mechanism.

Figure 7 is a cross-sectional view of the control valve and the pneumatic and hydraulic circuits associated therewith.

Figure 8 is a plan view of the control valve shown in Figure 7.

Figure 9 is a fragmentary cross-sectional view

of the control valve somewhat enlarged taken along the line 9—9 in Figure 8.

Figure 10 is a fragmentary cross-sectional view taken along the line 9—9 in Figure 8 but showing the valve piston in moved position.

Figure 11 is a fragmentary cross-sectional view taken along the line 11—11 in Figure 8.

Figure 12 is a fragmentary cross-sectional view taken along the line 12—12 in Figure 8.

Figure 13 is a fragmentary cross-sectional view taken along the line 13—13 in Figure 8.

Figure 14 is a fragmentary cross-sectional view taken along the line 14—14 in Figure 8.

Figure 15 is a cross-sectional elevation of the guide chute and mold showing a modification of the header plate and pallets, the parts being located in their block forming positions.

Figure 16 is a cross-sectional view taken along the line 16—16 in Figure 15.

Figure 17 is a view of a finished block formed by the modified header plate and pallets illustrated in Figure 15.

The general construction and organization of my novel automatic block making machine is shown in Figure 1 of the drawings. As herein shown the machine is supported on a bed or base plate 20 to which are secured the lower ends of four upright columns 22 which constitute a portion of the main framework of the machine. At their upper ends the columns 22 are secured to and serve to support a hopper 24 for receiving the concrete mix or other plastic material out of which the blocks are to be formed. Secured to the bottom of the hopper 24 is a cylinder 26 (see also Figs. 2 and 3) which may be welded or otherwise suitably fastened to the bottom of the hopper. The cylinder 26 has a rectangular opening 28 formed in the upper side thereof where the cylinder adjoins the hopper in order that the concrete mix in the hopper may have free access to the interior of the cylinder. The ends of the cylinder 26 are closed by end plates 30 to each of which is secured an annular flange 32 which serve to support ball bearings 34. Within the bearings 34 are received trunnions 36 which are attached to either end of a drum 38 located within the cylinder 26. The drum 38 has formed therein a rectangular opening 40 which is the same length as the opening 28 but somewhat wider than the latter opening as shown in Figure 3. Hence, when the openings 28 and 40 come into register, the concrete mix in the hopper will have free access into the interior of the drum 38, on either side of a center plate 41 which is secured about its periphery to the interior surface of the drum 38 and which serves to divide the latter drum into two approximately equal compartments. The amount of block forming material which may flow from the hopper into the interior of the drum 38 may be regulated by means of cylindrical filler drums 42 which may be adjusted along the axis of the drum 38 by means of threaded rods 44 to which the drums are secured. The threads on the rods 44 mesh with corresponding threads provided in bores formed in the trunnions 36. On the outer ends of the rods 44 are provided handwheels 46 by means of which the rods may be rotated and the drums 42 thereby adjusted either toward or away from the center of the drum 38. The rods 44 may be secured in their adjusted positions by means of lock-nuts 45 which may be screwed down against the outer ends of the trunnions 36. In this manner the spaces 47 existing between the inner walls 48 of the drums 42 and the center plate 41 may be varied to thereby alter the amount of mix which may be received within the drum 38 when the apertures 28 and 40 come into register.

The drum 38 is adapted to be rotated during the operation of the machine so as to cause the aperture 40 to come into register with a rectangular opening formed in the bottom of the cylinder 26 which opening is approximately of the same shape and size as the opening 28 formed in the top of the cylinder 26. At this time the mix contained in the spaces 47 between the drums 42 and the center plate 41 will be permitted to flow out of the charge measuring device through the opening 50.

As shown in Figures 1 and 2, the means for rotating the drum 38 consists of a pair of racks 52 which are arranged to mesh with spur gears 54 secured on the ends of the trunnions 36. The racks 52 are bolted at their lower ends to a pair of triangularly disposed supporting plates 55 which are rigidly attached to a guide chute 58 and thereby served to support the chute in position above the block mold located therebeneath. The racks 52 and the chute 58 are arranged to be moved up and down by means of a pair of air cylinders 60 which are mounted on supporting plates 62 (only one shown) which are supported from the base plate 20 by means of vertical posts 64. The upper ends of the posts 64 are prevented from movement in a lateral direction by means of horizontal braces 66 (only one shown) which are connected between the posts and each of the adjoining upright columns 22. The air cylinders 60 are provided with the usual piston rods 68 which are rigidly attached at their upper ends to the supporting plates 56. Compressed air is supplied to one side or the other of the air cylinders 60 by means of a control valve later to be described herein so as to cause the racks 52 and the chute 58 to be raised or lowered at the proper time during the machine cycle to cause the drum 38 to be rotated and the chute 58 to be raised or lowered for a purpose to be more fully described in a succeeding portion of this description.

