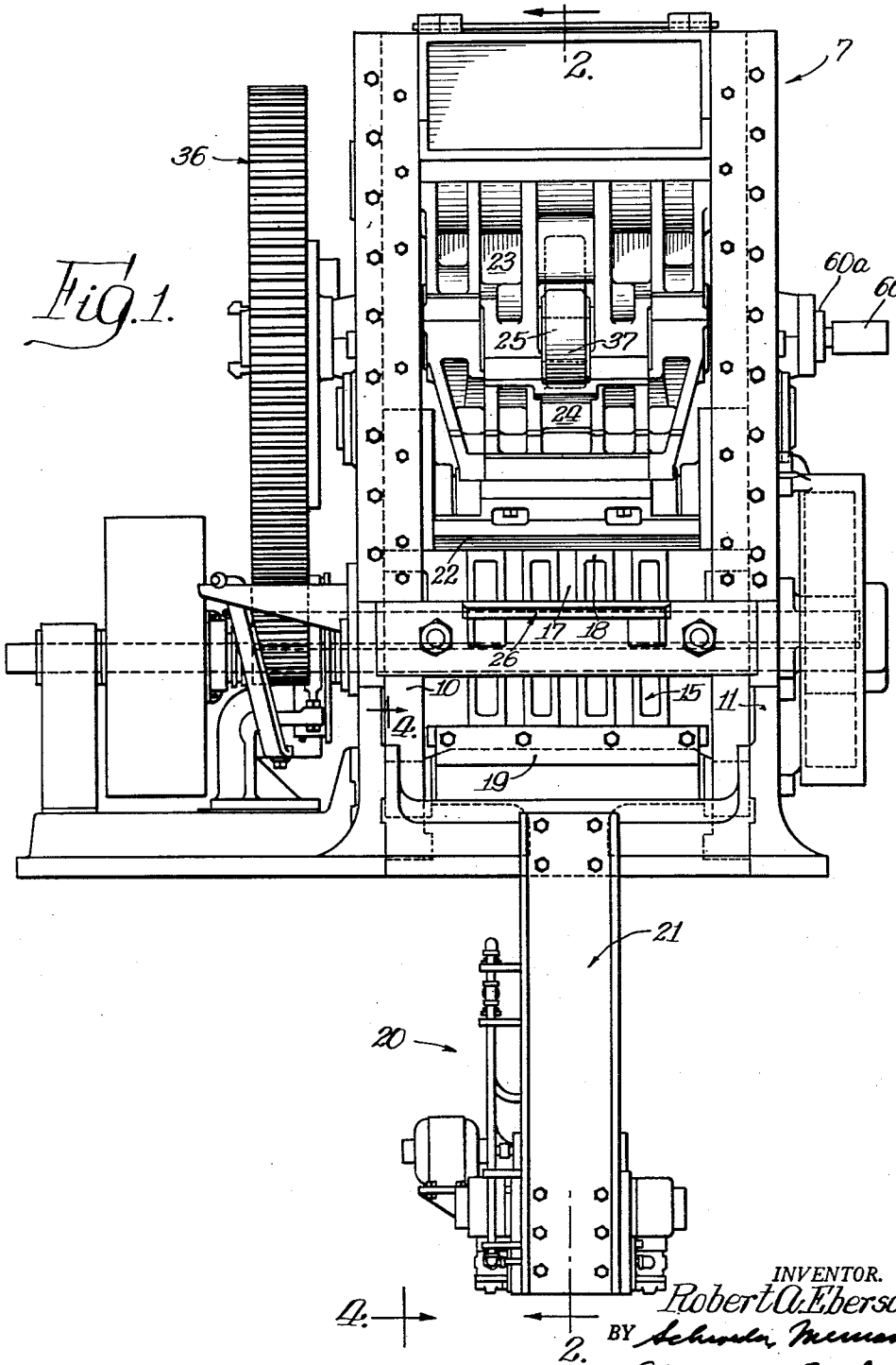
March 29, 1955 R. A. EBERSOLE 2,704,874

CONTROLLING APPARATUS FOR PRESSES AND THE LIKE

Filed June 16, 1953 5 Sheets-Sheet 1

Fig. 1.



