

June 24, 1930.

T. F. STACY

1,765,626

PRESS

Filed April 14, 1927

4 Sheets-Sheet 1

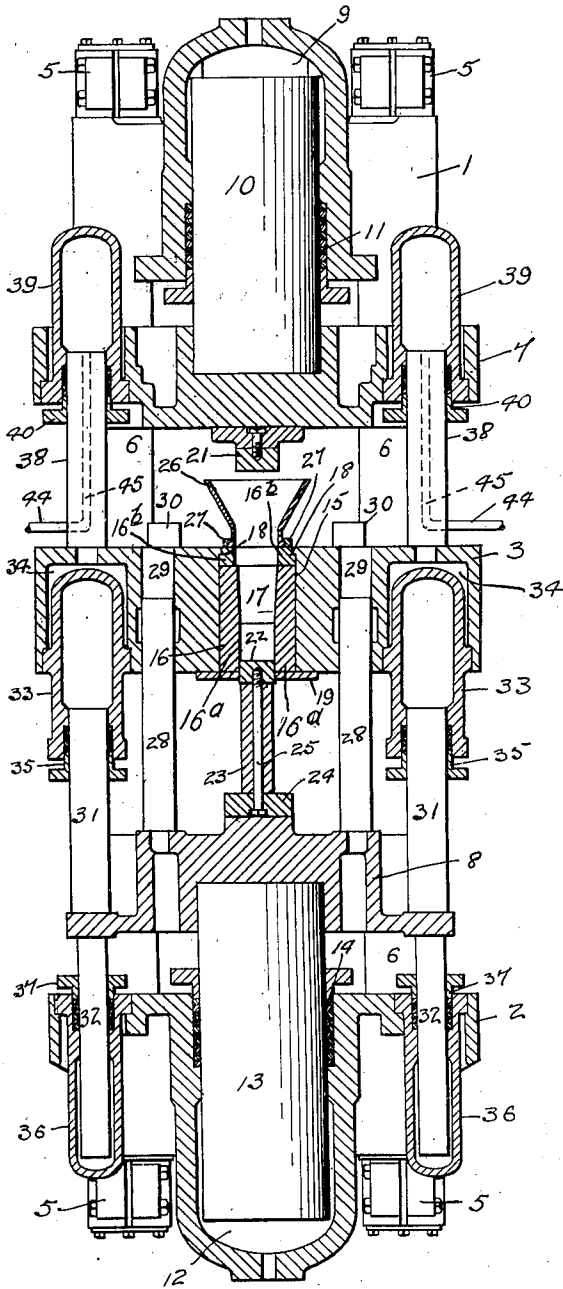


Fig. 1.

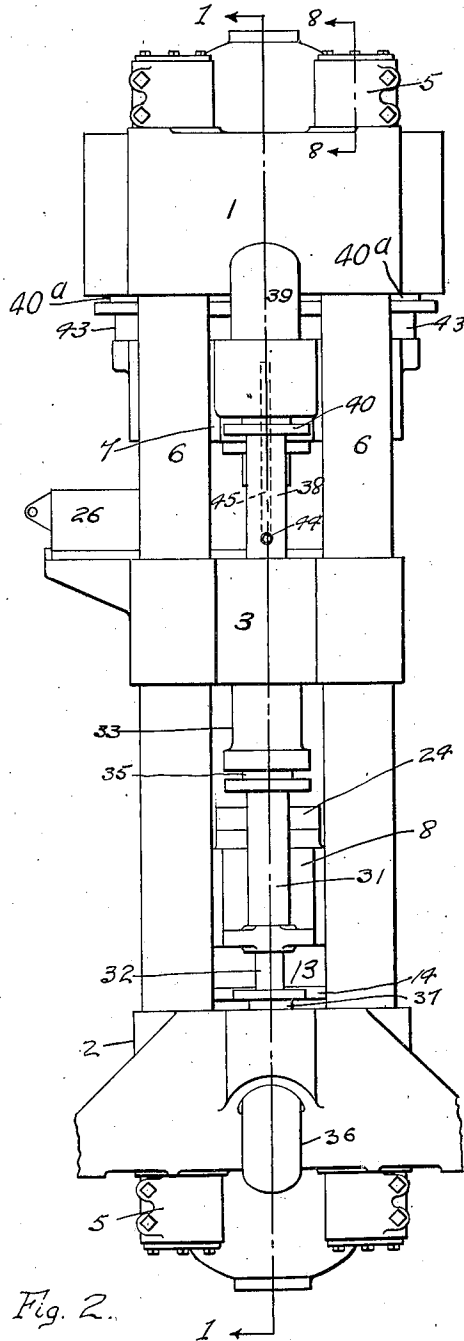


Fig. 2.

