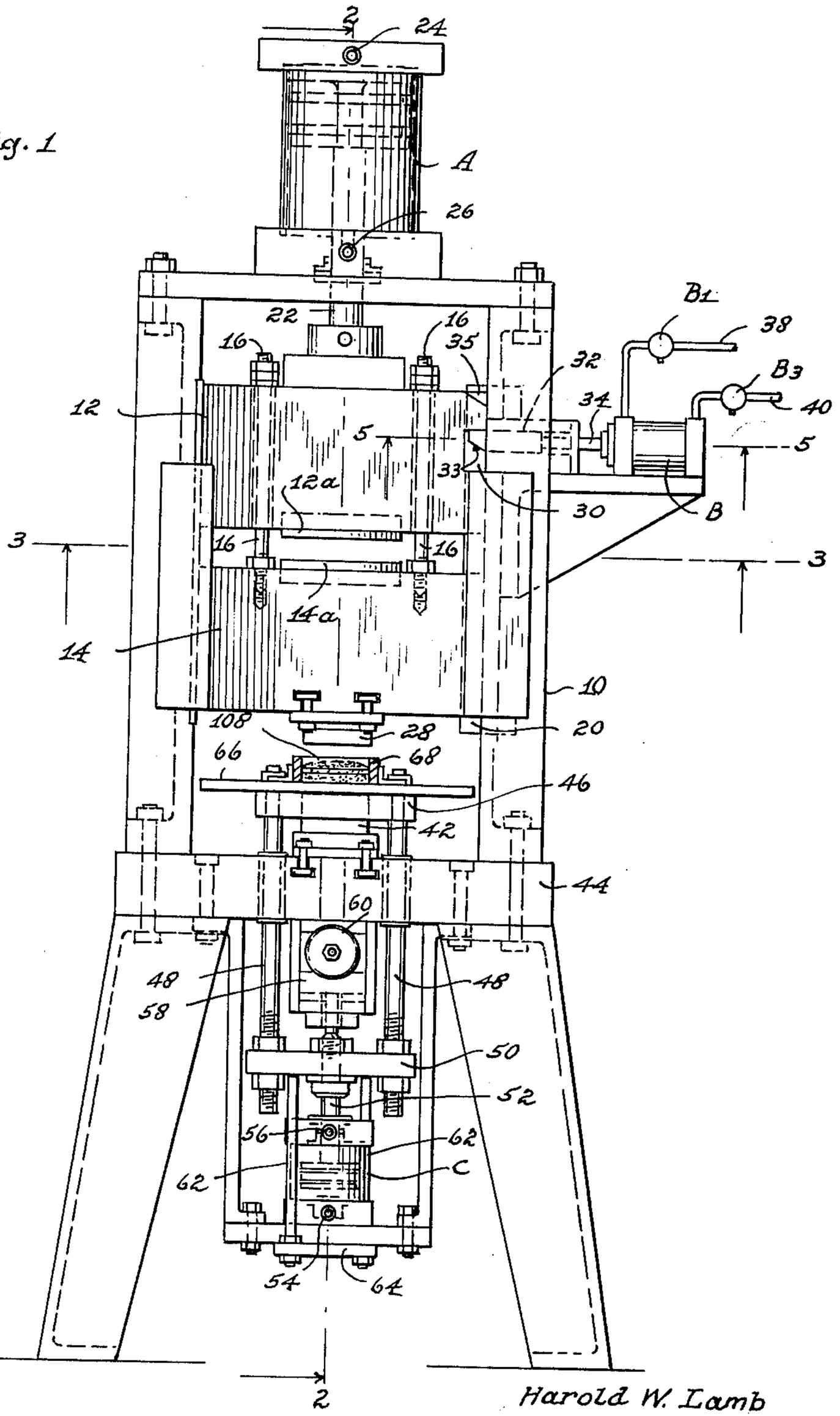
April 27, 1965 H. W. LAMB 3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962 6 Sheets-Sheet 1

Fig. 1



2

Harold W. Lamb
INVENTOR.

BY J. W. Wells
ATTORNEY

April 27, 1965

H. W. LAMB

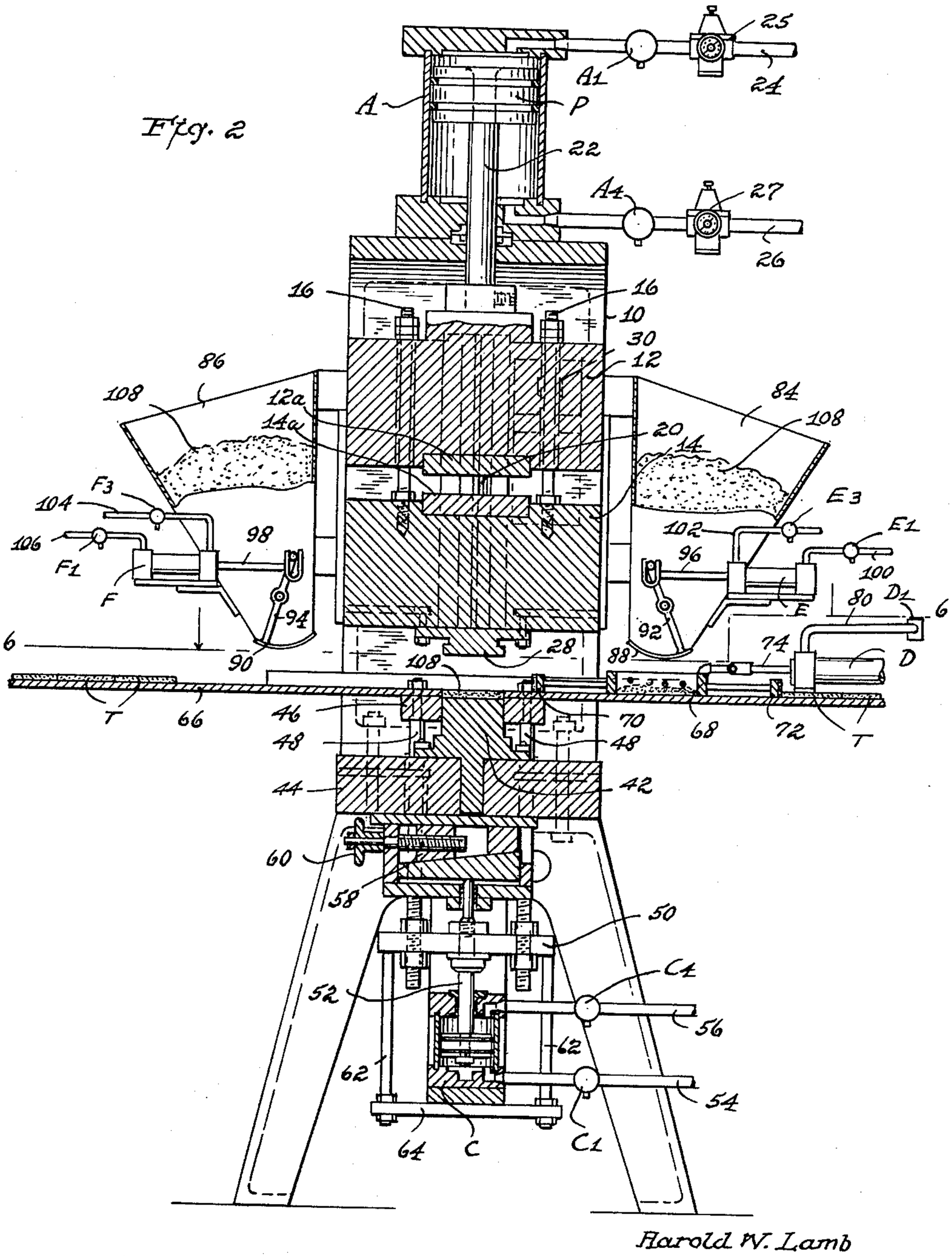
3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962