The guide chute 58 is shown in greater detail in Figures 4 and 5 and as therein illustrated this chute consists of a four-sided funnel shaped box which is divided into two sections 69 by means of a wedge shaped plate 70 which is secured to a bottom plate 72 bolted or otherwise suitably secured to the bottom of the side plates of the chute 58. Each section 69 is also divided into two parts by means of a triangular divider plate 74 which, like the plate 70, are secured to the bottom plate 72. The bottom plate 72 is provided with four rectangular openings 76 so as to permit the concrete mix to be discharged through the chute and into the block mold located beneath the chute.

Secured to the underside of the plate 72 are a pair of castings 78 which, taken together, constitute a header plate for the mold. Each casting is provided with a pair of chamfered rectangular openings 80 which cooperate with tapered cores 86 (Figure 6) so as to form tenons on the under side of the finished blocks, these tenons being fully shown and described in my above mentioned co-pending patent application, Serial No. 693,252. The openings 80 lie directly beneath the openings 76 formed in the bottom plate 72 so as to permit the concrete mix to flow freely through the chute and into the mold. The castings 78 each have formed thereon centrally disposed wedge shaped tongues 82 which

are provided on the castings for the purpose of forming indentations in the lower surfaces of the blocks between the tenons formed thereon for the purpose of reducing the weight of the blocks. The castings 78 are also provided on their lower faces with longitudinally extending half-round beads 83 for forming grooves in the lower face of the finished blocks. The blocks are formed in the present machine in an upside down position in a mold which is designated generally by the reference numeral 88 (Figure 1) and consists of a rectangularly shaped box having side plates 90 and a bottom plate 92 (Figure 6). The bottom plate 92 is rigidly secured to the upper end of a piston rod 94 of an air cylinder 96 which is bolted to the base plate 20. Hence, by admitting air to one side or the other of cylinder 96 the mold 88 may be raised or lowered with respect to the base plate.

The bottom plate 92 of the mold serves to support the tapered cores 86 which are secured to the bottom plate and move up and down with the mold when the same is raised or lowered by the air cylinder 96. The mold 88 is also provided with three vertically disposed partition plates 98 which serve to form the sides of the two blocks which are produced by the machine in each operation thereof, the middle plate 98 serving to divide the two blocks from one another and to form a side wall on each of the blocks. In my preferred embodiment of the invention, the ends of the blocks are formed by means of filler plates 100 (Figure 6) which may be secured to the side plates 90 of the mold by means of screws or other suitable fastening means. The surfaces of the plates 100 may be shaped so as to provide vertically disposed tongues and grooves in the finished blocks of the type disclosed in my aforementioned patent application.

The top surfaces of the blocks are formed by pallets 110 which also serve as a means for supporting the blocks while they are being processed through the machine. Each of the pallets 110 is provided with two rectangular openings 112 through which the tapered cores 86 may move when the mold is elevated and also with two grooves 114 extending along either side of the pallet. These grooves are provided for the purpose of forming longitudinally extending tongues on the top face of the finished blocks. As shown in Figure 6 the pellets are stacked one on top of another in a pallet supply box 116 which is supported above the base plate 20 on legs 118.

In order to provide pallets for the two blocks which are formed on each operation of the machine, the pallets are stacked into two adjoining piles within the box 116 as shown in Figure 1. The pallets are adapted to be guided by means of a pair of side plates 120 which may be removed when pallets for forming blocks of special shapes, such as the cove block shown in Figure 17, are being used. The pallets are arranged to be pushed off of the pile one at a time and into position above cores 86 of the block mold. The means for thus pushing the pallets off of the piles consists of an air cylinder 122 which is supported on legs 124 (only one shown in Figure 1) having a piston rod 126 to which is fastened a pusher bar 128 which is adapted to engage the ends of the top pair of pallets on the piles and move them into position on the mold.

Means is provided for automatically elevating the piles of pallets after each operation of the pusher bar 128 so as to present a new pair of pallets to the pusher bar for the next operation thereof. This means consists of a flat plate 130 situated in the bottom of the box 116 on which the pallets rest, this plate being secured to the upper end of the plunger 132 of a variable lift jack 134 mounted on the base plate 20. This jack is provided with an operating arm 136 which is bifurcated at its upper end so as to receive the piston rod 126 of the air cylinder. Hence, each time the pusher bar 128 returns to the position shown in Figure 6 the jack will be operated and the pile of pallets elevated in sufficient distance so as to enable a fresh pair of pallets from the piles to be pushed into position over the mold on the next operation of the pusher bar.