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CONTROLLING APPARATUS FOR PRESSES AND THE LIKE

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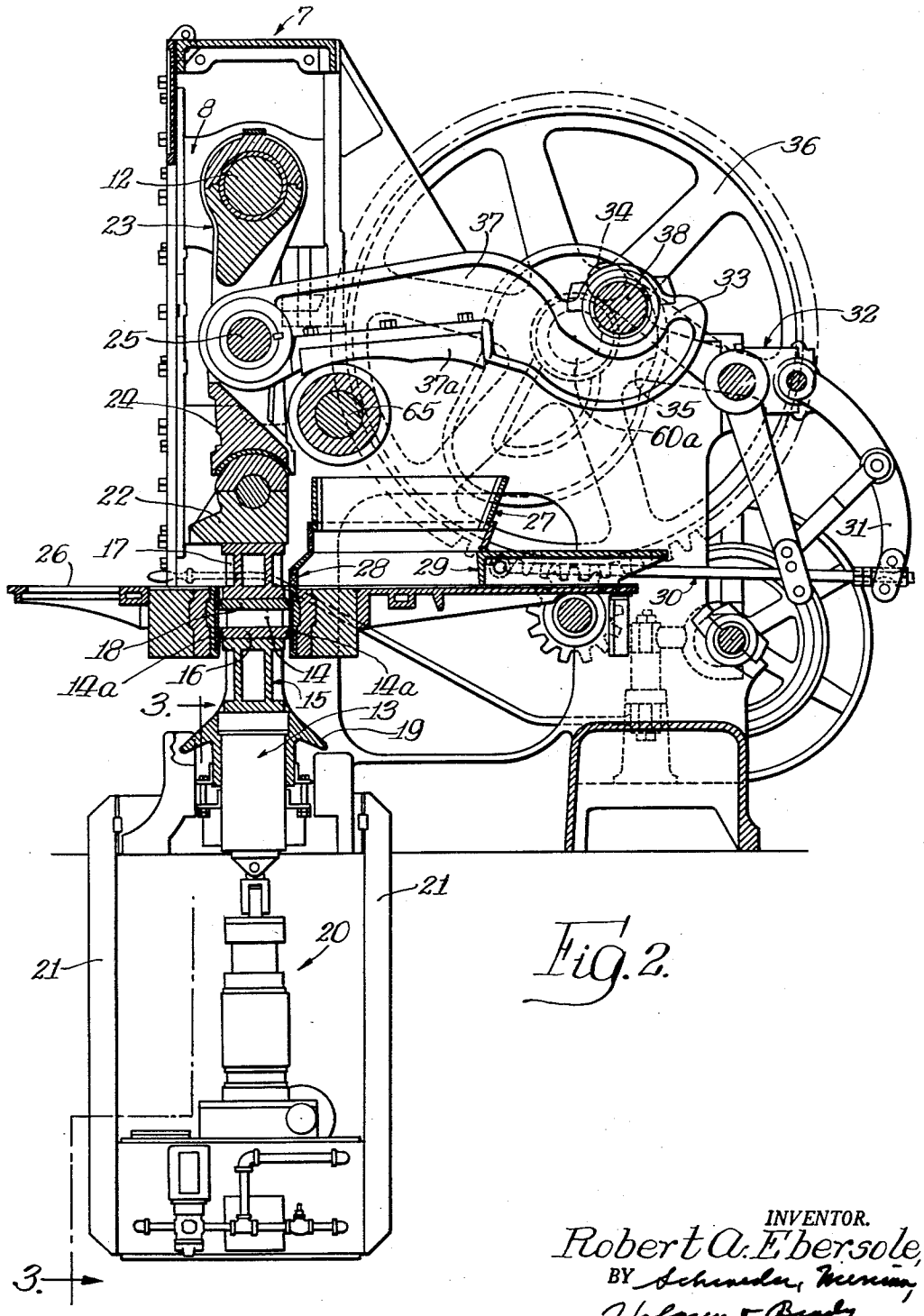


Fig. 2.

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Filed June 16, 1953 5 Sheets-Sheet 3