6 Sheets-Sheet 2

Fig. 2



Harold W. Lamb

INVENTOR.

BY J. W. Wells

ATTORNEY

April 27, 1965 H. W. LAMB 3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962 6 Sheets-Sheet 3

Fig. 3

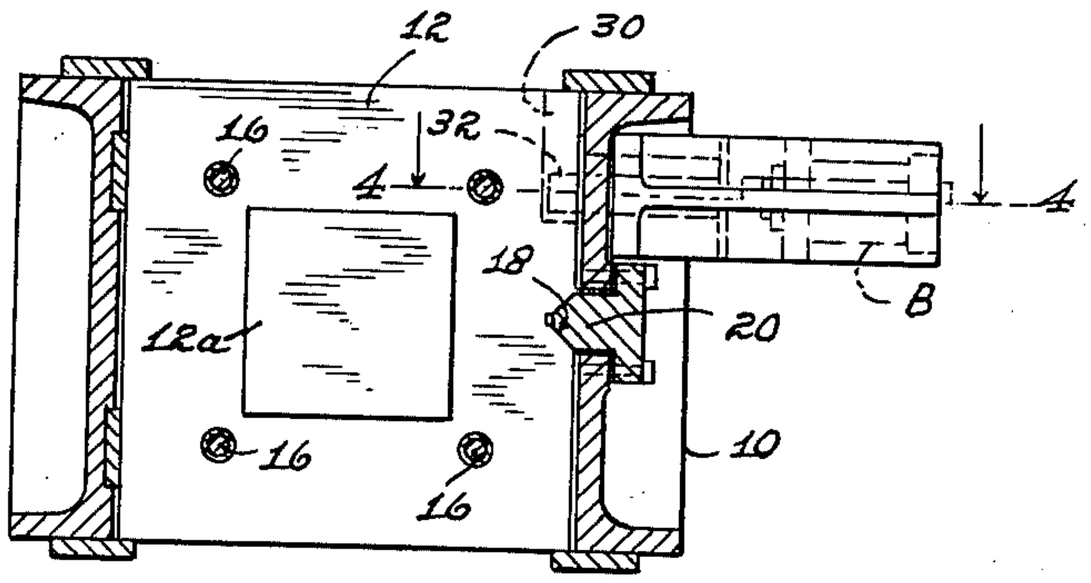


Fig. 4

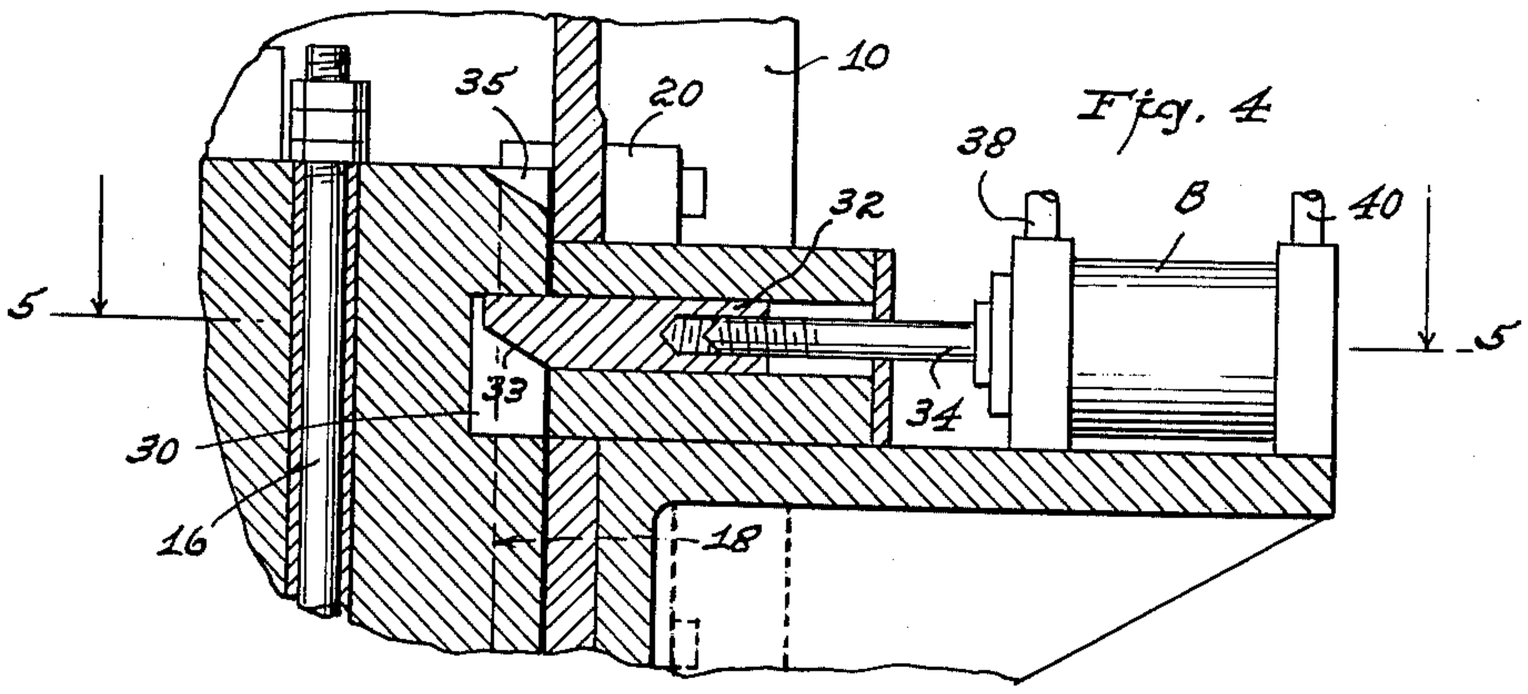
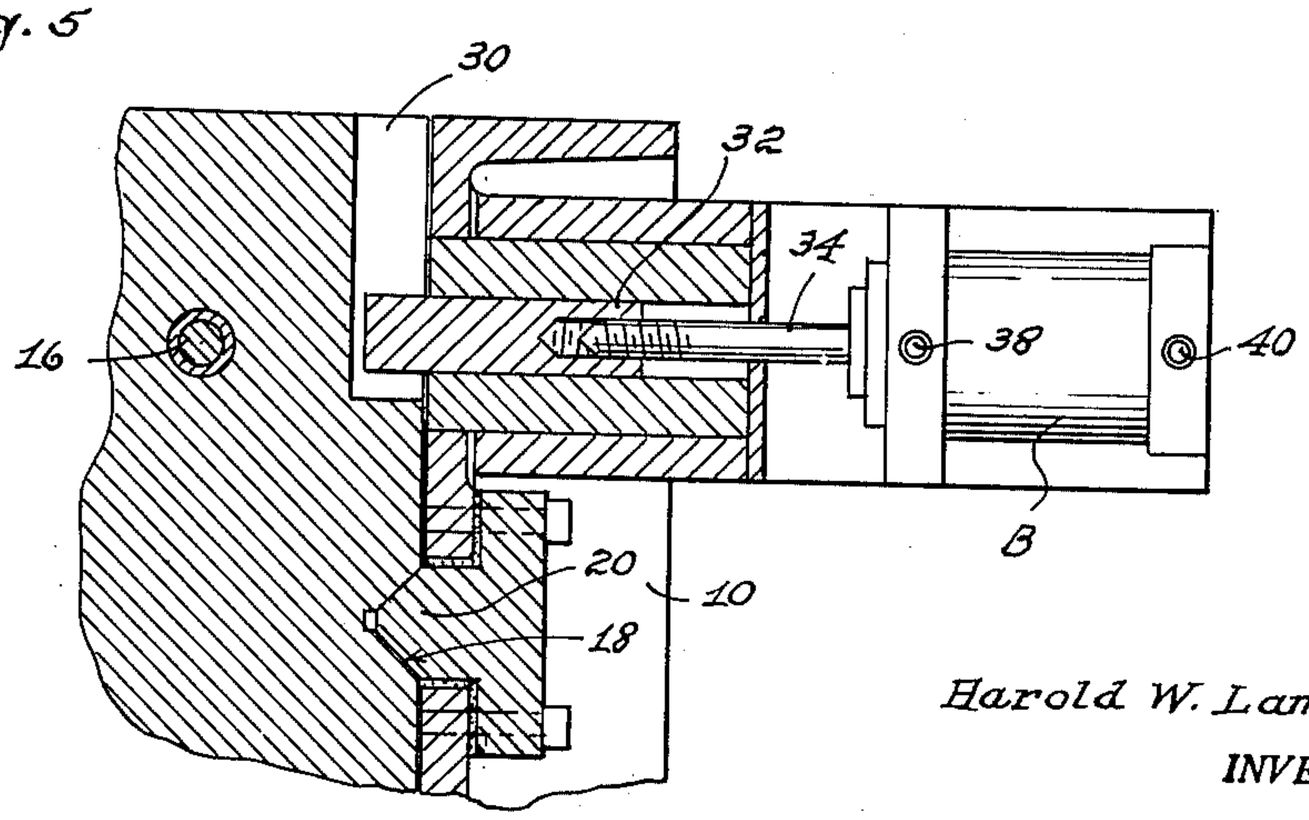


Fig. 5



Harold W. Lamb
INVENTOR.