When the pallets are thus moved by the pusher bar 128 off of the piles, they move above the tapered cores 86 in which position they are supported by means of rectangularly shaped plates 138 which are mounted on legs 140 resting on a flat plate 142 supported above the base plate 20 by means of legs 144. The plate 142 is provided with a centrally disposed aperture through which the piston rod 94 of the air cylinder 96 may pass in order to elevate and lower the mold. Similarly, the bottom plate 92 of the mold is provided with openings for accommodating the legs 140 which support the plates 138 so that the mold may move up and down while the legs 140 and plates 138 remain stationary. Each of the plates 138 is provided with an opening therein for accommodating the cores 86 as the latter move upwardly when the mold is elevated. Small rollers 146 are preferably mounted in the plates 138 so as to permit the pallets to move freely on and off of the plates during the operation of the machine. As each pair of pallets is pushed into position above the mold from the pile of pallets, the left-hand ends of the pallets (as viewed in Figure 6) will engage the right-hand ends of the pallets on which the newly molded blocks have been formed in the preceding operation of the machine and will cause the finished blocks to be moved onto a conveyor belt 148 operating on a roller 150 which is adapted to be driven by an electric or air motor 152 by means of a belt 154. The conveyer belt may be utilized to transport the finished blocks together with their supporting pallets to a drying kiln, a storage building, or to any other desired location.

It will be noted from the foregoing description that the various mechanisms involved in the present machine are arranged to be operated by the air cylinders 60, 96 and 122. The delivery of compressed air to these cylinders is controlled as to time and duration of application by means of a control valve 160 (Figures 1 and 7) which consists of a valve body 162 which is cylindrical in form and is provided with a sliding plunger or piston 164. The piston 164 is provided with a longitudinally extending bore 166 which is communicatively connected by a passageway 168 with an annular groove 170 extending circumferentially around the piston so as to enable air to flow from the bore 166 to any one of the series of ports provided in the wall of the valve body 162.

Compressed air is supplied to the bore 166 from a compressed air supply line 172 which may be connnected to the delivery outlet of an air compressor or other suitable supply of compressed air which will furnish air at a pressure of substantially 100 to 150 pounds per square inch. This line is connected to one port of a four-way reversing valve 174 consisting of a body 176 and

a rotatable plug 178 having a shaft 179 by means of which the plug may be rotated. The plug 78 is provided with a pair of curved bores 180. When the plug 178 is located in the position shown in Figure 7, air from the supply line 172 passes through one of the bores 180 to a T-fitting 182 which is adapted to screw into one of the ports formed in the valve body 176. As shown in Figure 7, the upper branch of the fitting 182 is connected by a tube 184 with a vertical pipe 186 extending downwardly into the bore 166. This pipe is mounted in a valve head 188 which is tightly secured to the upper end of the valve body 162 by means of screws 190. The lower end of the pipe 186 has provided thereon an O-ring 192 so as to seal the joint between the pipe and the bore 166 against the escape of air.

In order that the valve piston 164 may be operated up and down within the valve body so as to control the flow of air to the various ports provided in the latter member, the piston is secured to the upper end of a piston rod 194 which carries at its lower end a piston 196 adapted to slide in a vertical direction within a cylinder 198. This cylinder is provided at its lower end with a port 200 which is connected by a tube 202 with the lower branch of the T-fitting 182. Thus, when the reversing valve 174 is turned to the position shown in Figure 7, air will be supplied to the lower side of the piston 196, through the tube 202 so as to urge the piston 196 and the valve piston 164 to move upwardly. Upward movement of these parts is adapted to be controlled by means of a hydraulic circuit consisting essentially of an adjustable needle valve 204, a check valve 206, and a converter cylinder 208. The latter cylinder is provided with a piston 210 connecting to a piston rod 212 which serves to guide the piston 210 as it moves within the cylinder. The cylinder 208 has a port 214 formed on the upper end thereof which is connected by a tube 216 with one of the ports provided in the body 176 of the reversing valve 174. The cylinder 208 is also provided at its lower end with a port 218 which is connected by a tube 220 with a check valve 202 and also by a short length of pipe 222 with the needle valve 204. The needle valve is in turn, connected by an elbow 224 with the check valve 206 and by another elbow 226 with a port 228 formed in the upper end of the actuator cylinder 198.