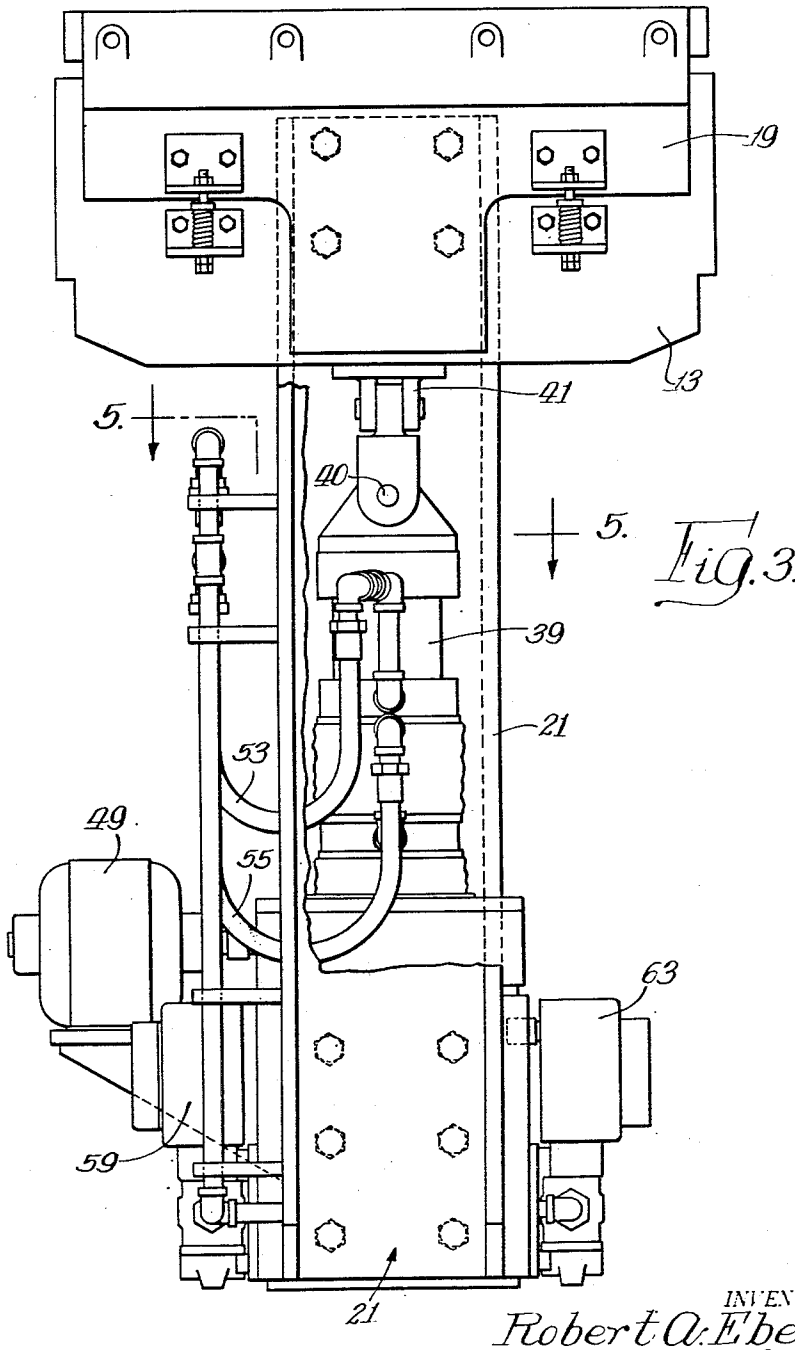


Fig. 3.