BY J. R. Mills
ATTORNEY

April 27, 1965

H. W. LAMB

3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962

6 Sheets-Sheet 4

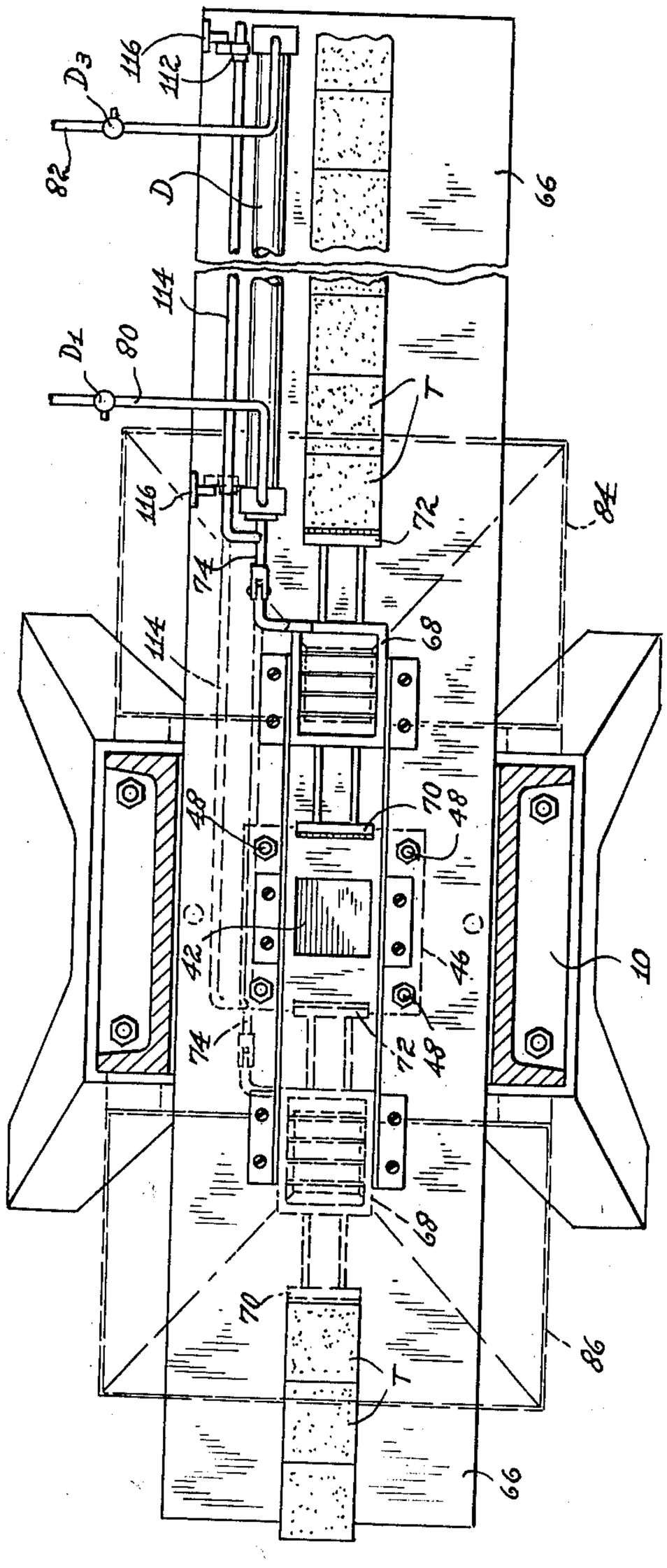


Fig. 6

Harold W. Lamb
INVENTOR.

BY J. N. Wells
ATTORNEY

April 27, 1965 H. W. LAMB 3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962 6 Sheets-Sheet 5

