

Nov. 20, 1956

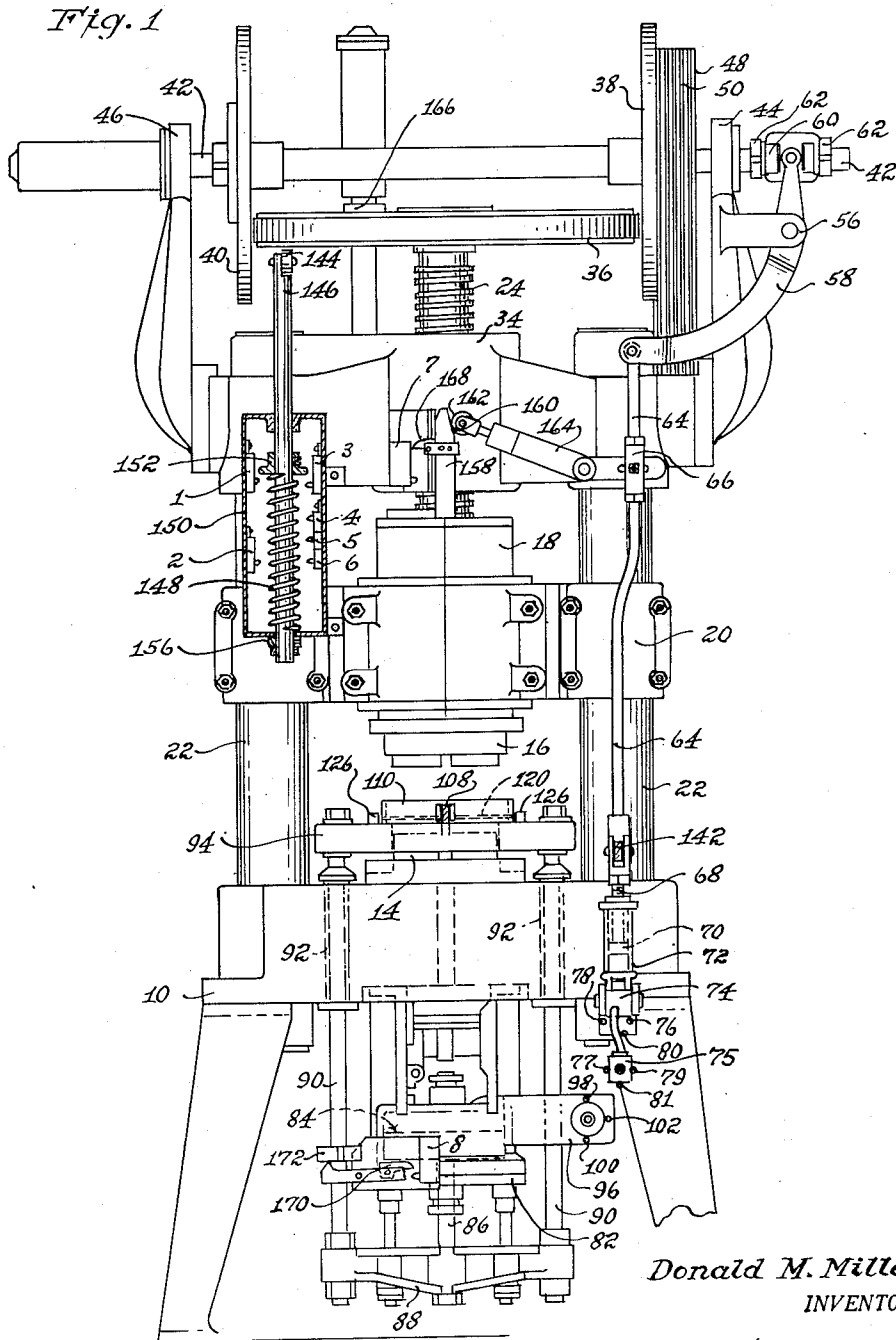
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2,770,862