INVENTOR.
Thomas F. Stacy
by *Parker & Prochman*
ATTORNEYS.

June 24, 1930.

T. F. STACY

1,765,626

PRESS

Filed April 14, 1927

4 Sheets-Sheet 2

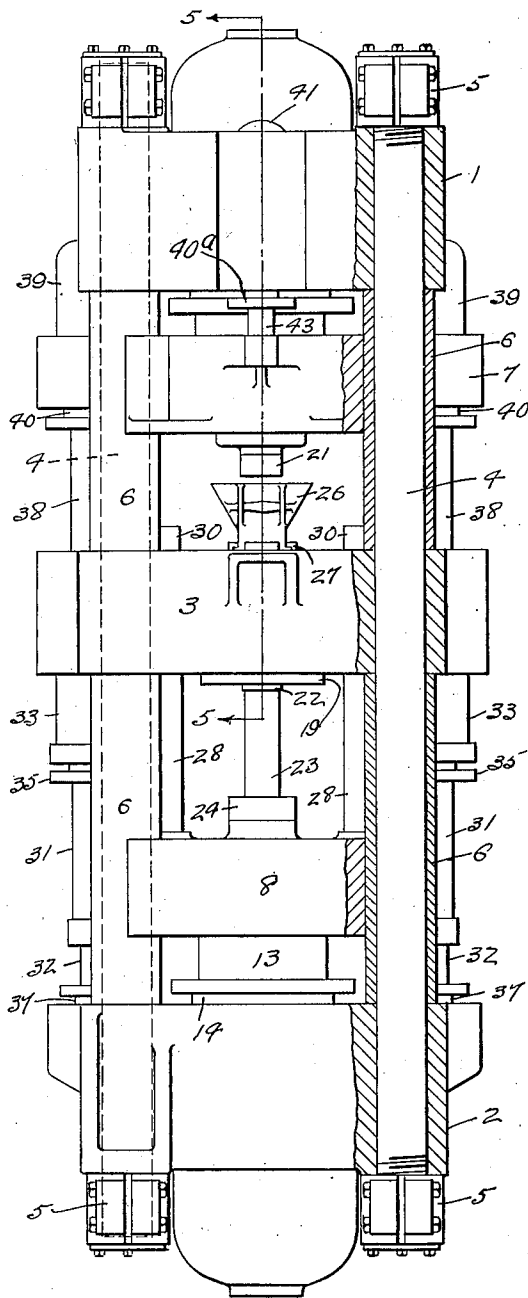


Fig. 3.

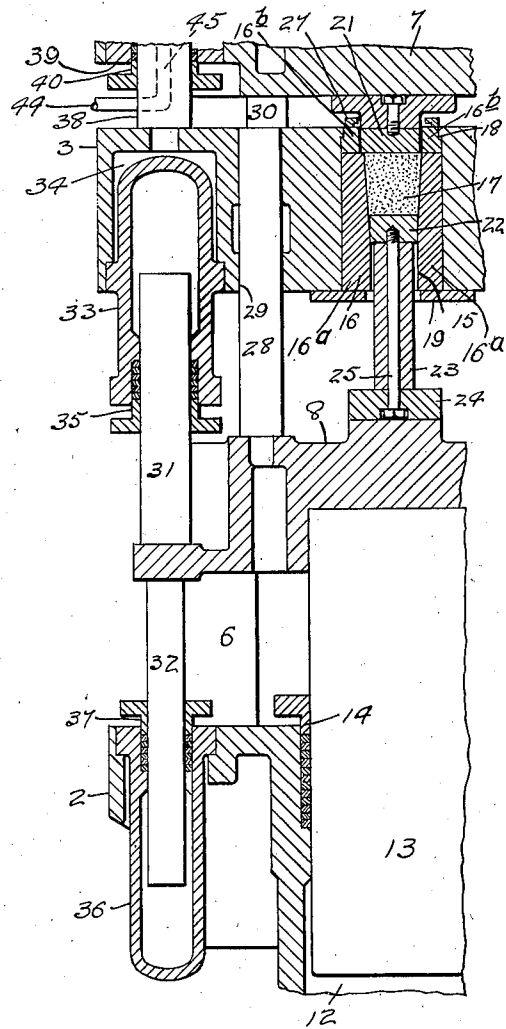


Fig. 4.