The space above the piston 196 and the space beneath the piston 210 are both filled with any type of fluid suitable for this purpose as are also the tubes 220 and 222, the elbows 224 and 228, and the needle valve 204 and the check valve 206. Thus, when compressed air is supplied to the lower portion of the cylinder 198, the fluid located above the piston 196 will be forced out of the cylinder through the elbow 226 and through the needle valve 204 into the pipe 222. The fluid will be unable to flow through the elbow 224 since the check valve 206 will automatically close when the fluid is flowing out of the cylinder 198. The rate at which the fluid is permitted to flow out of the cylinder 198 may be varied by operating the needle 230 of the needle valve in the well-known manner. From the pipe 222 the fluid may flow through the tube 220 into the lower part of the cylinder 208 thus raising the piston 210. The latter piston is free to rise at this time inasmuch as the upper portion of the cylinder is connected to atmosphere by means of tube 216, the curved bore 180, and the vent tube 232. In this manner the rate of travel of the piston 164 of the control valve 160 may be accurately controlled by suitable adjustment of the needle 230 of the needle valve 204 and the rate of cyclic operation of the block making machine controlled accordingly.

Secured to the lower end of the piston 164 is an arm 234 which is provided with an upstanding abutment finger 236. The top surface of the finger 236 is adapted to cooperate with a pin 238 provided on the outer end of an arm 240 which is loosely pivoted on the valve shaft 179. Rigidly secured to the valve shaft 179 adjacent to the arm 240 is a second arm 242 which is connected at its outer end to a tension spring 244 which at its other end is connected to the pin 238. When the parts are in the position shown in Figure 7 and the spring 244 is located beneath the center of the valve shaft 179, the arms 240 and 242 will be pulled downwardly against stop pins 246. However, when the piston 164 moves upwardly, as herein before described, the pin 238 will be moved up by the finger 236 until the spring 244 gets above the center of the shaft 179 whereupon the spring will snap the arms 240 and 242 upwardly into contact with an upper pair of limit stops 248. Upward movement of the arm 242 will cause the valve shaft 179 to be rotated through approximately one-quarter of a revolution in a counter-clockwise direction as view in Figure 7. The snap action of the arm 242 will thus cause a rapid operation of the reversing valve 174 to take place and the compressed air supply line 172 will now be connected with the tube 216 while the tubes 184 and 202 will be connected with atmosphere through the vent tube 232. Hence, compressed air will be furnished to the upper side of the piston 210 thereby forcing the fluid beneath the piston to flow through the tube 220 in a right-hand direction and through the check valve 206 which will open at this time so as to permit the fluid to bypass the needle valve 204 and flow through the elbow 226 into the upper portion of the cylinder 198. The piston 196 and the valve piston 164 will thereby be moved downwardly and since the needle valve will no longer be effective to control the flow of the fluid, this motion will be quite rapid and thus cause a quick return of the valve piston 164 to its lower or starting position. It is also to be observed that during the return stroke of the piston 164, the bore 166 therein will be connected with atmosphere and thereby prevent operation of the air cylinders of the block machine during the downward travel of the piston. As the piston 164 moves to its lower position, the arms 240 and 242 will be returned to their initial positions as shown in Figure 7 by means of flexible cables 250 which are connected at one end to the arm 234 and at their opposite ends to the outer ends of the arms 240 and 242.

In order to afford a better understanding of the operation of the valve in connection with the various mechanisms of the machine whose operation is controlled thereby, the various fragmentary cross-sectional views of the valve are shown in Figures 9 to 14, inclusive. As shown in Figure 9, which is taken along the line 9—9 in Figure 8, the valve body 162 is provided with two ports 252 and 254 located in vertical alignment with one another, the port 252 being connected by a tube 256 with a tube 257 (see also Figure 1) which connects with the lower end of the air cylinder 96. The port 254 is connected by a tube 258 with the upper end of the air cylinder 96. Thus, when the valve piston 164 is in the position shown in Figure 9, compressed air will be delivered to the lower end of the cylinder 96 and the piston rod 94 (Figure 6) will be caused to

move upwardly so as to elevate the block form 88. At the same time, the air in the upper end of the cylinder 96 will be permitted to escape through the tube 258 due to the fact that the port 254 is at this time in communication with a vent groove 260 (Figure 9) formed in the upper end of the piston 164. The air will thus be permitted to flow from the groove 260 into the space 268 (Figure 7) located above the upper end of the piston 164. This space is communicatively connected with the outside atmosphere by means of a vent 270 provided in the valve head 188.