AUTOMATIC CONTROL FOR SCREW OPERATED PRESS

Filed Dec. 14, 1953

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

Fig. 3

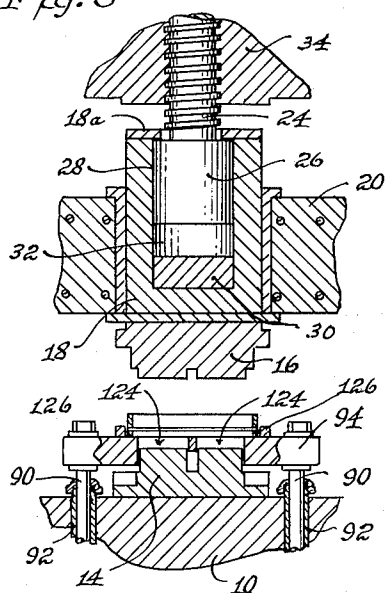
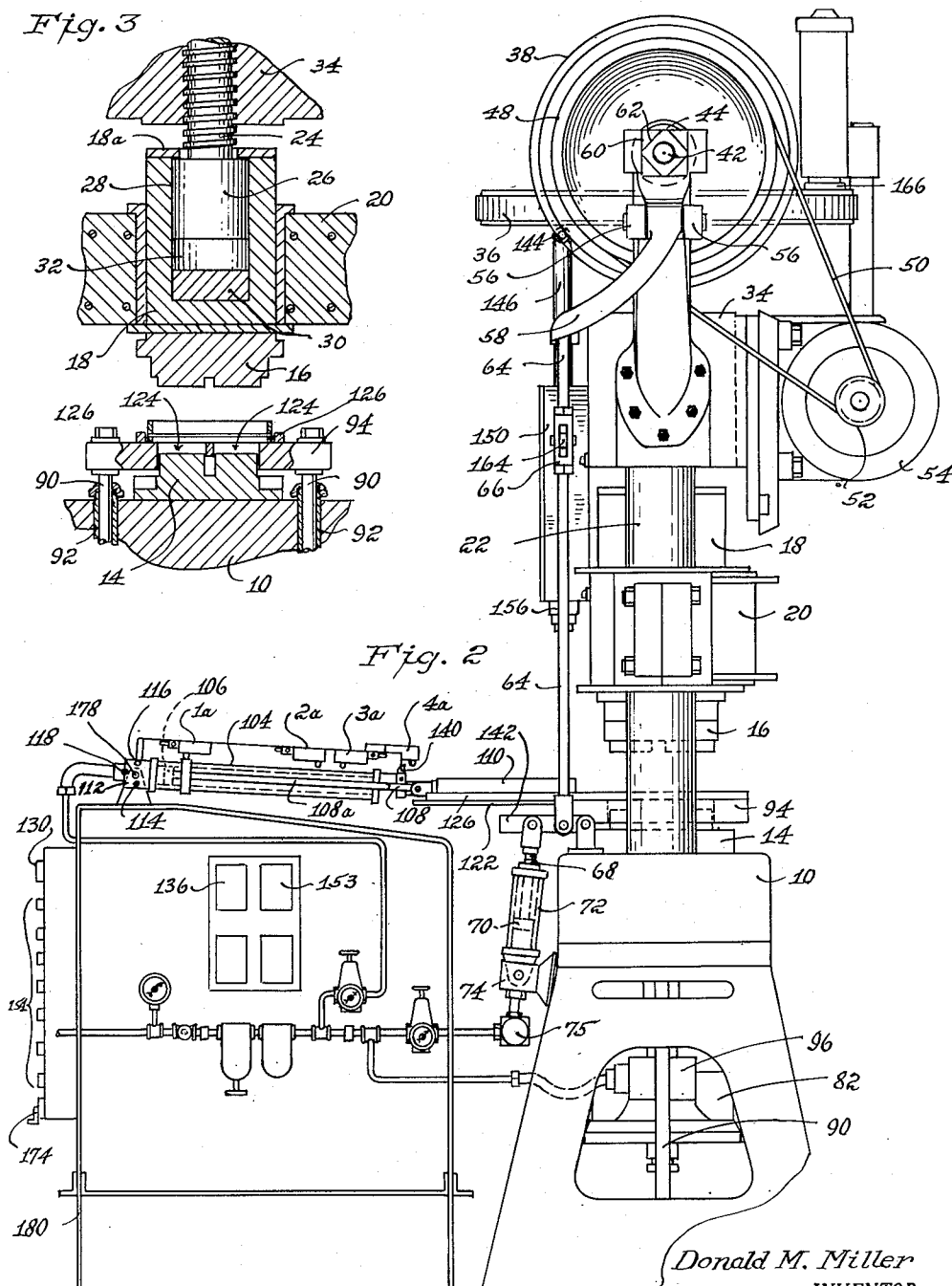


Fig. 2



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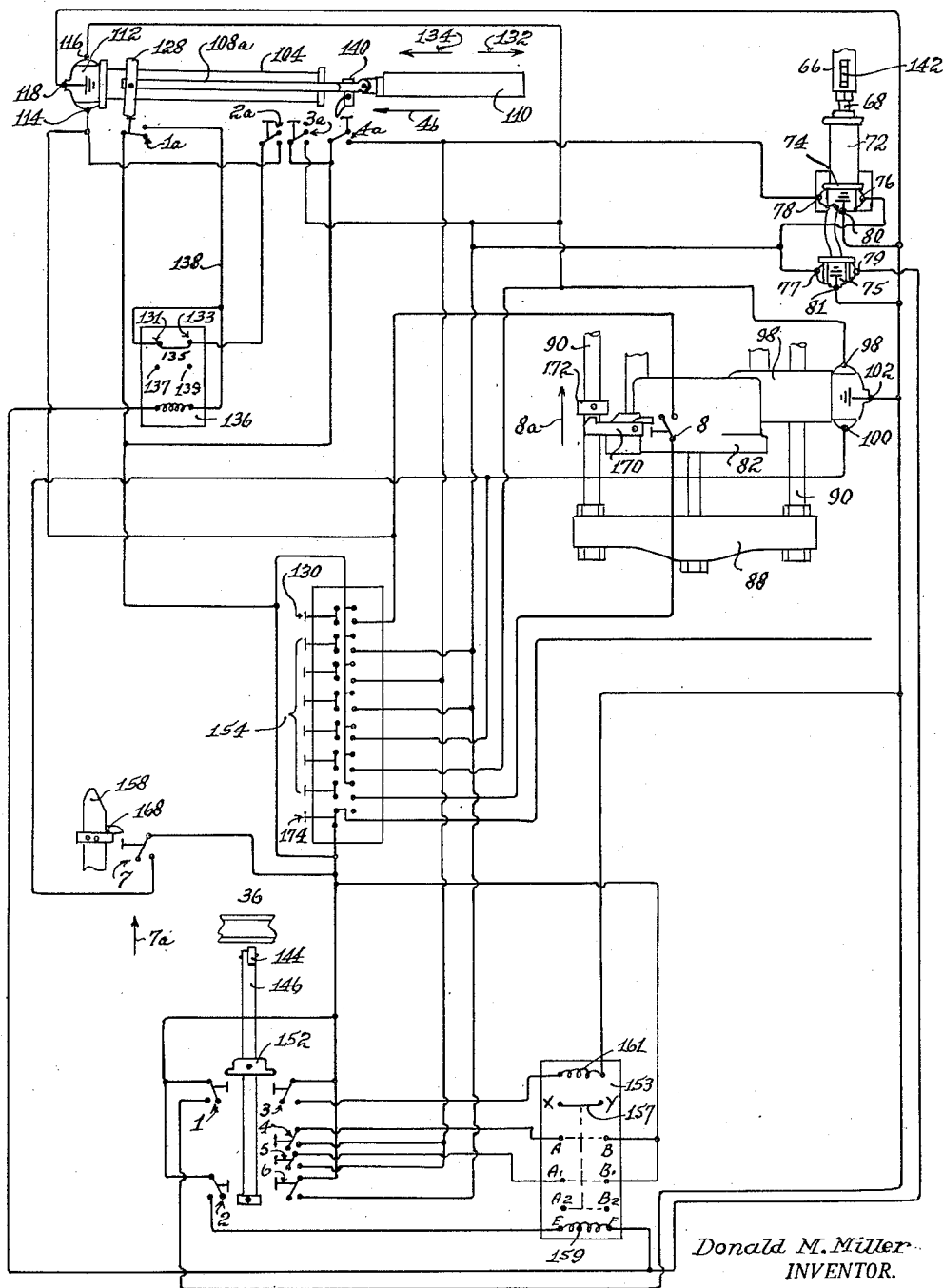
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Fig. 4