Fig. 7

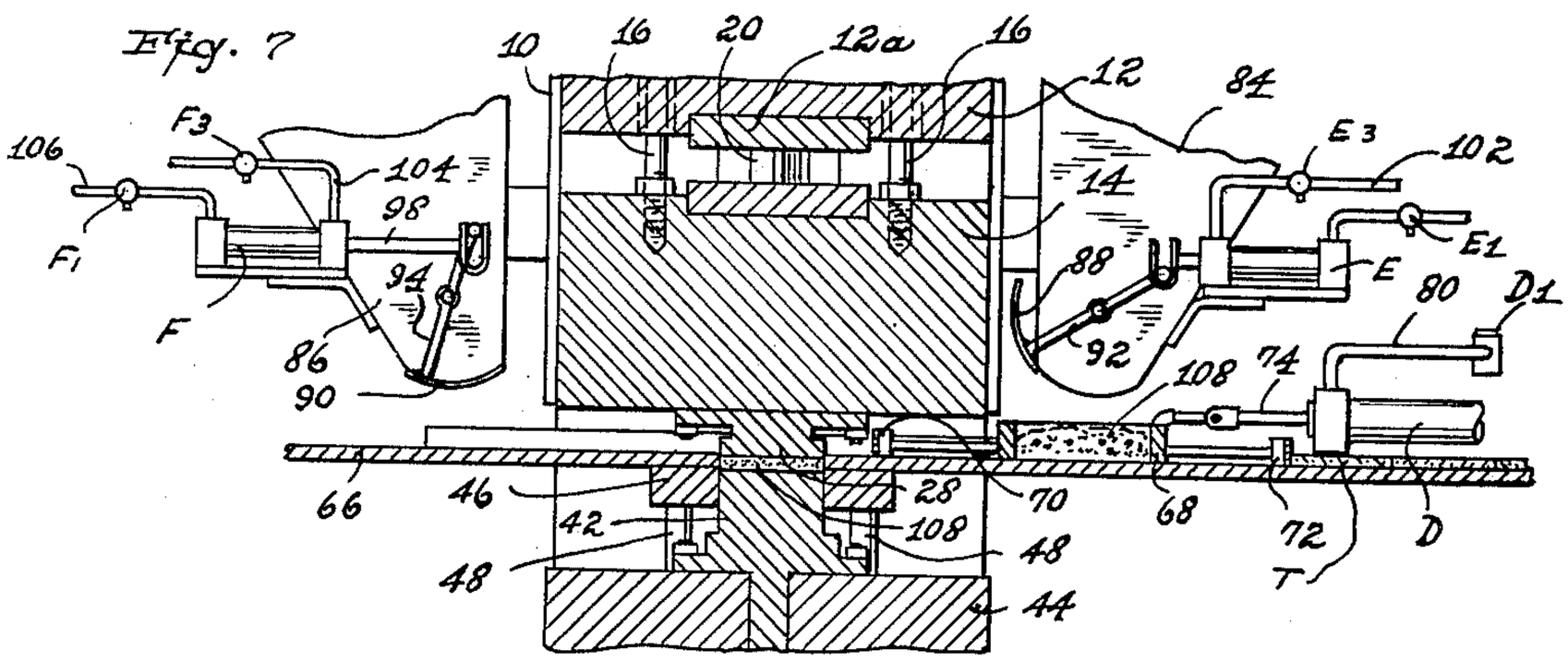


Fig. 8

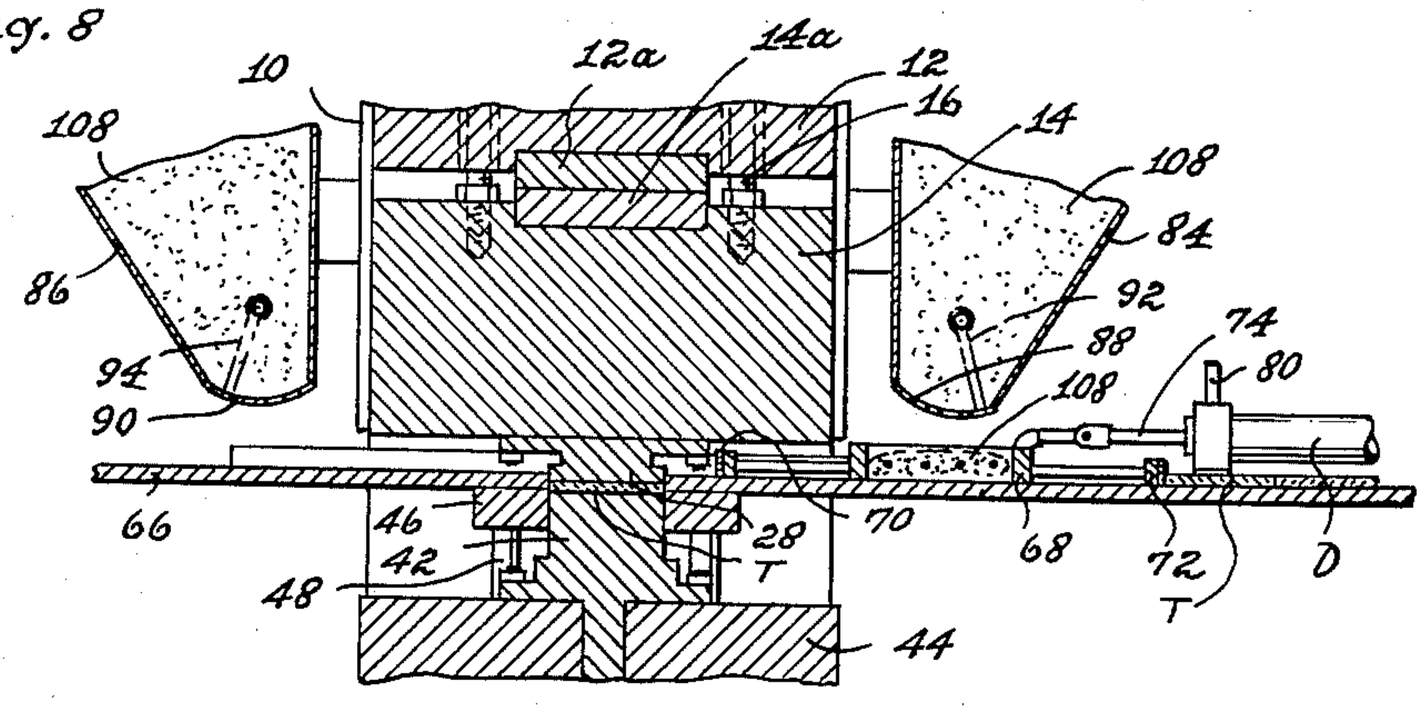