INVENTOR.
Thomas F. Stacy
 by *Parker & Prochnow*
 ATTORNEYS.

June 24, 1930.

T. F. STACY

1,765,626

PRESS

Filed April 14, 1927

4 Sheets-Sheet 3

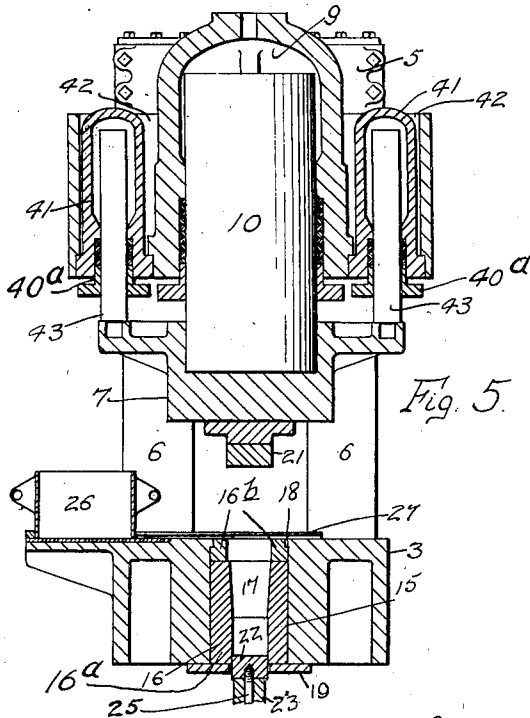


Fig. 5.

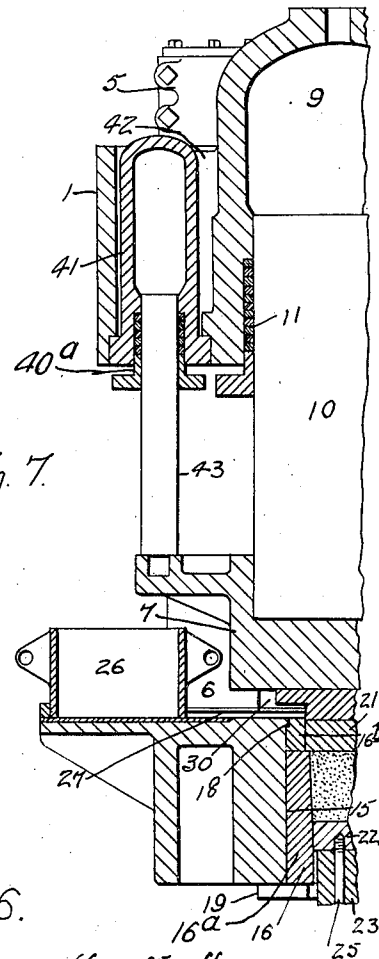


Fig. 7.

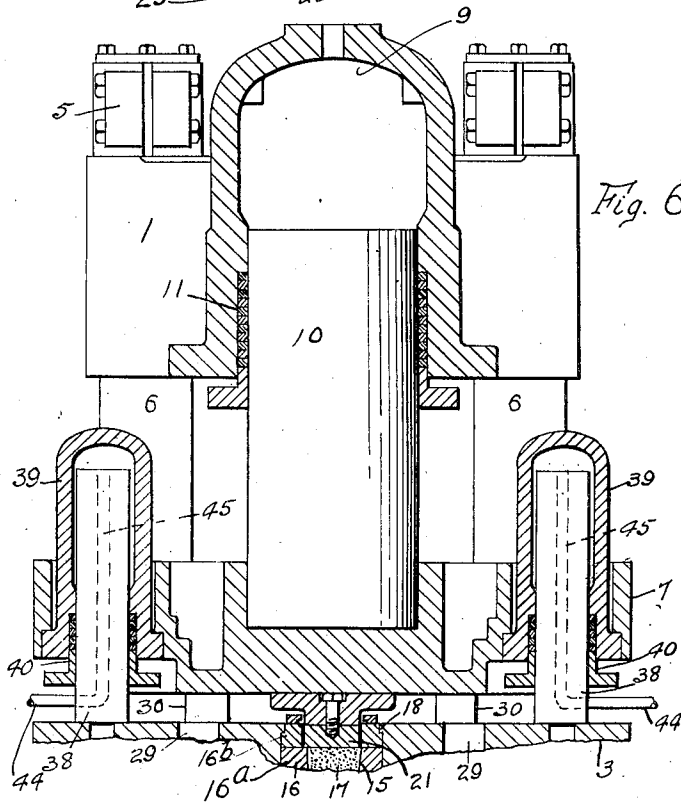


Fig. 6.