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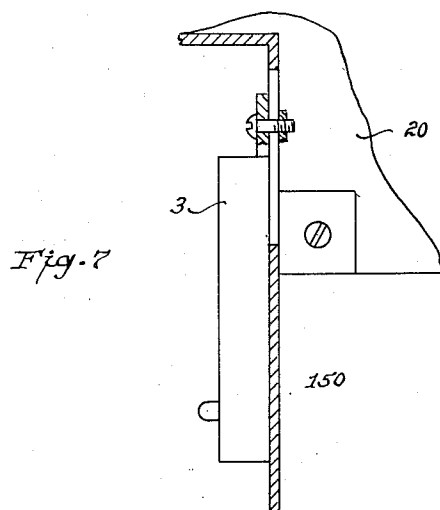
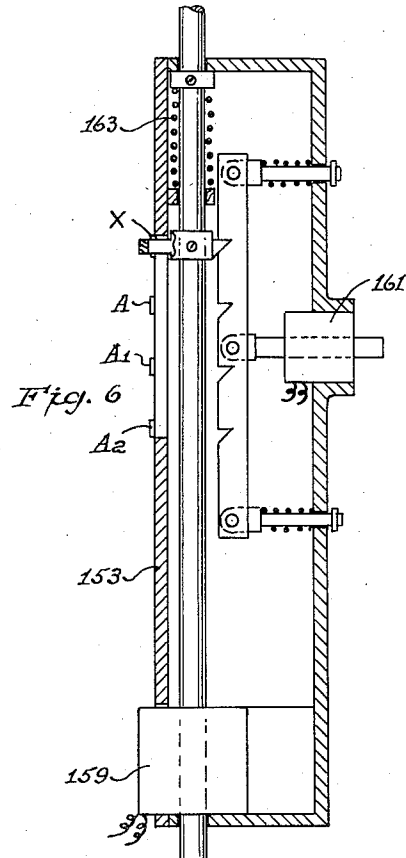
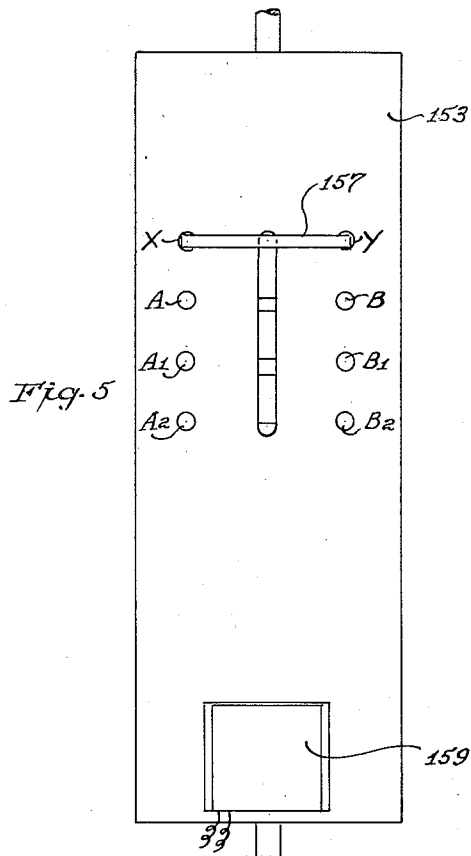
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AUTOMATIC CONTROL FOR SCREW OPERATED PRESS

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4 Sheets-Sheet 4



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AUTOMATIC CONTROL FOR SCREW OPERATED PRESS

Donald M. Miller, Trenton, N. J.

Application December 14, 1953, Serial No. 397,895

5 Claims. (Cl. 25—42)

This invention relates to screw operated presses for compressing pulverized clay or like material into tile and other compact articles adaptable to press and die production.

One of the principal objects of the present invention is to provide automatic control for screw operated presses, of conventional types, in which the cycles of operation, such as conveying the pulverized material to the die, effecting the strokes of the plunger or ram and ejecting the completed articles from the die have heretofore been manually controlled.

Another object of this invention is to provide means in a screw operated press in which multiple impacts of the ram and vibratory action of the box carrying the clay dust or other powdered material to the die, as well as the ejection of the pressed articles from the die, can be automatically effected in repeated cycles after the press has been started into operation.

A further, and important, object of the present invention is to provide means in a screw operated press in which multiple impacts of the ram of varying intensity can be automatically effected in repeated cycles after the press has been started into operation.

Another object of the invention is to provide means in a press of the character mentioned of varying both the number of impacts and the intensity of each impact of the ram in each cycle of automatic operation of the press.

A still further object of the present invention is to provide means in a press of the character mentioned for varying the number of short movements or vibrations of the clay or dust box in coordination with the reciprocal movements of the ram of the press.