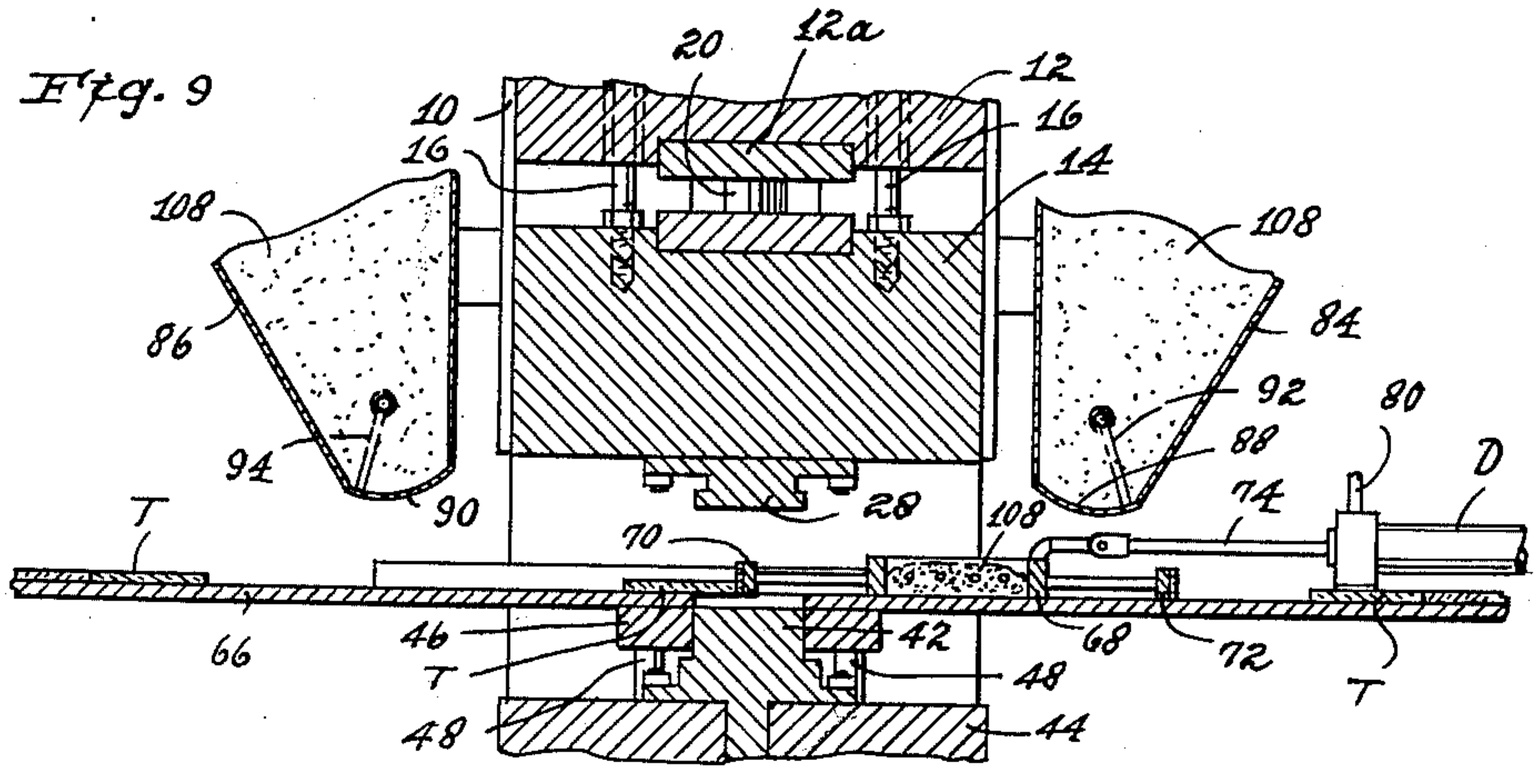


Fig. 9



Harold W. Lamb
INVENTOR.