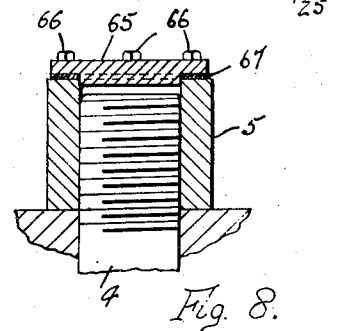


Fig. 8.

INVENTOR.
Thomas F. Stacy
Harker & Prochman
ATTORNEYS.

June 24, 1930.

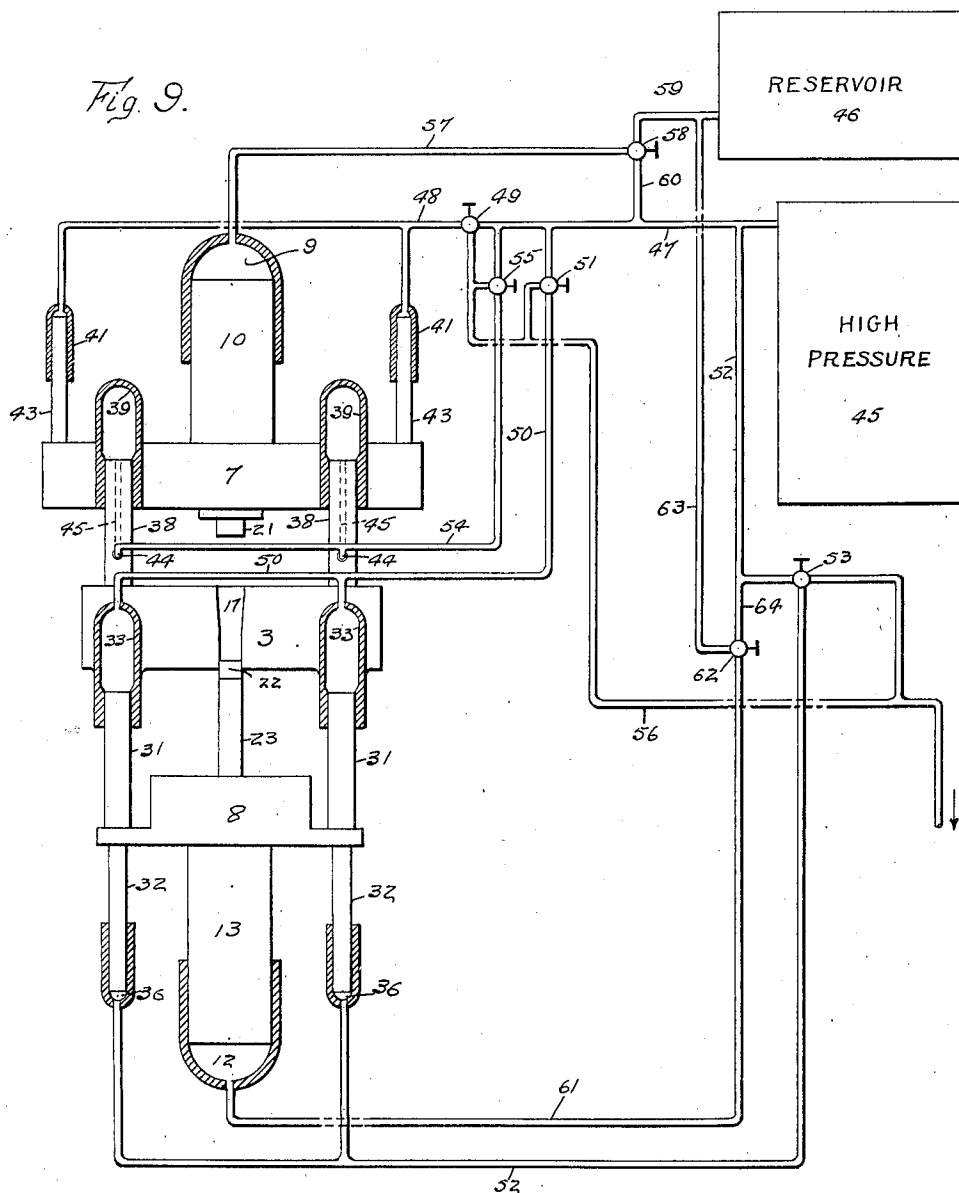
T. F. STACY

1,765,626

PRESS

Filed April 14, 1927

4 Sheets-Sheet 4



INVENTOR.
Thomas F. Stacy
by *Parker & Prochman*
ATTORNEYS.