As the valve piston 164 continues to move upwardly in the valve body 162, the ports 252 and 254 will be closed so as to trap the air in the lower end of the cylinder 96. The groove 170 will next come into registry with a port 272 (see Figure 11) which is connected with the upper ends of the air cylinders 60 by a tube 274 which serves to conduct the air from the groove 170 to the upper ends of the air cylinders 60 (Figure 1) and thereby cause the piston rods 68 to be moved downwardly, the air in the lower ends of the cylinders being vented through tubes 276 which are connected with a port 278 located immediately above the port 272 in the valve body 162 (Figure 11). The port 278 is communicatively connected at this time with a vent groove 280 formed in the upper end of the piston 164 so as to effectively vent the lower ends of the cylinders 60 to the outside atmosphere. As the piston rods 68 descend, the guide chute 58 will be lowered and the drum 38 rotated so as to cause the opening 40 therein to move into registry with the opening 50 formed in the bottom of the cylinder 26 and so permit the concrete mix contained in the spaces 47 to flow into the guide chute and thence into the mold. As the chute 58 descends, an air driven high frequency vibrator 286 (Figure 6) will be set into operation due to the registration of a port 288 (see Figure 14) formed in the valve body 162 with the air supply groove 170. The port 288 is connected with the vibrator 286 by means of a tube 290 and the mold will hence be agitated by the high frequency vibrations set up by the vibrator and thereby cause the concrete mix in the mold to be agitated while the castings 78 (Figures 4 and 5) and the tapered cores 86 are moving into position on top of the block molds so as to compress the concrete mix within the molds and at the same time to form the bottom surfaces of the building blocks. At the same time that the castings 78 move down on top of the molds the air cylinder 96 will be given a "boost" by means of a port 292 (see Figure 13) formed in the valve body 162 which port is connected by a tube 294 (see also Figure 1) with the tube 257 which in turn is connected to the lower end of the cylinder 96. Hence the mold will be forced upwardly at the same time that the guide chute 58 and the castings 78 move down on top of the block molds so as to apply pressure to the concrete mix contained within the molds.

As the piston 164 continues its upward movement, the supply groove 170 will move into registry with the port 278 and hence cause air to be supplied to the lower ends of the cylinders 60 through the tubes 276. Thus the piston rods 68 (Figure 1) will be forced upwardly so as to elevate the guide chute 58 and reversely rotate the drum 38 (Figure 2) so as to cause the opening 40 therein to register with the opening 28 provided on the upper side of cylinder 26. Hence, the concrete mix in the hopper will be permitted to flow into the spaces 47 of the charge measuring device and, in order to assist the mix to flow from the hopper into the spaces 47 at this time, an air driven vibrator 296 (Figure 1) will be operated by means of compressed air furnished to the vibrator by means of a tube 298 (see also Figure 14) connected with a port 300 provided in the valve body 162 which port is located immediately above the port 288.

Referring again to Figure 11, it will be noted that at the same time that the port 278 is in communication with the groove 170, the port 272 will be in communication with a vent groove 302 formed in the lower end of the piston 164 so as to permit air 70 to escape from upper ends of the cylinders 60 through the tubes 274 and the groove 302 to atmosphere.

Upward travel of the piston 164 will next cause the supply groove 170 to come into registry with the port 254 so as to cause air to be supplied to the upper end of the cylinder 96 and hence cause the mold 88 to be lowered so as to strip the finished blocks therefrom. At the same time, air will be permitted to escape from the lower end of the cylinder 96 through the tubes 257 and 256 through the port 252 which is in communication with vent groove 304 (Figure 10) formed in the lower end of the piston 164.

As the piston 164 moves still further in an upward direction, the supply groove 170 will come into registry with a port 306 (Figure 12) which is connected with the right-hand end of the air cylinder 122 (Figure 1) by means of a tube 308 so as to cause the piston rod 126 and the pusher bar 128 connected thereto to be moved to the left as viewed in Figure 1 and thereby cause a fresh pair of pallets to be moved into position on the molds and to cause the finished pair of blocks just stripped from the molds to be moved onto the conveyor belt 148. Air contained in the left-hand end of the cylinder 122 will be permitted to escape therefrom through a tube 310 which is connected with a port 312 located a short distance above the port 306. The port 312 is at this time in communication with a vent groove 314 so as to permit the air from the left-hand end of the cylinder 122 to flow into the space 268 (Figure 7) and thence through the vent 270 into the surrounding atmosphere.

Further upward movement of the piston 164 will cause the groove 170 to move into registry with the port 312 so as to cause air to be supplied to the left-hand end of the cylinder 122 thereby forcing the piston rod 126 and the pusher bar 128 to move toward the right, the air in the right-hand end of the cylinder being permitted to escape through tube 308, port 306 and vent groove 316 (Figure 12) formed in the lower end of the piston 164 to the outside atmosphere. As the pusher bar 128 returns to its initial retracted position it will engage with the fork formed on the upper end of the jack operating arm 136 and thereby cause the pile of pallets to be elevated a sufficient distance to enable the next pair of pallets to be pushed into position on the molds on the next cycle of operation of the pusher bar.