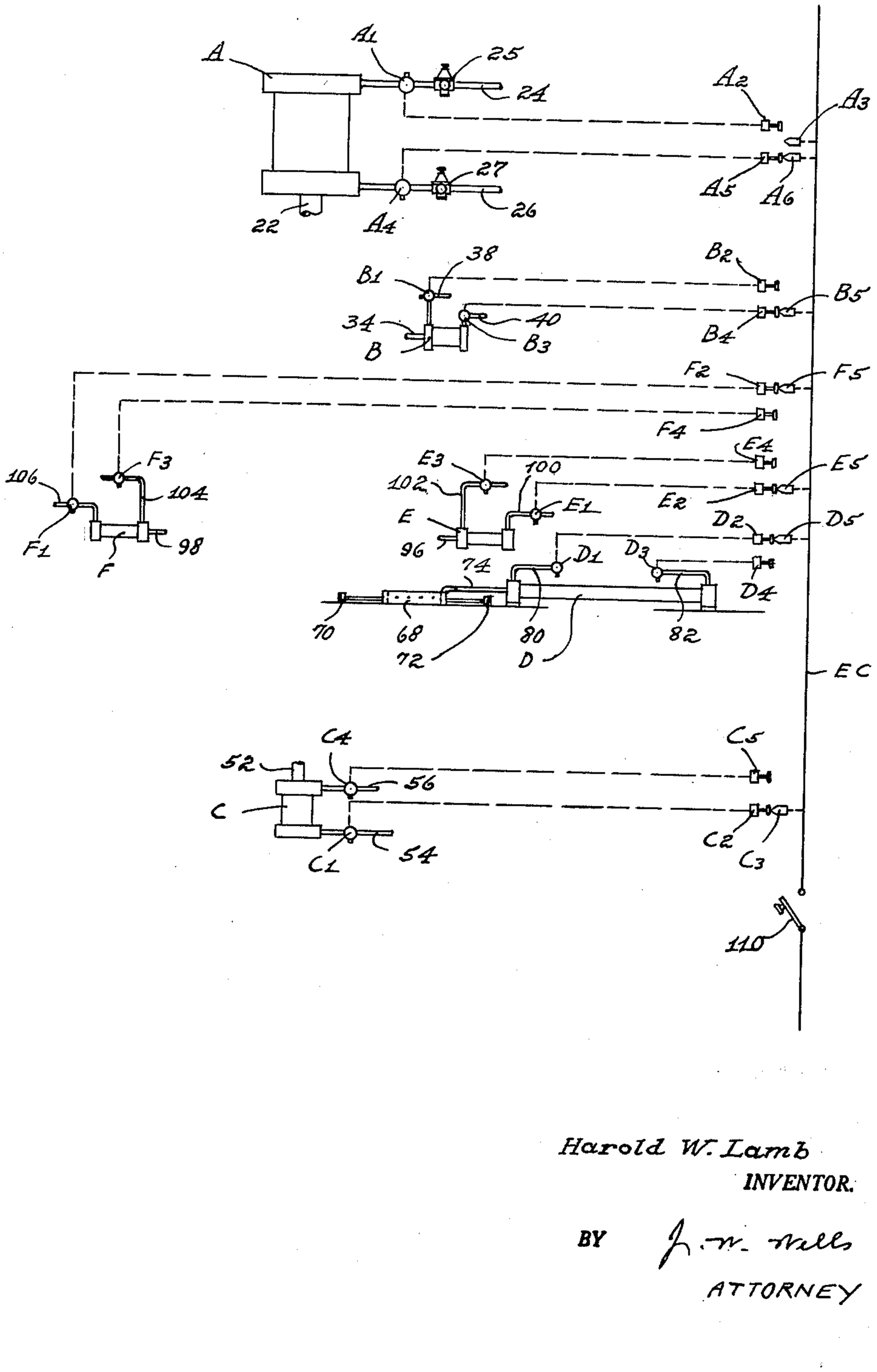
BY J. W. Wells
ATTORNEY

April 27, 1965 H. W. LAMB 3,179,998

VARIABLE IMPACT TILE PRESS

Filed Oct. 12, 1962 6 Sheets-Sheet 6

Fig. 10



Harold W. Lamb
INVENTOR.

BY J. W. Wells
ATTORNEY

United States Patent Office

3,179,998

Patented Apr. 27, 1965

3,179,998

VARIABLE IMPACT TILE PRESS

Harold W. Lamb, Washington Crossing, N.J., assignor to Crossley Machine Company, Inc., a corporation of New Jersey

Filed Oct. 12, 1962, Ser. No. 230,044
3 Claims. (Cl. 25—84)

This invention relates to power presses of the general type employed in compressing pulverized clay or other pulverized material into tile or other compact products adaptable to such press and die operations.

In presses of the type referred to the die cavity is formed by means of a die case surrounding and slidable on a vertical stationary die member in a telescopic manner and the tile is ejected from the cavity by lowering the die case. The clay dust for a new tile is supplied to the die cavity by means of a rectangular dustbox or tray which first pushes the previously completed tile from the cavity area, after which the die case is immediately raised and the cavity formed thereby is filled with clay dust by sweeping or wiping action of the dust box, as it passes over the cavity. The dust box is then returned to its starting position and the ram member of the press shaped for close fitting insertion into the die cavity is lowered into the cavity to compact the clay dust therein into a tile.

In previous presses of the type mentioned the impact of the ram member on the clay dust in the die cavity is effected by mechanical power, and has been found to have the serious disadvantage of trapping air in the clay dust due to the rapidity and force of the impact, and thereby resulting in defective tile.

Therefore, one of the principal objects of the present invention is to provide a tile press having means for effecting an initial retarded impact on the clay dust for forcing the air from the dust, followed immediately by a more rapid and heavier impact for forming the completed tile. For the purposes of this invention I employ two heavy impact members one above the other, the lowermost of which is suspended from the other in vertically spaced and movable relation and from which the ram depends; and the uppermost of which is attached to the piston rod of an air cylinder having electrical control valve means for simultaneously admitting air pressure into both ends of the cylinder for effecting a retarded lowering of both impact members until the ram slightly presses the dust in the die cavity, and then releasing the air pressure from the lower end of the cylinder while maintaining the air pressure in the upper end thereby effecting an accelerated and heavy impact of the uppermost impact member upon the lowermost member, the force of which impact is transmitted to the ram and the clay dust in the die cavity. The initial force exerted by the ram as it comes into the clay dust and compresses it is adjustable and controllable by the weight and cooperation of the lowermost or suspended member, and by the speed with which it is lowered, which, in turn, is determined by the speed and length of travel between this member in its upper starting position and its position upon contact of the uppermost member therewith.

The speed of the simultaneous downward movement of the impact members is controlled by a differential of air pressure above and below the piston to which the uppermost impact member is attached, and/or also the transverse area or diameter of the piston rod, which traverses the bottom portion of the cylinder, and the diameter of the piston and creates a preponderance of pressure above the piston, which may be further varied by means of regulators in the air pressure lines.

The vertical space between the lowermost and uppermost impact members may also be varied as required by

the axial adjustment of the rods upon which they are slidably mounted. The greater the spacing the more acceleration of movement of the uppermost member and, consequently, the greater the force of impact of the uppermost upon the lowermost member.