UNITED STATES PATENT OFFICE

THOMAS F. STACY, OF PIQUA, OHIO, ASSIGNOR TO THE FRENCH OIL MILL MACHINERY CO., OF PIQUA, OHIO

PRESS

Application filed April 14, 1927. Serial No. 183,873.

This invention relates to presses, and particularly to the type employed to press loose particles into hard cakes. It is desirable to have the cake of equal density upon both faces, and heretofore presses employed in an endeavor to secure such equal density of the cake have been unsatisfactory for various reasons, among which may be mentioned the difficulty of ejecting the cakes, the tendency of the dies to get out of alinement after short use, and the necessity for complicated mechanism for the press.

An object of the invention is to provide an improved and simplified press with which loose particles may be compressed into cakes with approximately equal density upon both faces.

A further object is to provide an improved press for cakes, with which the dies and molds will maintain their alinement during use of the press, with which injury to the dies may be prevented, with which the cakes may be ejected in a simple manner and without difficulty, which will be exceptionally simple, strong, durable, rigid, and inexpensive in construction, relatively rapid in operation, and which will have a relatively low operating cost.

Various other objects and advantages will be apparent from the following description of an embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings,

Fig. 1 is a sectional elevation of a press constructed in accordance with this invention, the section being taken approximately along the line 1—1, of Fig. 2;

Fig. 2 is a side elevation of the same;

Fig. 3 is a front elevation, partly in section, of the same;

Fig. 4 is an enlarged, sectional elevation of a portion of Fig. 1, but showing the upper and lower rams in the act of compressing a cake;

Fig. 5 is a sectional elevation of a portion of the same, the section being taken approximately along the line 5—5, of Fig. 3;

Fig. 6 is a sectional elevation of a por-

tion of the press, the section being taken as in Fig. 1, but showing only the upper part of the press and with the parts in a different operative relation to one another;

Fig. 7 is an elevation somewhat similar to Fig. 5, but illustrating the parts in a different operative relation to one another and shown on a somewhat larger scale;

Fig. 8 is a sectional elevation of a portion of the press, showing the connection between the tie rods and the heads, the section being taken approximately along the line 8—8 of Fig. 2; and

Fig. 9 is a diagram illustrating the piping connections to the fluid operating means for the various rams of the press.

In the illustrated embodiment of the invention, the press is provided with an upper head 1, a lower head 2, and a mold support 3. The upper and lower heads are connected by tie rods 4 which pass through and between the heads 1 and 2 and also through and closely fitting suitable apertures in the mold support 3. The tie rods, at their ends which project through the heads, are threaded and carry suitable nuts 5 which when tightened upon the tie rods will draw the heads toward the mold support 3. Sleeves 6 are provided upon the tie rods and act as spacers between the heads and the mold support 3, so that when the nuts 5 are tightened the heads will be drawn toward one another and held in spaced relation to the mold support 3 in a rigid structure.

A platen 7 is disposed between the upper head 1 and the mold support 3, and another platen 8 is disposed between the mold support 3 and the lower head 2, both platens being guided by the sleeves 6 for movement along the same toward and from the mold support 3. The upper head 1 is provided with a main cylindrical cavity 9 which opens downwardly toward the mold support 3. A plunger or piston 10 is carried by the upper platen 7 and extends upwardly into and slidably fits the cylindrical chamber or cavity 9. The piston or plunger 10 may be packed by any suitable means such as by a packing gland 11. The cylindrical chamber 9 is relatively large in cross section, and

therefore considerable pressure upon the upper platen may be obtained when the closed end of the chamber 9 is filled with a high pressure fluid.