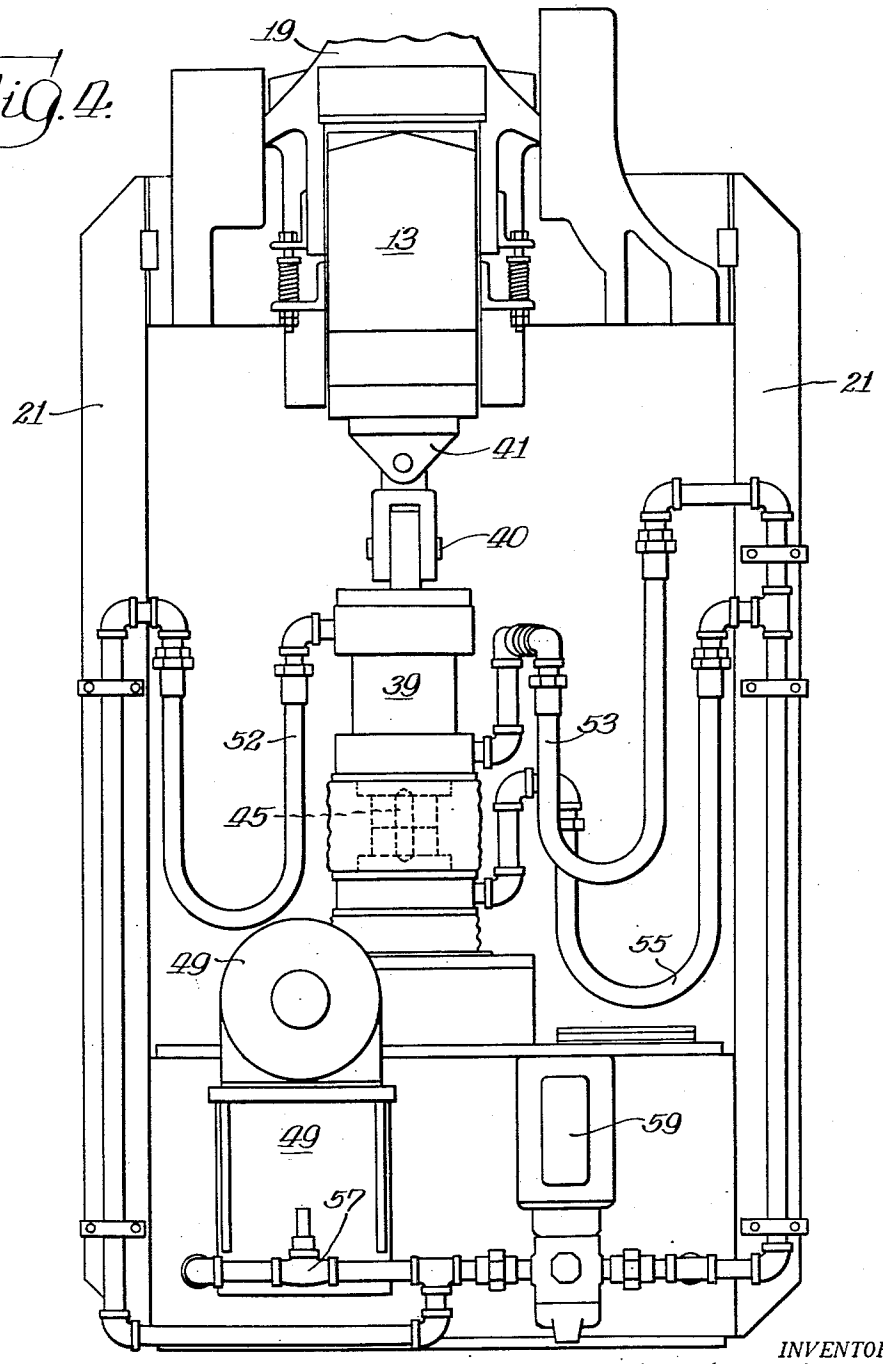
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CONTROLLING APPARATUS FOR PRESSES AND THE LIKE

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Fig. 4.



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CONTROLLING APPARATUS FOR PRESSES AND THE LIKE

Filed June 16, 1953 5 Sheets-Sheet 5

Fig. 6.