In presses of the character mentioned the various movable members, such as the ram, the die case and the dust box are commonly actuated directly or indirectly by compressed air cylinders controlled by air valves connected to the cylinders and manually operated to effect the required movements of such members. The general purpose of the present invention is to provide controls for the valves referred to by means of which they will be automatically actuated to effect coordinated movements of the movable members, to accomplish the objects already mentioned. Such controls may include electrically operated valves for the air cylinders and switches actuated by certain movable parts of the press for controlling the valves; or poppet type valves may be employed for the air cylinders with movable parts of the press arranged for contact operation of the valves.

In the embodiment of my invention hereinafter described the air cylinders are controlled by electrically operated valves included in a circuit with electrical switches which latter are actuated in cooperative sequence by certain movable elements of the press, to accomplish the objects referred to.

Other objects and advantages of the present invention will be apparent from the following specification in which reference is made to the accompanying drawings forming a part hereof, in which

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Fig. 1 is a front elevation of a screw operated press for forming clay tile, and showing some of the electrical switches for effecting automatic control of certain operations of the press;

Fig. 2 is a side elevation of the press shown in Fig. 1, and showing additional electrical switches and other elements included in the automatic press control circuits;

Fig. 3 is a detail sectional view showing the press ram and die;

Fig. 4 is a diagram showing the electrical circuit, switches and other elements in the automatic press operation controls;

Fig. 5 is a schematic view of a sequence relay included in the electrical control system;

Fig. 6 is a side view of the relay shown in Fig. 5; and Fig. 7 is a detail view of one of the electrical switch showing the means of adjustability of each switch.

Referring to the drawings in which like numerals designate like parts in the several views, it is to be understood that the press and operating units thereof are of conventional design and that the present invention resides in the combination with such a press of certain means attached or applied thereto for automatic operational control of the press; and also to provide simple adjustments which will cause the press to duplicate any operation in any predetermined sequence within the power limitations of the press to which the control means are applied.

The particular press shown in the accompanying drawings is of the screw compression type and includes a base 10 carrying a stationary die member 14. An impact member 16 for the die member is mounted on the lower end of a plunger or ram 18 slidably mounted in a bearing 20 fixedly, but adjustably, mounted on stationary rods 22 carried by the base 10. This ram 18 is actuated by a screw 24, having on its lower end an enlarged head 26 slidably mounted in a bore 28 in the plunger 18. The bore is closed at its lower end and has therein an impact plate 30 for abutment with the head 26 end of the screw 24. The head 26 is shorter than the bore to provide an axially extending space 32 to afford lost motion between the head and the impact plate as the ram reciprocates. The screw 24 extends through a stationary screw-threaded bearing member 34 carried by the rods 22, and the upper end of screw 24 is rigidly keyed to a friction wheel 36. Friction disks 38 and 40 are mounted on an axially shiftable shaft 42 which is journaled in bearings 44 and 46 carried by bearing member 34, one of said disks being disposed on each side of friction wheel 36. Outwardly of disk 38 on shaft 42 is a pulley 48 carrying a belt 50 which extends to a drive pulley 52 on an electric motor 54, which motor is mounted on bearing member 34.

Support arms 56 are carried by shaft bearing 44, and pivoted between these arms is a lever 58 which is connected at its upper end to a clutch 60 mounted on shaft 42 between thrust collars 62. The opposite end of lever 58 is connected to a double clevis 66 near its upper end and is connected at its lower end to the outer end of a piston rod 68 of a piston 70 (shown dotted) of an air cylinder 72, the latter being pivoted to a 4-way solenoid piloted air operated valve 74. This valve has three electrical connections, 76, 78, and 80. When the electrical circuit to connection 76 is closed the valve directs air to the lower end of the piston and causes it to move upwardly provided that solenoid piloted air valve 75, hereinafter described, has been shifted in the manner to be described. When the circuit to connection 78 is closed it causes the valve 74 to direct air pressure to the upper end of piston 70, causing the piston to move downwardly, if valve 75 has been shifted in the manner to be described. Connection 80 is to the ground.

Valve 75 is mounted below and in communication with valve 74 and it has three electrical connections, 77,

79 and 81. When the electrical circuit to connection 77 is closed air is directed to and through valve 74 to air cylinder 72. When the circuit to connection 79 is closed air is exhausted from valve 74 and cylinder 72, thus relieving any pressure exerted by air cylinder 72 in either direction. Connection 81 is to the ground.

Another air cylinder 82 is rigidly attached to the base 10 and has a piston 84 (shown dotted in Fig. 1) connected by piston rod 86 to a cross support 88, which carries at each end an upwardly extending rod 90 projecting through a bushing 92 in base 10 to a mold forming member or die case 94, which is slidably mounted over the die member 14. A 4-way solenoid piloted air operated valve 96 is carried by cylinder 82 and has three electrical connections, 98, 100, and 102. When the circuit to connection 98 is closed air pressure will be directed to the upper end of piston 84, causing it to move downwardly. When the circuit to connection 100 is closed air pressure will be directed to the lower end of piston 84, causing it to move upwardly. Connection 102 is to the ground.

Another air cylinder 104 has a piston 106 connected by piston rod 108 to a dust box or material conveyor member 110. A 4-way solenoid piloted air operated valve 112 carried by the outer end of cylinder 104 has three electrical connections, 114, 116, and 118. When the electrical circuit to connection 114 is closed air pressure will be directed to the inner end of piston 106, causing it to move outwardly, or toward the die case 94. When the circuit to connection 116 is closed air pressure will be directed to the outer end of piston 106, causing it to move inwardly, or from die case 94. Connection 118 is to the ground.