The operation of the machine is as follows: With the parts in their Figure 1 positions and with the piston 164 of the control valve in its lowermost position as shown in Figure 9, air will be supplied to the cylinder 96 so as to cause the mold box 88 and the tapered cores 86 to be elevated into position to receive the next batch of the concrete mix from the hopper 24. The guide chute 58 will then be lowered and the drum 38 rotated so as to cause a measured amount of the

mix to be delivered into the mold and at the same time the castings 78 and the cores 82 will be moved down on top of the mold so as to compress the mix contained therein and to also form the bottom faces of the blocks. While mix is pouring into the mould and cores 78 and 82 are moved down on top of the mould, the high frequency vibrator 286 (Figure 6) is operated so as to agitate the concrete mix and thereby assist in settling the same within the mold. Next the guide chute 58 will be elevated and the drum 38 reversely rotated so as to cause the aperture 40 in the drum to again register with the opening 28 in the cylinder 26 so that the concrete mix in the hopper may flow into the spaces 47 of the charge measuring device, this flow being assisted at this time by the vibrator 296 which agitates the material within the hopper. The mold 83 and the tapered cores 86 are then moved down so as to strip the mold from the finished blocks which are supported on the pallets 110 and the plates 138 at this time. The pusher bar 128 is then reciprocated so as to move a fresh pair of pallets into position on the plates 138 and at the same time to move the finished blocks together with the pallets on which they are supported onto the constantly moving conveyor belt 148. Return movement of the pusher bar 128 will cause the jack 134 to be operated to elevate the pile of pallets so as to bring another pair of the same into position in front of the pusher bar 128. One complete cycle of the machine has now been completed and the piston 164 of the control valve will be quickly returned to its initial or lower position as earlier described herein so as to be ready for the next cycle of operation of the machine. During the return movement of the piston 164 to its lower position the supply of compressed air will be cut off from the control valve as described above so as to prevent operation of the air cylinders 60, 96 and 122 and vibrators 286 and 296 so as to prevent the operation of these parts during the return stroke of the piston.

In order to adapt my present machine to the construction of special forms of blocks which may be of considerably greater width than a standard block; for example, a double cove block similar to the block shown in Figure 17 of the present drawings but with a cove formation provided on each side of the block, it may be necessary to restrict the use of the mold to either the left-hand or the right-hand sections thereof, (Figure 1), the taper cores 86 of the other section being removed from the mold so as to make way for the wider pallets and other parts needed to form the wider type of block. In this case it will be necessary that the concrete mix be delivered to the chute 58 on only one side of the wedge-shaped plate 70. This may be accomplished by moving one of the filler drums 42, toward the center of the drum 38 until it is brought into contact with the center plate 41 so as to confine the concrete mix to one of the spaces 47 within the drum 38. Hence, the mix will flow out of only one side of the charge measuring device and will be deflected to one side or the other of the plate 70 by a flow dividing strip 318 attached at either end to the cylinder 26 so that the concrete mix will be delivered to only one section of the mold.

In order to utilize the above described machine for the formation of the standard half block as shown in Figure 16 of my co-pending patent application, Serial No. 693,252 hereinabove referred to, it will be necessary to divide each of the block forming sections of the mold into two parts by means of a pair tranverse divider plates 320 (Figure 6) lying at right angles to the plates 98. Inasmuch as somewhat more than one-half of the length of a standard block is required in order to form a standard half-block, only two half-blocks can be formed at a time, the parts of each of the block mold sections lying nearest to the conveyor belt 148 preferably being used for the purpose of forming the half blocks. In order to cause the concrete mix to be properly directed into the mold for forming the half-blocks, it will be necessary to provide a pair of flow directing plates 322 in the guide chute 58 as shown in Figures 4 and 5.

The half-blocks may be formed on shortened pallets provided for this purpose which may be fed by the pusher bar 128 onto the plates 138 situated adjacent to the conveyor belt 148. It will be realized of course that it will be necessary to increase the length of the piston rod 126 so that the pusher bar 128 will lie immediately behind the half-block pallets piled up in the box 116.

In Figs. 15 and 16 of the drawings is shown a modified form of header plate for forming the cove block shown in Figure 17 and a modified form of pallet forming the light trough in the cove block. Also shown in these figures is a different type of pallet supply box which may, if desired, be used in place of the supply box 116 described earlier herein.