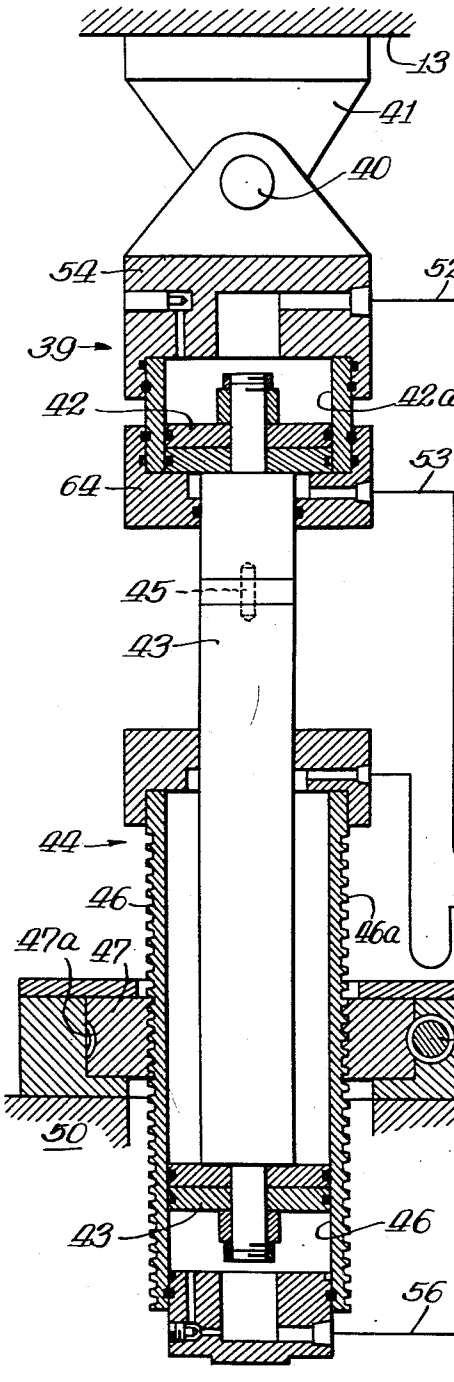
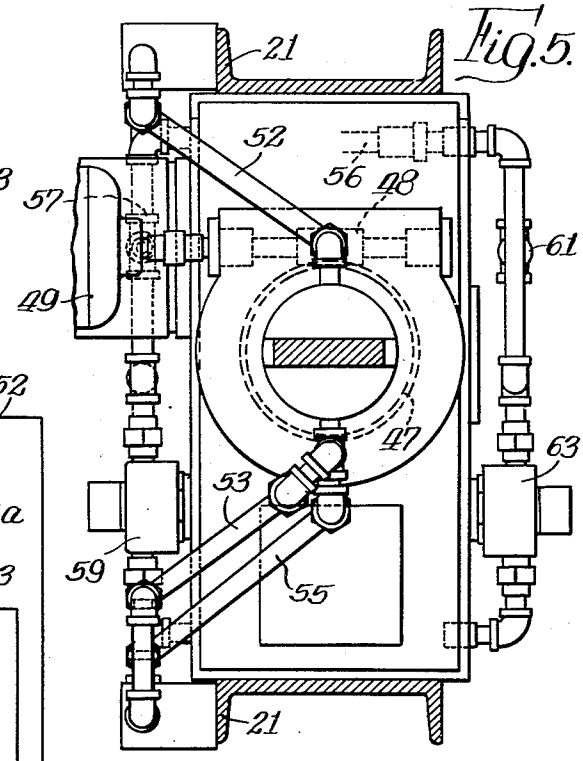
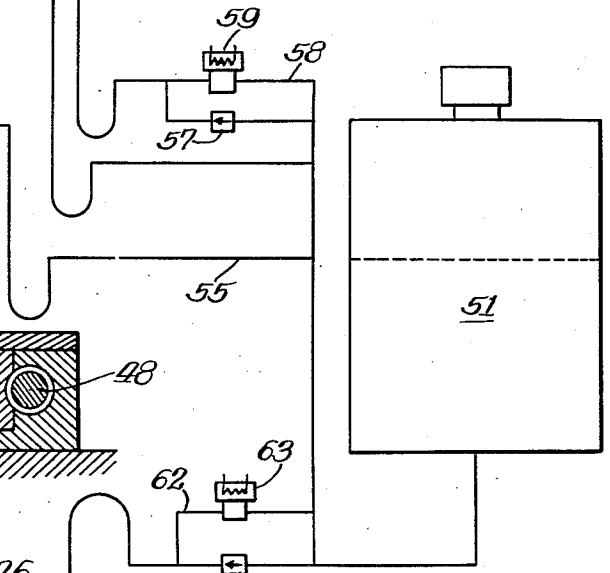


Fig. 5.





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2,704,874

CONTROLLING APPARATUS FOR PRESSES AND THE LIKE

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Application June 16, 1953, Serial No. 361,957

3 Claims. (Cl. 25—89)

This invention relates to presses and other mechanisms for applying pressure to material in the treatment and formation thereof, and has the general purpose of improving and adding to the uses of such mechanisms.

The invention is here illustrated in one particular embodiment as applied to a toggle arm type press. The press in this instance is a brick press, details of which are disclosed in the co-pending patent application of Joseph Barkham, filed June 11, 1952 as Serial No. 292,796. It is to be understood that the invention is not limited to any particular form of press.

The press illustrated is of the general type shown in Flood Patents Nos. 985,153 and 987,124. The press includes a main frame having side bars in which there is vertically movable a subframe. An upper plunger is secured to the bottom of an upper cross head which is movable vertically in guides in the side bars due to the swinging movement of a pair of toggle arms. The toggle arms are each rotatably secured to an intermediate shaft to form the toggle. The toggle is operated by connecting rods and a crank, the crank being rotated by a gear. A lower plunger which, with the upper plunger forms the bottom and top of the mold, is mounted on a saddle which is movable vertically on a lower cross head and may be raised relative to the main frame by control means. The lower cross head is rigidly attached to the side bars of the subframe.

The entire combination of parts forms the basic means by which a predetermined amount of material may be compressed between the upper and lower plungers, which are faced for that purpose, the compressed article then discharged, a new mold fill made, the cycle then repeating itself.