The dust box 110 consists of a rectangular frame, open at top and bottom and provided with a plurality of transverse rods 120. The frame is slidable on a support plate 122 upon which the clay dust or other material for the pressed article is placed, inside the frame. The plate 122 is mounted on the press base 100 flush with the upper surface of die case 14, so that the clay dust can easily be moved transversely over the die cavities 124. The dust box is guided toward and from the die case by guides 126. This box not only conveys clay dust to the die cavities but also serves as a wiper to level the upper surface of the dust in the die by removing surplus dust, when it is withdrawn from the die case.

It has been found in actual practice that a more perfect clay tile can be produced by performing two important operations. The first is to subject the dust box to a cycle of reciprocal or vibratory movements at a predetermined speed after it has been moved over the die cavities with the dust for a new operation. Under such vibration the rods 120 break up any lumps that may have been formed in the moist dust and insure that there will be no faults in the completed tile. The second operation is first to subject the clay dust to a light compressive action by die impact member 16 at a predetermined speed in order that air not be trapped within the die, but of sufficient power to force air out of the dust and compress it. This action may be followed by two impacts, each of successively increased power, through strokes of the screw 24 and ram 18. Such operations have heretofore been either manually controlled, or controlled with manually operated valves on air cylinders, thus rendering them not only extremely tiresome to the operator, but also greatly lacking in the uniform compactness of the tile and in an efficient rate of production.

In the embodiment of the invention shown in the accompanying drawings, twelve electrical switches are employed, in the automatic control, these switches being designated as switches 1, 2, 3, 4, 5, 6, 7 and 8, carried by the base 10 of the press, and 1a, 2a, 3a and 4a, carried by the dust box 110 and associated members. In the diagram, Fig. 4, all of the switches and other control elements are indicated in schematic relation.

In describing the automatic action of the press, it will be assumed that the clay dust box 110 carried by piston rod 108 of air cylinder 104 is in its withdrawn or starting position, as shown in the diagrams, Fig. 4. In this position the two-way contact dog 128 on rod 108a carried by piston rod 108 is in contact with switch 1a, holding the circuit open. For convenience in the initial starting of the press into operation a starting switch 130, which is self-opening, is manually depressed. This directs electric current through connection 114 of the 4-way solenoid piloted air operated valve 112 on air cylinder 104 causing air pressure to flow into the inner end of cylinder 104 and force piston 106 and dust box 110 outwardly in the direction of arrow 132 (Fig. 4) until the dust box, containing the clay dust to be pressed into the tile or like product, reaches a position above die case 94. Immediately after dust box 110 starts outwardly the switch 1a is released by dog 128 and returns to its closed position, thus providing electric current to timing relay 136 and to contacts 131 and 133 in the relay, (Fig. 4) which are held in closed position by contact member 135, thus directing current to close circuit 138 to switch 2a. During the outward travel of contact dog 128 on rod 108a it actuates switch 2a, which has no effective action at this time for the reason that the dust box 110 is already moving outwardly. However, when dog 128 reaches switch 3a it directs current through connection 100 of solenoid piloted air operated valve 96 on air cylinder 82, causing the piston 84 in said cylinder connected to die case 94 to be forced upwardly, thereby lifting the die case on die member 14 to provide cavities, or mold, 124 to contain the quantity of clay dust required to form a tile or other article to be pressed into form.

At the same instant when die case 94 is forced upwardly, as already described, the contact dog 128, in actuating switch 3a, also directs current to connection 116 on the return side of valve 112, thereby causing piston 106 to move inwardly, in the direction of arrow 134 (Fig. 4) and withdraw dust box 110 toward its starting position. However, when contact dog 128 makes contact with switch 2a this directs current through connection 114 of valve 112, which causes this valve to reverse the flow of air pressure and return dust box 110 to a position over die case 94, before a full inward stroke of piston 106 is completed. Dog 128 then again actuates switch 3a and reverses the direction of piston movement, thereby causing a back and forth, or vibratory movement of dust box 110 over die case 94, which, during such movements, shakes out into cavities 124 the quantity of clay dust required for the tile or other article to be pressed into form. The number of vibratory movements is controlled by the timing relay 136, which, in the embodiment of the invention shown, is preset to effect a predetermined number of reversals of movement of piston 106, which carries clay dust box 110. This relay then opens circuit 138 by moving contact member 135 to a position between contacts 137 and 139 (Fig. 4) thus permitting contact dog 128 to return past switch 2a to its starting position, thereby opening switch 1a and breaking the circuit to relay 136 and circuit 138, which permits contact member 135 to return to its original position between contacts 131 and 133. As the clay dust box 110 leaves die case 94 on its final inward stroke, it wipes away from the molds all surplus clay, leaving the outer surface of the clay dust in a level and smooth condition.

When piston 106 returns to its starting position a one-way contact dog 140 carried by dust box 110 actuates switch 4a. This directs current through connection 78 of valve 74 on cylinder 72, having therein the piston 70, which is forced downwardly, and thereby, through the several linkage connections 64, 66, 58 and 142 and clutch 60, causes shaft 42, on which friction disks 38 and 40 are mounted, to be axially shifted to force disk 38 into contact with friction wheel 36, which is keyed to

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screw 24. When friction disk 38, which is driven by motor 54, engages wheel 36 the screw 24 is rotated clockwise, as viewed in top plan, thus forcing the plunger or ram 18 downwardly toward cavities 124, containing the clay or other powdered material to be pressed.

Friction wheel 36, during its downward movement comes into contact with a roller 144 on a vertically disposed rod 146, which is slidably mounted under compression of spring 148 in a stationary casing 150. Rod 146 is provided with an adjustable stop collar 156 which limits the upward movement of this rod. Adjustment is thus provided to compensate for various die settings, various amounts of screw travel and other press settings necessary in normal operations. A double contact dog 152 is adjustably mounted on rod 146. This dog actuates switches 1, 3, 4, 5, 2 and 6, in cooperation with a sequence relay 153 (Figs. 5 and 6) mechanically held in effecting multiple impact actions of plunger 18, which will now be described.