Referring to Fig. 15, the structure therein shown is the same as that previously described except that a pair of downwardly extending curved plates 324 are secured to the castings 78 so as to form the surface 326 (Fig. 17) on each of the two cove blocks 328 being formed in the mold. The pallets 330 used in conjunction with the modified form of header plate are somewhat wider than the standard pallets 110 and are formed with longitudinally extending half-round sections 332 for forming the light trough 334 on each of the cove blocks.

I have also shown a modified form of pallet supply box consisting of a front plate 336, side plates 338 and a bottom plate 340. The supply box comprised of the plates 336, 338 and 340 is supported on the base by means of legs 342 and is adapted to hold a supply of pallets piled on top of one another the same as in the case of the supply box 116. However, in the case of the box shown in Fig. 16, the pallets are fed off of the bottom of the pile instead of the top, the plates feeding downwardly by force of gravity. The bottom pallet of the pile is fed into position on the mold by means of pusher bar 343 secured to the end of the piston rod 126, the remaining pallets in the pile being held back by either the front plate 336 or by an adjustable plate 344 which is adapted to be held in its adjusted position by means of nuts and bolts 346. Rearward movement of the pile of pallets when the piston rod 126 is retracted is prevented by means of a guard plate 348 attached at either end to the side plates 338. The plate 348 should preferably be adjustable from the position shown in Fig. 16 to a position near the center of the box in order to enable the plate to fulfill its intended function when half-length pallets are used for forming half-blocks as mentioned earlier herein.

Although I have described my invention in considerable detail and have therefore utilized certain specific terms and language herein, it is to be understood that the present disclosure is illus-

trative rather than restrictive and that changes and modifications may be resorted to without departing from the spirit or the scope of the claims appended hereto.

I claim:

1. In a machine for automatically casting and forming building blocks, the combination of a mold having a lower block-shaping portion movable to molding position and an upper block-shaping portion movable to engage the lower portion after the lower portion has been moved to molding position, said upper mold portion having an opening therein through which molding material may pass to the mold; and means to deliver molding material to the mold through the opening in the upper portion of the mold while the upper portion moves to engage the lower portion of the mold.

2. In a machine for automatically casting and forming building blocks, the combination of a pallet upon which the block is formed; a block-forming mold including a lower block-forming portion movable vertically into engagement with the pallet and an upper block-forming portion movable downwardly to engage the moved lower portion, said upper portion having therein means through which block-forming material can be introduced into the mold; means for delivering a predetermined quantity of block-forming material to the mold; means to guide the material through the means in the upper portion of the mold; means to move the portions of the mold into molding position and thereafter to retract the portions to strip the mold from the block which has been formed on the pallet; and means to operate the delivery means to deliver block-forming material to the guiding means after the lower portoin has engaged the pallet and while the upper portion moves toward the lower portion.

3. A machine according to claim 2 in which the block-forming material guiding means is mounted on and moves with the upper block-forming portion of the mold.

4. In a machine for automatically casting and forming building blocks, the combination of a mold having a lower block-shaping portion movable upwardly to molding position and an upper block-shaping portion movable downwardly to engage the moved lower portion to complete the mold, said upper portion having apertures through which molding material can enter the mold; a hopper located above the mold for holding a supply of block-forming material; means intermediate the hopper and the mold for receiving a variable predetermined quantity of block-forming material from the hopper by gravity feed and delivering it through the apertures in the upper block-shaping portion of the mold by gravity feed as the upper portion of the mold moves toward the lower portion; and means to move the upper and lower portions of the mold to molding position and to retract the portions to strip the mold from the finished block.

5. A machine as claimed in claim 4 in which the means intermediate the hopper and the mold consists of a receptacle for receiving a measured amount of material from the hopper and a guide means mounted on the upper block-shaping portion, and movable therewith, to receive material from the receptacle and guide the material into the mold through the apertures in the upper block-shaping portion of the mold.

6. In a machine for automatically casting and forming building blocks, the combination of a mold having a lower block-shaping portion movable upwardly to molding position and an upper block-shaping portion movable downwardly to engage the moved lower portion to complete the mold, said upper portion having apertures through which molding material can enter the mold; a hopper located directly above the mold for holding a supply of block-forming material; measuring means intermediate the hopper and the mold for receiving a variable predetermined quantity of block-forming material from the hopper by gravity feed and operable to deliver it through the apertures in the upper block-shaping portion of the mold by gravity feed; means to move the upper and lower portions of the mold to molding position and to retract the portions to strip the mold from the finished block; and means operable in synchronism with the mold-moving means for operating the measuring means to deliver the molding material through the upper block-shaping portion of the mold as the upper portion moves toward the bottom shaping portion of the mold.