In the press shown in the Flood patents, the lower control mechanism has but one primary purpose, that being to determine the depth at which the lower plunger is positioned in the mold during the filling operation, thereby determining the amount of refractory material, measured in terms of height or depth alone, which may be delivered into the mold for compression. Thus it has been customary to provide a hopper, filled with the material to be compressed, which hopper is moved across a table on the press and over the mold cavity. Material in the hopper may fall by gravity into such cavity with the amount of material falling therein being determined by the position of the lower plunger. Retraction of the hopper serves to level off the material in the mold flush with the table surface. The usual control means used in conjunction with the lower plunger is a mechanical linkage and spring arrangement. This mechanical control means, which proved satisfactory for a great number of years, has now become inadequate for the purpose of finite control over certain portions of the cycle of operation of the press and particularly to control the depth of the mold. The quality demand with respect to structural perfection of compressed articles, such as bricks, has increased to such an extent that improved methods of control are needed.

Another difficulty encountered with the depth control device as shown in the aforementioned Flood patents is the tendency of the upper plunger to force material out of the mold when compression begins, particularly where the face of the plunger is slanted, as in the production of wedge-shaped bricks. To alleviate such an undesirable result, a secondary drop of the lower plunger is provided to lower the material in the mold below the press table.

Accomplishing such varied and exacting control over the position of the lower cross head and plunger also enables the fulfillment of a further improvement over prior control devices. It has been found that there may be times when it is necessary to raise the compressed article a predetermined distance above the horizontal table, this being due to the design of the article or the structure of the mold faces. Therefore, provision has been made to hold the lower plunger above the horizontal table for a time sufficient to remove the compressed article without interfering with the orderly process of moving the hopper in for fill purposes.

Thus, an object of this invention is to provide the means for controlling the movement of the lower plunger relative to the mold.

A further object of this invention is to provide an electrically controlled hydraulic mechanism for the purpose of controlling not only the depth of the mold for fill purposes but the height of the compressed article for removal purposes in relation to a brick press or the like.

A still further object is to provide a depth control apparatus in conjunction with a brick press or the like which control mechanism also functions to raise a compressed article a predetermined height above the horizontal table, then sequentially to depress the lower plunger to a first position to determine the depth of the mold, and then further to lower the lower plunger immediately prior to the compression of the material.

Other objects and features of the invention will be readily apparent from the following description and drawings, in which:

Fig. 1 is an elevational view of the front of a press embodying the invention;

Fig. 2 is a vertical sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a vertical view of the depth control mechanism and lower cross head taken along the line 3—3 of Fig. 2;

Fig. 4 is a side elevational view of the lower cross head and depth control mechanism;

Fig. 5 is a top sectional view taken along the line 5—5 of Fig. 3; and

Fig. 6 is a combination sectional and schematic view of the present invention.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail, one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principals of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring to Figs. 1 and 2 of the drawings, the press includes a fixed main frame 7 in which there is vertically movable in suitable guideways a subframe 8 including a pair of side bars 10 and 11. A shaft 12 is secured to the side bars and extends therebetween near the upper portion of the press. A beam 13, hereinafter referred to as the lower cross head, extends between the side bars at the bottom of the press.

Mounted on the main frame are four side plates 14*a* forming the sides of a mold 14. A lower plunger 15 carries a die plate 16 movable into the lower portion of the mold 14 while an upper plunger 17 carries an upper die plate 18 movable into the top of the mold. The lower plunger 15 is mounted upon a saddle 19 which is movable vertically on the lower cross head 13. The position of the lower cross head during certain portions of the operating cycle of the press is controlled by a hydraulic device 20 mounted in a channel support 21.

In the particular press shown for purposes of illustrating the invention, four upper plungers 17 are provided which cooperate with four lower plungers 15 in four molds 14 so that four bricks are formed in each cycle of the press.

Each upper plunger 17 is rigidly secured to an upper cross head 22 which is secured to and movable vertically by swinging movement of a pair of toggle arms, the upper of which is designated 23 and the lower 24. The upper toggle arm is rotatably secured to the shaft

12 and the upper and lower toggle arms are each rotatably secured to an intermediate shaft 25 to form the toggle.

The press is provided with a table 26 upon which is horizontally slidable an open-bottomed hopper 27 adapted to contain a supply of material to be pressed. The hopper has a front wall 28 and a rear wall 29 and means are provided for reciprocating the hopper over the upper surface of the table so as to carry material therein over the mold 14 when the upper plunger 17 is above the mold so that the material in the hopper may drop by gravity into the mold, with the quantity of the material falling into the mold being determined by the position at that time of the lower plunger 15. For the purpose of reciprocating the hopper there is provided a rod 30 connected to a link 31 which in turn is pivotally supported upon a member 32 movable through the operation of a cam follower arm 33 connected thereto which carries a cam follower 34 riding in a cam groove 35 secured to the main drive gear 36.