The wheel 36 upon its initial downward stroke of the multiple cycle forces double contact dog 152 into contact with switch 1, which is a one-way roller operated switch actuated only on downward movement of rod 146, thus directing current through connection 79 of 4-way solenoid piloted air valve 75, causing this valve to reverse and shut off the flow of air pressure to cylinder 72 and further exhaust the high pressure air in cylinder 72. This relieves the pressure of friction disk 38 against wheel 36, thus permitting the momentum of wheel 36, screw 24 and ram 18 to power the ram through the remaining portion of its downward movement. The distance of downward travel on the first stroke, during which the friction wheel 38 is engaged against wheel 36, determines the force of impact at the end of the ram travel. The force of impact is adjustable by this method, varying from full power of the press to as light as that effected by permitting wheel 36, screw 24, and ram 18 to coast from a raised position to the limit of depth in the die by their weight alone.

Double contact dog 152 next comes into contact with switch 3, thereby directing current to reset coil 161 of sequence relay 153 thus causing holding latch 155 to release and allow spring 163 to return contact 157 to position XY (Fig. 5), if for any reason return has not been previously effected. Double contact dog 152 next comes into contact with switch 4, which has no effective action at this time because current to this switch is provided only when contacts A and B of sequence relay 153 are closed.

Double contact dog 152 next comes into contact with switch 5 which also has no effective action at this time because current to this switch is provided only when contacts A and B in the sequence relay 153 are closed. Double contact dog 152 next comes into contact with switch 2 and switch 6. Switch 2 provides current to index coil 159 of sequence relay 153 (Fig. 5), which moves the contacts of the sequence relay, closing member 157 in the sequence relay between contacts A and B, held in place by latch 155 as current is released, thus providing current to switch 5. Switch 6 directs current through connection 77 of solenoid piloted valve 75, permitting air pressure to flow to valve 74 and connection 76 of valve 74, causing this valve to reverse the flow of air pressure in cylinder 72, thereby forcing piston 70 upwardly. This effects withdrawal of disk 38 from contact with friction wheel 36 and forces disk 40 against wheel 36. That causes wheel 36 to reverse its direction of rotation to counter-clockwise and moves screw 24 upwardly. However, because of the lost motion space 32 between head 26 of the screw 24 and the impact plate 30 of the ram 18 the ram will remain stationary with the impact member 16 in cavities 124 until later when the upper end of head 26 engages the plate 18a on the upper end of the ram. When wheel 36 revolves counter-clockwise the screw 24 causes it to move axially in an

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upward direction. Rod 146 being slidable and urged upwardly by spring 148 this rod moves upwardly with wheel 36 until dog 152 comes into contact with switch 5. Switch 5 with current now provided through contacts A and B in sequence relay 153 directs current to connection 78 of valve 74 on cylinder 72 having therein the piston 70, which is forced downwardly, and thereby, through the linkage connections 64, 66, 58 and 142 and clutch 60, causes shaft 42, on which friction disks 38 and 40 are mounted, to be axially shifted to force disk 38 into contact with friction wheel 36, which is keyed to screw 24. When friction disk 38, driven by motor 54, engages wheel 36 the screw 24 is rotated clockwise, thus forcing the screw 24 again downwardly and effecting impact of head 26 against impact plate 30, which at this time is in cavities 124.

At the end of the downward stroke of screw 24 the double contact dog 152 again actuates switches 2 and 6. Switch 2 provides current to index coil 159 of sequence relay 153, thereby moving the closing contact member 157 from its mechanically held position between contacts A and B to contacts A1 and B1 where it is again mechanically held. Switch 6 reverses the flow of air pressure in cylinder 72, and thus causes screw 24 and wheel 36 to rise a second time, thereby bringing dog 152 again into contact with switch 5, which at this time has no effective action because the contacts which were previously closed on A and B are then open. The ram 18 and impact member 16 remain stationary, as previously mentioned. Dog 152, by-passing switch 5, comes into contact with switch 4, to which current is provided to contacts A1 and B1, closing contact member 157 of sequence relay 153, directing current to connection 78 of valve 74 and causing a third impact of head 26 against impact plate 30, which at this time is in cavities 124. Because of the greater distance of travel between switches 6 and 4, the third impact is greater than that which was provided by holding friction disk 38 against wheel 36 between switches 5 and 6. The distance between switches 4 and 5 and switch 6, at depth of movement of head 26 permits adjustment necessary to regulate the force of impact on the head 26 on plate 30.

As the third impact occurs, switches 2 and 6 are again actuated. Switch 2 sends contact closing member 157 in sequence relay 153 to a new position between contacts A2 and B2 where it is mechanically held, opening contacts A1 and B1 which it had previously held closed. Switch 6 repeats its previous operation, sending wheel 36 and screw 24 upwardly. However, this time both switches 4 and 5 have no effective action because current which was provided to these switches through closed contacts A and B, A1 and B1, in sequence relay 153, are now open with contact closing member 157 in its A2, B2 position. As screw 24 moves upwardly the head 26 engages plate 18a, lifting impact member 16 from die 14 and out of cavities 124. Continuing its upward travel, dog 152 actuates switch 3, directing current to reset coil 161 of sequence relay 153, releasing holding latch 155, and permitting the spring 163 of contact member 157 to return this member to its XY position for a new cycle of operation. As plunger 18 closely approaches its final upward position a one-way dog 168 is attached to a power release lever 158 makes contact with switch 7 when ram 18 is lifted toward its uppermost position by the screw 24 on its third, or complete, upward axial movement, thus directing current through connection 98 on valve 96, thereby causing this valve to reverse the flow of air pressure in cylinder 82, and forcing die case 94 to its down, or stripped position to free the completed tile for removal from the die.