7. In a machine for automatically casting and forming building blocks, the combination of a mold having a lower block-shaping portion movable to molding position and an upper block-shaping portion movable to molding position to engage the lower portion after it has been moved to molding position, said upper mold portion having an opening therein through which molding material may pass to the mold; means situated directly above the mold and operable to deliver molding material to the mold by gravity feed through the upper portion of the mold; means to move the upper and lower block-shaping portions to molding position and to retract the portions to strip them from the molded block; means to operate the molding material delivering means; and means to synchronize the several operating means to cause the delivering means to operate and deliver material to the mold as the upper block-shaping portion of the mold moves to engage the lower portion, whereby the mold can receive a charge of molding material as the portions move to molding position.

8. A machine as claimed in claim 7 in which the means to operate the portions of the mold and the means to operate the molding material delivering means are fluid pressure operating means, and the synchronizing means is a cyclically operable valve for controlling the fluid pressure operating means.

9. A machine as claimed in claim 8 in which a reversible fluid driving means causes the cyclical operation of the valve.

10. In a machine for automatically casting and forming building blocks, the combination of a block-forming mold including a pallet upon which the block is formed, a lower block-forming portion movable vertically into engagement with the pallet, and an upper block-forming portion movable downwardly to engage the moved lower portion, said upper portion having therein means through which block-forming material can be introduced into the mold; a hopper mounted directly above the mold; adjustable means for receiving a variable predetermined quantity of block-forming material from the hopper and operable to deliver the material by gravity feed to the mold; a guide chute mounted on the upper block-forming portion to guide the material through the means in the upper portion of the mold, said chute being movable with the upper portion of the mold; means to move the

upper and lower portions of the mold into molding position and to thereafter retract the portions to strip the mold from the block which has been formed on the pallet; and means to operate the delivery means to deliver molding material to the guiding means after the lower portion has engaged the pallet and while the upper portion moves toward the lower portion.

11. An automatic block making machine comprising a multi-section block mold having an upper section and a lower section, the upper section of which having apertures through which block-forming material can enter the mold, a hopper for holding a supply of block forming material for filling said mold, a guide chute secured to the upper section of the mold and located above said apertures in the mold for directing the material into said mold, a charge measuring device situated between the hopper and the chute for receiving a predetermined quantity of block forming material from said hopper and depositing it into said guide chute, and means for enabling the flow of material from said charge measuring device and said guide chute to be controlled so as to cause the material to be directed into a particular section of said mold.

12. An automatic block making machine comprising a block forming mold, said mold including a header plate which is vertically movable relative to the remainder of said mold and which has apertures therein through which block-forming material can be fed into the mold, a hopper for holding a supply of block forming material for filling said mold, and a guide chute attached to said header plate and movable therewith for guiding the material from said hopper through the apertures and into said mold.

13. The invention as defined by claim 12 including in combination therewith a plate detachably secured to said header plate for forming specially shaped blocks.

RICHARD L. WEIR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 838,704 | Francisco | Dec. 18, 1906 |
| 1,175,011 | Phillipoff | Mar. 14, 1916 |
| 1,237,887 | Ferguson | Aug. 21, 1917 |
| 1,294,311 | Seiferd | Feb. 11, 1919 |
| 1,400,969 | Nelson | Dec. 20, 1921 |
| 1,458,551 | Seat | June 12, 1923 |
| 1,695,327 | Goldston | Dec. 18, 1928 |
| 1,777,660 | Dahl | Oct. 7, 1930 |
| 1,796,636 | Toulmin, Jr. | Mar. 17, 1931 |
| 1,799,928 | Phifer | Apr. 7, 1931 |
| 1,835,914 | Stockdale | Dec. 8, 1931 |
| 1,899,277 | Kraft | Feb. 28, 1933 |
| 1,905,619 | Carton | Apr. 25, 1933 |
| 1,919,807 | Sharpe | July 25, 1933 |
| 1,925,050 | Jagdmann et al. | Aug. 29, 1933 |
| 2,047,356 | Boyle | July 14, 1936 |
| 2,062,196 | Stacy | Nov. 24, 1936 |
| 2,070,720 | Ernst | Feb. 16, 1937 |
| 2,136,009 | Holland, Jr. | Nov. 8, 1938 |
| 2,360,122 | Gelbman | Oct. 10, 1944 |
| 2,366,780 | Gelbman, et al. | Jan. 9, 1945 |
| 2,400,631 | Darden | May 21, 1946 |
| 2,413,109 | Leipold, et al. | Dec. 24, 1946 |
| 2,492,297 | Lagarde | Dec. 27, 1949 |
| 2,524,359 | Romie | Oct. 3, 1950 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 586,326 | Germany | Oct. 20, 1933 |