The intermediate shaft 25, to which the upper and lower toggle arms 23 and 24 are rotatably secured, is also secured at its center portion to a crank 37, the other end of which is rotatably secured to a crankpin 38 on the main drive gear 36. It will be understood from the foregoing, that as the crank 37 is oscillated with rotation of the drive gear, the toggle arms are swung toward and finally through dead center and thus the plunger 17 is moved into the mold 14 under great pressures.

For the purpose of adjusting the depth of the mold and other purposes as mentioned before, the hydraulic control device 20 includes a casing 39 (see Fig. 6) which is connected at its top by a clevis pin 40 to a clevis 41, the clevis being connected to the lower cross head 13. Rigidly secured to the casing 39 is a cylinder 42*a* in which is located a piston 42. The piston 42 is connected to a piston 43 of a lower piston and cylinder device 44 by means of a shaft 45. The lower cylinder 46 is externally threaded as indicated at 46*a*, which threads are engaged by a nut 47. The external surface of the nut is provided with worm gear threads 47*a* engaged by a worm 48 connected to be driven by a motor 49. As the latter parts are mounted on a stationary base 50 attached to the channel support 21, the rotation of the nut 47 by the worm 48 raises or lowers the lower piston and cylinder device 44. The position of the lower device determines thereby the mold fill position of the lower plunger 15, as will hereinafter be more explicitly set forth.

For regulating the passage of fluid in the two piston and cylinder devices, controlling thereby the downward movement of the lower cross head 13, four fluid passage lines are connected at one end to the piston and cylinder devices and at the other end to a common fluid reservoir 51. The first fluid passage 52 and the second passage 53 are connected to the opposite ends of the upper cylinder 42*a* and the third passage 55 and fourth passage 56 are connected to the opposite ends of the lower cylinder 46. A check valve 57 is interposed in the first passage 52 so as to permit fluid to flow only into the upper cylinder 42*a*. A by-pass line 58 around the check valve 57 is controlled by a two-way solenoid valve 59. A second one-way check-valve 61 is interposed in the passage 57 so as to permit fluid to flow only into the lower cylinder 46 and a second by-pass line 62 around the second check-valve 61 is controlled by a two-way solenoid valve 63.

The operation of the hydraulic control system is in phase with the operation of the press and for this purpose there is provided cam operated switches, generally indicated at 60, with the cams being driven off the main gear shaft 60*a*. As such switches are well-known, no detailed illustration is deemed necessary.

After the toggle arms are moved through dead center position (as will occur after a few more degrees of rotation of the drive gear in a clockwise direction from the position illustrated in Fig. 2) continued rotation of the drive gear serves to move the adjacent end of the crank downwardly to bring its lower cam shaped surface 37*a* into contact with roller 65 and thus lifts the entire subframe and attendant toggle arms and cross head upwardly. Upward movement of the lower cross head imparts similar movement to the upper cylinder 42*a* relative to its contained piston 42. This action

causes fluid to be drawn into the cylinder above the piston, the fluid being drawn through the passage 52 and the check-valve 57. Both solenoid valves 59 and 63 are closed at this time. As the lower portion 64 of the cylinder 42*a* moves upward, fluid in the cylinder below the piston is forced out through the fluid passage 53 and into the reservoir 51. When the bottom of the cylinder 42*a* contacts the bottom of the upper piston 42, continued upward movement of the lower cross head then carries the piston 42 and the connected lower piston 43 upwardly. This action of the piston 43 forces fluid in the lower cylinder above the piston therein out through the passage 55 and simultaneously fluid is drawn into the cylinder 46 below the piston through the passage 56 and the check valve 61.

The cam portion 37*a* of the crank is so shaped as to cause continued upward movement of the subframe until it is raised to a position where the lower cross head 13 positions the lower plunger 15 above the level of the horizontal table 26. At this position piston 42 is at its lowermost position in the cylinder 42*a* and the piston 43 is at its highest position in cylinder 46 and the fluid entrapped in the cylinders, due to the closed solenoiod valves 59 and 63 and the one-way check valves 57 and 61, prevents the subframe assembly 8 from moving downward due to its own weight; at this point in the cycle the compressed article is discharged.