Similarly the lower head 2 is provided with a cylindrical cavity 12 which opens toward the mold support 3. A plunger 13 is secured to the lower platen 8 and depends into the open end of the cylindrical cavity 12, and the piston or plunger 13 closely fits and slides in the cylindrical cavity 12. The piston 13 may be packed by any suitable means such as by a packing gland 14 at the open end of the cavity 12. The cavities 9 and 12 are connected at their closed ends by suitable pipes, which will be explained hereinafter, to a source of high pressure fluid by which the plungers 10 and 13 may be forced outwardly of the cavities and thus the platens 7 and 8 are forced toward the mold support 3, all in a manner which will be explained more fully hereinafter.

The mold support 3 is provided with a passage 15 from face to face, which passage receives a suitable sleeve like element 16 which acts as a mold lining and in turn contains a passage 17 which serves as the passage or cavity in which the cake is formed. The mold lining 16 may be formed of two sections 16^a and 16^b, the section 16^b being the smaller and disposed uppermost in the passage 15. The passage 15 has adjacent its upper end a slight shoulder 18 against which a shoulder of the section 16^b fits in order to prevent movement of section 16^b entirely out of the passage 15. The lower section 16^a of the mold lining fits endwise against the upper section and closes the cavity or passage 15, being confined therein in any suitable manner such as by a plate 19 which overlaps the lower end of the section 16^a of the lining, all as shown clearly in Fig. 1.

The lining section 16^a is provided with a passage, the lower portion of which is uniform in cross section and the upper portion of which is tapered and diverging outwardly from the lower portion. The upper section 16^b of the lining is also provided with a passage of uniform cross section but which is larger than the passage in the lower section 16^a, and is of slightly larger cross section than the larger end of the tapered section of the passage. It will thus be observed that the mold lining is provided with a passage which is divided into three sections, the upper and lower or the end sections of which are of uniform but different cross sections and the intermediate or connecting section which is of tapered cross section, that is, varying progressively from one section to the other so as to provide a tapered mold cavity or passage. A die 21 is secured to the under face of the upper

platen 7 and is of a size and shape to enter and fill the upper, uniform end passage section of the mold lining. Similarly a die 22 is secured with a spacer sleeve 23 to a mounting 24 on the upper face of the lower platen 8, so as to be operable with the lower platen. The die 22 is of a size and shape to fill the lower end of the passage of the mold lining and move along the same when the platen 8 is shifted upon its guides. Any suitable means may be employed for connecting the die 22 and the sleeve 23 to the mounting piece 24, but a bolt 25 which passes through the mounting 24 and the sleeve and threads into the lower end of the die 22 has been found to be satisfactory for this purpose. The sleeve 23 and the die 22 are of such lengths that when the platen 8 is forced upwardly toward the mold support 3, the die 22 will move along the lower end of the mold lining passage until it reaches the top of the mold lining passage during the latter part of which movement it serves as an ejector for lifting out of the mold lining passage a cake which has been formed. Thus when the cavity in the passage of the mold lining is filled with a suitable quantity of loose particles which are to be pressed into a cake and the platens 7 and 8 are shifted toward the mold support 3, the dies will compress the material between them.

A hopper 26 is mounted upon the upper face of the mold support 3 for sliding movement across the same, and is guided in its path of travel in any suitable manner such as by guiding strips 27, see Fig. 1. The lower end of the hopper is open, but the material is held therein normally by reason of the engagement of the hopper with the upper surface of the mold support 3 as the hopper slides thereover. The hopper may be filled in any suitable manner, and carries the charge of material to be compressed with it as it slides over the face of the mold support, and when the hopper is placed over the passage in the mold lining, the contents of the hopper will fall into the mold lining passage ready for compression. The hopper is then shifted out of the path of the upward die 21, and into the position shown in Fig. 2. The hopper is refilled preferably while in this out-of-the-way position.

In the event that the dies should be brought toward one another and into the mold cavity without any material being provided in the mold cavity for compression, the engagement of the two dies with one another might cause serious injury to their surfaces. To prevent this situation one of the platens, such as the lower platen 8, is provided with one or more pins 28 which project upwardly from its upper face and slide in passages 29 in the mold support 3, so that when the platen 8 is elevated up-

wardly, the pins 28 will be elevated also and will strike the lower face of the upper platen 7 just before the surfaces of the two dies 21 and 22 meet, thereby preventing any danger of injury to the dies. The downward travel of the upper platen 7 is preferably limited by suitable lugs 30 which are secured to or formed integrally upon the upper face of the mold support 3. These lugs are engaged by the upper platen 7 after the die 21 on that platen has descended into the mold cavity for a predetermined extent which is preferably just as the lower face of the die 21 reaches the beginning of the tapered section of the mold cavity.