In previous presses of the type mentioned the dust box is supplied with clay dust at only one side of the press, so that after the initial stroke or horizontal movement of the dust box across the die cavity, to deposit therein the clay dust for the next tile, the dust box is returned to its starting position for another supply of dust. In order to ensure a complete filling of the die cavity the dust box is necessarily supplied with a greater quantity of clay dust than that required to fill the die cavity. Consequently, in its return passage over the die cavity the back end of the box drags and impacts more dust into that already in the die cavity, especially toward the front edge of the cavity, resulting in a tile of uneven thickness and compactness.

Therefore, another, and important, object of this invention is to provide a tile press of the character referred to having means for supplying clay dust to the dust box on each side of the press, so that the die cavity is filled with clay dust by a single stroke of the dust box across the cavity, resulting in an even, uniform filling of the cavity.

Other objects and advantages of my improved tile press will be apparent or pointed out in the following specifications in which reference is had to the accompanying drawing forming a part thereof, and in which

FIG. 1 is a front elevation of a tile press in accordance with the present invention, with some of the parts omitted in the illustration;

FIG. 2 is a section taken on the line 2—2 of FIG. 1;

FIG. 3 is a section taken on the line 3—3 of FIG. 1;

FIG. 4 is a section taken on the line 4—4 of FIG. 3, with the air cylinder shown exteriorly;

FIG. 5 is a section taken on the line 5—5 of FIG. 4, with the air cylinder also shown exteriorly;

FIG. 6 is a section taken on the line 6—6 of FIG. 2;

FIG. 7 is a detail section similar to FIG. 2 and showing the initial impact of the press ram;

FIG. 8 is a similar detail view showing the completion of a tile;

FIG. 9 is a similar view showing a completed tile being pushed by the clay dust box from the area of the die caivty; and

FIG. 10 is a schematic diagram showing the arrangement of the several air cylinders, electrical air pressure control valves and switches employed in the press illustrated.

Referring to the drawing in which like reference characters designate like parts in the several views, 10 is a vertical press base upon which is slidably mounted a pair of heavy metal impact members 12 and 14 one above the other. The lowermost impact member 14 is suspended from the uppermost member 12 in vertically spaced and unrestrained slidable relation on a plurality of rods 16 which are threaded into the member 14 to provide means for adjusting the space between the two members, each of which is notched on one edge, as indicated at 18 (FIGS. 3 and 5) for engagement with a V-shaped guide member 20 mounted on the press base 10.

The uppermost impact member 12 is rigidly attached to the piston rod 22 of an air cylinder A, the ends of which are closed and in communication with a source of air pressure through pipes 24 and 26 having air pressure regulators 25 and 27 and electrical control valves A1 and A4. The press ram 28 is rigidly attached to the lowermost impact member 14 in depending relation therewith. One edge of the uppermost member 12 is provided with a socket 30 for engagement therein of horizontal latch

bar **32** which is attached to the piston rod **34** of an air cylinder B mounted on the press base **10** and the ends of which are in communication with a source of air pressure through pipes **38** and **40** provided with electrical control valves **B1** and **B3**. This latch bar is slidably inserted into the socket to hold the members **12** and **14** in their uppermost starting positions and is withdrawn to permit downward movement of those members. The members **12** and **14** may be made of cast iron and provided with steel contact plates **12***a* and **14***a*. The bottom of the inner end of the bar is inclined as shown at **33** (FIG. 4) and upon the upward movement of member **12** is retracted by contact with a beveled portion **35** in the upper edge of the member **12**.

A stationary and vertically elongated die member **42** is mounted on a horizontal portion **44** of the press base, and a die case **46** is slidably or telescopically mounted over the die member **42** for forming a die cavity below the ram **28**. The die case **46** is attached through rods **48** and yoke **50** to the piston rod **52** of an air cylinder C, the ends of which are in communication with a source of air pressure through pipes **54** and **56** having electrical control valves **C1** and **C4**. The upward movement of the piston rod **52** and die case **46** is limited by an adjustable wedge device **58** operated by a handle **60**. The downward movement of the piston rod **52** is limited by vertical rods **62** adjustably mounted at their lower ends in a plate **64** on the bottom of the cylinder C and in abutting engagement at their upper ends with the yoke **50**.

A horizontal plate or platform **66** is rigidly attached to the die case **46** with its top surface flush with that of the die case and extends a substantial distance forwardly and rearwardly of the die case. A rectangular clay dust box or tray **68** having an open bottom is mounted on the platform for slidable movement thereon across a die cavity formed by the stationary member **42** and the die case **46** in either direction. The dust box has projecting portions or bumpers **70** and **72** at its ends for pushing completed tile from the die cavity in advance of the arrival of the dust box over the die cavity. One end of the dust box is attached to the piston rod **74** of an air cylinder D having communication at its ends with a source of air pressure through pipes **80** and **82** which are provided with electrical control valves **D1** and **D3**.

As illustrated, the dust box is supplied with clay dust at each end of its stroke from hoppers **84** and **86** in which their outlet ends are closed by pivotally mounted gates **88** and **90** provided with operating levers **92** and **94** which are connected, respectively, to the piston rods **96** and **98** of air cylinders E and F which are in communication with a source of air pressure through pipes **100**, **102**, **104** and **106** having electrical control valves **E1**, **E3**, **F1** and **F3**.

The diagram FIG. 10 schematically indicates the arrangement of the various air cylinders, electrical control valves and switches at the end of one stroke of the dust box **68**, after pushing a completed tile T from the die cavity and filling the die cavity with clay dust **108** as shown in FIG. 2. The connection of the switches with the electrical valves are indicated in broken linking lines. As show in the diagram, air pressure is on the bottom of cylinder A through switch **A5** and contact **A6**, having returned the piston P, together with the impact members **12** and **14** to their uppermost or starting positions. Air pressure is on the back of cylinder B through switch **B4** and contact **B5**, having inserted the latch bar **32** into the socket **30** in the upper impact member **12**. Air pressure is on the bottom of cylinder C through switch **C2**, contact **C3** and valve **C1** holding the die case **46** in its raised or cavity forming position. Air pressure is on the front of cylinder D through switch **D2**, contact **D5** and valve **D1**, holding dust box **68** in its starting position. Air pressure is on the back ends of cylinders E and F through switch **E2** and contact **E5** and through switch **F2** and contact **F5**, holding the gates **88** and **90** in closed position. Although the electrical valves and switches are shown schematically in separate relation, in actual practice they are all coordinated into an automatic timing switch unit connected in the electrical circuit EC, so that when started into operation by closing a switch **110** the air cylinder will function in cooperative sequence until the switch is again opened. Since such timing units are conventional and form no part of the present invention, illustration of details is omitted in the drawing.