After the discharge position, further rotation of the drive shaft 60*a* causes the rotary cam limit switch 60 to open the solenoid valve 63. Due to its own weight, the subframe assembly 8 moves downward, forcing the fluid out of the lower cylinder 46 through the fourth fluid passage 56 and around the one-way check valve 61 by means of the by-pass line 62 and the open solenoid valve 63. Fluid enters the lower cylinder 46 above the piston 43 through the fluid passage 55. The downward distance moved by the subframe is determined by the vertical position of the lower cylinder 46, as the subframe moves downward only until the lower piston 43 seats on the bottom of the cylinder 46.

This first downward movement positions the lower plunger at its fill position relative to the mold cavity 17. This position can be adjusted through the worm and nut previously described. The motor, worm gear and nut being stationary, rotation of the nut causes vertical movement of the lower cylinder, determining thereby the position of the lower piston 43 and thus that of the lower plunger 15 at fill position. By this means, the depth of the mold cavity is determined. At this time the hopper is moved across the table 26 to fill the mold cavity and then returned. During return movement of the hopper, the walls 27 and 28 scrape off excess material so as to leave the material in the mold flush with the table.

After the mold is filled, further rotation of the drive shaft 60*a* causes the rotary cam limit switch 60 to open the first solenoid valve 59. Due to the weight of the subframe assembly 8, fluid is forced out of the upper cylinder 54 through the fluid passage 52 and around the one-way check valve 57 by means of the by-pass line 58 and the open solenoid valve 59. Fluid enters the cavity formed in the upper cylinder 54, by the cylinder seating on the top of the upper piston 42, through the fluid passage 53. Drainage of fluid from above the piston 42 permits further downward movement of the subframe and thus leaves the lower plunger to position the top of the material in the mold below the top of the table 26.

The hydraulic control means is now in the compression position, and the lower plunger is supported by the saddle 19 and lower cross head 13. Further rotation of the shaft 60 continues the movement of the crank 37 to bring the toggle arms through dead center, and thus to compress the material in the mold.

As there may be instances where the placement of the hydraulic control device 20 (as exemplified in the drawings) may not be feasible or where the placement is desired elsewhere, it is to be noted that the device 20 and the stationary base 50 could be mounted at other places on or near the main frame 7. For example, the device 20 and base 50 could be mounted on the frame 7 and a suitable means of connection provided between the upper cylinder 42*a* and the subframe 8. As so mounted, the hydraulic control device would be able to perform the same functions as hereinbefore described.

I claim:

1. In a press of the character described, a toggle frame, a pair of toggle arms on the frame carrying an upper plunger, a cross head on the frame carrying a lower plunger, means for moving said arms toward and through dead center position to cause relative approaching movement of said plungers to compress material in a mold, means for raising said frame, means for controlling the downward movement of the frame including a first and a second hydraulic piston and cylinder device, the first device being connected at one end to the cross head and supported at its other end on the second piston and cylinder device, a base member movably supporting the second cylinder, means for exhausting fluid from the second cylinder to lower the frame to a first position, means for exhausting fluid from the first cylinder to lower the frame to a second position, and means on the base member for vertically adjusting the position of the second cylinder relative thereto, thereby to predetermine said first position.

2. In a press of the character described, a toggle frame carrying upper and lower plungers for compressing material in a mold, means for raising said frame to position said lower plunger above said mold, hydraulic means for controlling the downward gravity movement of said frame, control means for said hydraulic means comprising a reservoir, a plurality of fluid passages connecting said reservoir to said hydraulic means, a plurality of check valves and solenoid operated valves controlling said passages, electric switch means for controlling said solenoid valves, and means on the press for cyclically operating said switch means in timed relationship to movement of said plungers and operable to hold said frame at

a first position, to exhaust fluid from said hydraulic means to permit the downward movement of said frame to a second position, and then to again exhaust fluid from said hydraulic means to permit further downward movement of said frame to a third position.

3. In a press of the character described, a toggle frame, a pair of toggle arms on the frame carrying an upper plunger, a cross head on the frame carrying a lower plunger, means for moving said arms toward and through dead center position to cause relative approaching movement of said plungers to compress material in a mold, means for raising said frame, means for controlling the downward movement of the frame including a first and a second hydraulic piston and cylinder device, the first device being connected at one end to the toggle frame and supported at its other end on the second piston and cylinder device, valve means for exhausting fluid from one of the cylinders to lower the frame to a first position, other valve means for exhausting fluid from the other cylinder to lower the frame to a second position, and means cyclically operating said valve means in timed relationship to movement of said plungers and operable to lower said frame to said second position and then to lower said frame to said first position.

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