The power release lever 158 has a sloping outer end 160, which, in its extreme uppermost position, only, engages a roller 162 on lever 164, which projects through double clevis 66. This imparts a slight axial shift to shaft 42 sufficient to break contact between disks 38 and 40 and friction wheel 36. The purpose of this action is

to bring the actuating means for screw 24, ram 18 and impact plate 16, into a neutral, or idle position. The upper surface of wheel 36 at the same time comes into contact with an air operated brake shoe 166, which abruptly stops rotation of this wheel.

During movement of die case 94 toward its down or stripped position a pivoted one-way contact dog 170 is actuated by collar 172 mounted on one of the rods 90, attached to the die case, and it actuates switch 8 which directs current through connections 114 of valve 112 and admits air pressure into the inner end of cylinder 104, thereby causing piston 106 to force clay dust box 110 back over die case 94, at which time the forward edge of the dust box will push the completed tile from the surface of the die member 14, which is then substantially flush with the upper surface of the die case. This corresponds to the initial starting of the cycle of operations of the press effected by the closing of switch 130, as previously described. From this stage the various cycles of operation will continue until the press is stopped by the opening of switch 174.

The switches between starting and stopping switches 130 and 174, designated generally by the numeral 154, are for various purposes, including breaking the electric circuit for safety, moving die case up and down, moving the ram up and down and single automatic operation.

It should here be explained that one-way switch contact dogs 140, 168 and 170 are pivoted to ride idly over the contacts of their respective cooperative switches 4a, 7a and 8a when moving in one direction, and they actuate said switches only when moving in the direction indicated by arrows 4b, 7a and 8a respectively. Therefore, in the diagram (Fig. 4), dog 140 is shown in the position immediately following actuation of switch 4a upon the inward, or withdrawn, movement of dust box 110; dog 168 is in its uppermost position and will actuate switch 7 only upon its upward movement after first being lowered below the contact of switch 7 by downward movement of ram 18; and dog 170 will actuate switch 8 only upon its upward movement after first being lowered below the contact of switch 8. As shown in Figs. 1 and 4, dog 170 has just actuated switch 8 through a partial downward movement of die case 94, causing the collar 172 to depress the outer end of the pivoted dog 170.

Each of the switch contact dogs 128, 140, 152, 168 and 170 is adjustable relative to its associated switch or switches to permit variation of the sequence of movements of the different units controlled by said switches. Each of the switches, 1, 2, 3, 4, 5, 6, 7, 8, 1a, 2a, 3a, and 4a, is also adjustable relative to its support in cooperation with the contact dogs.

Switches 1a, 2a, 3a and 4a may be attached to a bar 176, as shown in Fig. 2, mounted on air cylinder 104, which is preferably pivoted at 178 to the top of a housing 180 containing timing relay 136 and sequence relay 155 together with coils, pipes and valves for supplying compressed air to the air cylinders 70, 82 and 104.

From the foregoing description it will be seen that I have provided effective means for automatic control of a screw operated press of the character described whereby, after the operator starts the press into operation by manually closing switch 130, it will automatically function through repeated cycles of operation until it is stopped by the opening of switch 174. During such cycles of operation the only other manual effort required of the operator will be to fill the clay dust box 110 with clay dust upon each return of the box to its withdrawn, or starting position. Moreover, I have provided means whereby the number of impacts of the ram 18, the intensity of the impacts and the vibratory movements of the dust box can be varied as may be best adapted for the products to be pressed into form by the press.

It will be seen also that an important feature of the

improvement described is the infinite variations in impact force of the ram 18 which may be effected because of the cooperative relation of the clutch control with the screw type compression press and the means of limiting or adjusting the stroke length, ram travel and momentum to which the arrangement illustrated and described is adapted, which can be advantageously employed in any kind of impact operations in which the variation of the force of impacts in a cycle of operations is necessary or advisable.

As already mentioned, the air valves for control of the operation of the ram 18, particularly, may be of the poppet type and operated by direct abutment with elements actuated by contact with the lower face of the friction wheel 36, instead of by electrically controlled valves. Such modified means of operation is believed to be obvious, and is, therefore, not illustrated.

Since various changes in the construction and arrangement of the control elements, which can either be built into a new press or attached to new presses which are already in use, may be made without departing from the spirit and scope of my invention as defined in the appended claims, it should be understood that the specific constructions and arrangement shown and described are intended to be illustrative only and not restrictive thereto.

I claim:

1. In a screw operated press of the type including a base, a pair of power driven horizontally shiftable friction disks journaled on said base, a horizontally arranged friction wheel mounted on said base between the opposed faces of said disks and carrying an axially aligned screw threadedly mounted in said base for rotary and reciprocal axial movement therein, said screw carrying a ram, a tile forming die member on said base axially opposed to said ram, means for supplying clay dust to said die member, a plurality of mechanical elements connected in series with and adapted for alternately shifting said friction disks into and out of contact with the periphery of said fraction wheel to effect reciprocal movement of said screw and ram, an air pressure cylinder mounted on said base and having therein a piston connected with and adapted for actuating said mechanical elements in shifting said disks, as aforesaid, automatic control for the axial movements of said screw and ram comprising in combination an electrical circuit, a source of electric current therefor, an electrically actuated valve in the electrical circuit connected with said air pressure cylinder for controlling the movements of the piston therein, a sequence relay in said circuit for sequentially controlling the operation of said electrically actuated valve, a plurality of electrical switches in said circuit mounted on said base, a switch contact member movably mounted on said base in opposed relation to the lower side of said friction wheel and adapted for vertical movement by contact with the lower side of said wheel upon downward movement thereof, said contact member being provided with a contact element adapted for alternately actuating each of said switches in the operation of said relay and valve in effecting automatic predetermined reciprocal sequential movements of said ram in the operations of pressing a supply of clay dust in said die member into a tile; and resilient means mounted on said base and engaging said contact member for automatically returning said member to its uppermost position when said friction wheel moves to its uppermost position.