FIG. 7 shows the ram **28** upon its initial retarded impact on the clay dust **108** in the die cavity. In this phase of a cycle the latch bar **32** will have been withdrawn from the socket **30**, thereby releasing impact members **12** and **14** for downward movement, and both valves **A1** and **A4** of cylinder A will be open and admitting air pressure into each end of the cylinder. As previously mentioned, due to the transverse area of the piston rod **22**, which extends through a packing in the bottom end of the cylinder, thereby causes a preponderance of pressure against the upper end of the piston P, which forces the impact members **12** and **14** downwardly at a retarded rate of speed to effect a light impact of the ram **28** on the clay dust **108** in the die cavity. During this stage the gate **90** of hopper **84** is opened by cylinder E to deposit a quantity of clay dust **108** into the dust box **68**, which is still held in its starting position by the piston in cylinder D.

FIG. 8 shows the ram **28** upon completion of the formation of a tile T. In this stage the air pressure has been released from the bottom portion of cylinder A thereby applying the full air pressure against the top of the piston P, thereby accelerating member **12** downwardly and bringing contact plate **12***a* against contact plate **14***a* with great force which is transmitted to the ram **28** to complete the pressing of clay dust **108** into a tile T. As previously mentioned, the force of impact by member **12** is determined by acceleration of member **12** and to the vertical distance between contact plates **12***a* and **14***a* as governed by the axially adjustable rods **16**. Further variations may be effected by the weight of member **12** and the air pressure regulators **25** and **27**. At this stage the dust box **68**, now filled with clay dust, is still held in its starting position.

FIG. 9 shows the start of the dust box with its charge of clay dust **108** on its stroke across the die member **42**, pushing the completed tile T therefrom. The air pressure has been released from the top of cylinder A through valve **A1** and the pressure applied to the bottom of the cylinder through valve **A4**. At this time the latch bar **32** is forced into the socket **20** by cylinder B under air pressure through valve **B3**. Immediately before the clay dust in the dust box **68** reaches the edge of the die member **42** the air pressure is released from the top of cylinder C, through valve **C4**, and the pressure applied to the bottom of the cylinder through valve **C1**, which raises the die case **46** to form the die cavity. As the dust box **68** continues its stroke the cavity will be evenly filled with clay dust through sweeping or wiping action of the following end of the dust box, which will continue its stroke until stopped under the hopper **86** to receive a supply of clay dust, which will be deposited in the die cavity upon its return stroke to its starting position, as shown in FIG. 2, to begin a new cycle of operation, as already described. The dust box **68** may be stopped at each end of its stroke by means of a collar **112** on a rod **114** attached to the piston rod **72** and abutments **116** on the platform **70**, or by other suitable means.

From the foregoing description it will be seen that I have provided a tile press having the following outstanding advantages over previous designs, namely (1) means for pressing tile without the employment of cams, screws or other conventional means, a press in which the preliminary operation of expelling the air from the clay dust in the die cavity and the final pressing operation are almost simultaneous, and, because of the speed of movement of the impact members, this press operates much faster than presses of previous designs; (2) both the air

expelling operation and the final impact operation are completely adjustable as to both force and speed; (3) the great forces required to compact tile are obtained through acceleration of weight, without the necessity of heavy motors and other expensive power equipment; (4) due to the action of this press all applied forces are utilized in compacting the tile, and not dissipated; and (5) means for eliminating the return stroke of the dust box, thereby preventing the dragging of additional clay dust into the die cavity after it has been evenly filled during the initial stroke of the dust box over the die cavity, thereby ensuring a uniform deposit of clay dust in the die cavity and a resulting uniform thickness and compactness of the tile.

The important features mentioned are simple, efficient and economical, resulting in a high tonnage press at exceptionally low cost.

Obviously, various modifications or changes may be made in my improved press without departing from the spirit or scope of my invention. Therefore, it should be understood that the embodiment of my invention shown and described is intended to be illustrative, only, and restricted only by the appended claims.

I claim:

1. In a tile press including a stationary die for containing clay dust, a cylinder having a piston, and a piston rod projecting from its lower end, said press also including an upper impact member carried by said piston rod and a lower impact member having means for suspending it from said upper member in initially spaced and limited unrestrained, vertically movable relation of said upper member toward and from said lower member, the unrestrained movement of said upper member toward said lower member being limited only by contact with said lower member and its unrestrained movement from said lower member being limited only by the means for suspending the lower member therefrom; and a ram carried by said lower impact member for impact on clay dust in said stationary die; means for effecting a retarded and relatively light impact of said ram on said clay dust followed by a rapid and heavier impact on said dust, and the immediate retraction of said ram from contact therewith, said means comprising, in combination, a pipe in

communication with the upper end of said cylinder and a source of relatively high air pressure, and a pipe in communication with the lower end of said cylinder and a source of a lower air pressure, and electrically actuated air pressure flow control valve means in said pipes for simultaneously admitting air pressure from both air pressure sources into the respective ends of said cylinder for effecting a retarded simultaneous downward movement of said impact members until the initial impact of the ram on said clay dust and then immediately releasing the air pressure from the lower end of said cylinder while maintaining the same air pressure in the upper end of said cylinder for effecting a more rapid and heavier impact of the upper impact member upon said lower member immediately following said initial impact, and immediately thereafter releasing the air pressure from the upper end of the cylinder and admitting air pressure into its lower end to retract said ram.

2. A tile press as in claim 1 and including pressure regulating means in the pipes communicating with the ends of the cylinder, for varying the air pressure in said pipes.

3. A tile press as in claim 1 and including means cooperative with the means for suspending the lower impact member from the upper impact member for adjusting the maximum space between said members.

References Cited by the Examiner

UNITED STATES PATENTS

1,288,472	12/18	Barr	100—269
1,460,287	6/23	Stevenson	25—55
1,652,883	12/27	Ackermann	25—103
2,383,736	8/45	Rembert et al.	25—103
2,398,227	4/46	Hubbert	25—91
2,584,534	2/52	Barnhardtson	192—129
2,613,409	10/52	Miller	25—103
2,674,008	4/54	Van Der Pyl	25—103
2,770,862	11/56	Miller	25—84
2,855,628	10/58	Lassman	25—102
2,888,731	6/59	McElroy et al.	25—102
3,060,540	10/62	Lapidus	25—103

ROBERT F. WHITE, *Primary Examiner.*