2. In a screw operated press of the type including a base, a pair of power driven horizontally shiftable friction disks journaled on said base, a horizontally arranged friction wheel mounted on said base between the opposed faces of said disks and carrying an axially aligned screw threadedly mounted in said base for rotary and reciprocal axial movement therein, said screw carrying a ram, a tile forming die member on said base axially opposed to said ram, means for supplying clay dust to said die member, a plurality of mechanical elements connected in series with and adapted for alternately shifting said friction

disks into and out of contact with the periphery of said friction wheel to effect reciprocal movement of said screw and ram, an air pressure cylinder mounted on said base and having therein a piston connected with and adapted for actuating said mechanical elements in shifting said disks, as aforesaid, automatic control for the axial movements of said screw and ram comprising in combination an electrical circuit, a source of electric current therefor, an electrically actuated valve in the electrical circuit connected with said air pressure cylinder for controlling the movements of the piston therein, a sequence relay in said circuit for sequentially controlling the operation of said electrically actuated valve, a plurality of electrical switches in said circuit mounted on said base, a switch contact member movably mounted on said base in opposed relation to the lower side of said friction wheel and adapted for vertical movement by contact with the lower side of said wheel upon downward movement thereof, said contact member being provided with a contact element adapted for alternately actuating each of said switches in the operation of said relay and valve in effecting automatic predetermined reciprocal sequential movements of said ram in the operations of pressing a supply of clay dust in said die member into a tile, an electrically actuated auxiliary air pressure valve in the electrical circuit with and in air communication with the first mentioned electrically actuated valve and with said sequence relay said auxiliary valve being controlled by switches mounted on said base and actuated by the aforesaid contact element of said contact member and co-operative with said air pressure cylinder and said mechanical elements for effecting the release of said friction wheel from contact with said disks at a predetermined point during a downward movement of said screw and ram; and resilient means mounted on said base and engaging said contact member for automatically returning said member to its uppermost position when said friction wheel moves to its uppermost position.

3. In a screw operated press of the type including a base, a pair of power driven horizontally shiftable friction disks journaled on said base, a horizontally arranged friction wheel mounted on said base between the opposed faces of said disks and carrying an axially aligned screw threadedly mounted in said base for rotary and reciprocal axial movement therein, said screw carrying a ram, a tile forming die member on said base axially opposed to said ram, means for supplying clay dust to said die member, a plurality of mechanical elements connected in series with and adapted for alternately shifting said friction disks into and out of contact with the periphery of said friction wheel to effect reciprocal movement of said screw and ram, an air pressure cylinder mounted on said base and having therein a piston connected with and adapted for actuating said mechanical elements in shifting said disks, as aforesaid, automatic control for the axial movements of said screw and ram comprising in combination an electrical circuit, a source of electric current therefor, an electrically actuated valve in the electrical circuit connected with said air pressure cylinder for controlling the movements of the piston therein, a sequence relay in said circuit for sequentially controlling the operation of said electrically actuated valve, a plurality of electrical switches in said circuit mounted on said base, a switch contact member movably mounted on said base in opposed relation to the lower side of said friction wheel and adapted for vertical movement by contact with the lower side of said wheel upon downward movement thereof, said contact member being pro-

vided with a contact element adapted for alternately actuating each of said switches in the operation of said relay and valve in effecting automatic predetermined reciprocal sequential movements of said ram in the operations of pressing a supply of clay dust in said die member into a tile, said switches being adjustable on said base for the purpose of varying the timing of actuation of said switches; and resilient means mounted on said base and engaging said contact member for automatically returning said member to its uppermost position when said friction wheel moves to its uppermost position.

4. In a screw operated press of the type including a base, a pair of power driven horizontally shiftable friction disks journaled on said base, a horizontally arranged friction wheel mounted on said base between the opposed faces of said disks and carrying an axially aligned screw threadedly mounted in said base for rotary and reciprocal axial movement therein, said screw carrying a ram, a tile forming die member on said base axially opposed to said ram, means for supplying clay dust to said die member, a plurality of mechanical elements connected in series with and adapted for alternately shifting said friction disks into and out of contact with the periphery of said friction wheel to effect reciprocal movement of said screw and ram, an air pressure cylinder mounted on said base and having therein a piston connected with and adapted for actuating said mechanical elements in shifting said disks, as aforesaid, automatic control for the axial movements of said screw and ram comprising in combination an electrical circuit, a source of electric current therefor, an electrically actuated valve in the electrical circuit connected with said air pressure cylinder for controlling the movements of the piston therein, a sequence relay in said circuit for sequentially controlling the operation of said electrically actuated valve, a plurality of electrical switches in said circuit mounted on said base, a switch contact member movably mounted on said base in opposed relation to the lower side of said friction wheel and adapted for vertical movement by contact with the lower side of said wheel upon downward movement thereof, said contact member being provided with a contact element adapted for alternately actuating each of said switches in the operation of said relay and valve in effecting automatic predetermined reciprocal sequential movements of said ram in the operations of pressing a supply of clay dust in said die member into a tile, said contact element on the contact member being adjustable thereon; and resilient means mounted on said base and engaging said contact member for automatically returning said member to its uppermost position when said friction wheel moves to its uppermost position.

5. An automatic control for the operations of a press ram according to claim 1 in which the switch contact member consists of a rod slidably mounted on said base below and in perpendicular relation to the opposed side of said friction wheel for abutment of said wheel against the end of said rod.

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