The ram cavities 9 and 12 being relatively large they will require a considerable quantity of fluid in actuating the platens 7 and 8 to the desired extent, and when the source is of a very high pressure fluid, the cost of operation will be relatively high. Accordingly additional means is provided for operating the platens 7 and 8 when they encounter little resistance. To this end the lower platen 8 is provided with pins 31 and 32 which extend upwardly and downwardly therefrom for some distance. The upwardly extending pins 31 enter the open ends of cylinders 33 which are secured to the mold support 3, and preferably placed in cavities 34 provided in the lower faces of the mold support, all as shown in Fig. 1. The open ends of these cylinders 33 may also be closed by suitable packing glands 35, so that the pins 31 will serve as pistons or plungers for the small cylinders 33. These cylinders 33 are, of course, smaller than the larger cylinders 9 and 12. Similarly the pins 32 which depend from the platen 8 will enter the open ends of upright cylinders 36 which are secured in the lower head 2 so as to open upwardly from the upper face thereof. The open ends of these cylinders may also be closed by packing glands 37. From this it will be seen that when compressed fluid is admitted to the cavities of the cylinders 33 and 36 the platen 8 will be shifted upwardly or downwardly depending upon which set of cylinders the compressed fluid is admitted to.

The upper platen 7 is shifted upwardly and downwardly during its preliminary adjustments or settings, by means similar to that provided for the movement of the platen 8. Accordingly the mold support 3 is provided with upwardly extending pins 38, which are received in the open ends of inverted cylinders 39 that are provided in the upper platen 7. The open ends of these cylinders 39 are closed by any suitable packing means such as by packing glands 40.

Referring now particularly to Figs. 5 and 7, a plurality of cylinders 41 are secured in an inverted relation in the head 1. The cylinders 41 are preferably disposed in cavities

42 in the head so as to open downwardly through the lower face thereof. A plurality of rods 43 are secured to the upper platen 7 and extend into the open ends of the cylinders 41 so as to act as pistons or plungers therefor. The open ends of the cylinders 41 may be closed tightly by packing means such as packing glands 40^a. When compressed fluid is admitted to the cylinders 41 the rods 43 will be forced downwardly, and the latter will force the platen 7 downwardly and thus lower it into the mold. The compressed fluid may be admitted to the cylinders 9, 12, 33, 36 and 41 at any suitable point, but for the cylinders 39 the compressed fluid is preferably admitted by means of pipes 44 which are connected to the rods 38. The rods 38 contain passages 45 each of which opens at one end into its cylinder through the inner end of that rod, and communicates with its pipe 44 at its other end.

In Fig. 9 a piping diagram of one system which may be employed in connection with this particular press is illustrated. Any suitable source of high pressure fluid may be employed but preferably a source of high pressure liquid indicated diagrammatically by reference 45 is supplied. A reservoir of a liquid not necessarily under pressure is indicated at 46 and is used to fill the larger cylinders when they are being moved preparatory to being subjected to high pressures. A pipe 47 leads from the source 45 of high pressure, and is provided with a plurality of branches which lead to the different cylinders which are to actuate the platens. Each branch passage is provided with a controlling valve. A branch pipe 48 which is controlled by a valve 49 leads from the pipe 47 to the cylinders 41 which control the downward movement of the upper platen 7. A pipe 50 controlled by a valve 51 leads from the pipe 47 to the upper cylinders 33 which control the downward movement of the lower platen 8. A pipe 52 controlled by a valve 53 leads from the pipe 47 to the lower cylinders 36 which actuate the lower platen 8 upwardly. A pipe 54 controlled by a valve 55 also leads from the pipe 47 to the pipe 44 and the passages 45 which extend within the pins 38 into the cylinders 39. Each of the valves 49, 51, 53 and 55 may be what is termed a three way valve, in that it is adapted to connect a pipe such as 47 selectively to either of the branch pipes or to another waste pipe 56 which is common to all of these valves. Thus by suitable operation of these valves the various cylinders may be connected selectively to the source 47 for receiving a compressed fluid, or they may be cut off entirely so as to prevent movement of a fluid into or out of the cylinders, or the supply from the pipe 47 may be cut off and the various cylinders of this

group connected to the common pipe 56 so that the contents of the cylinders may be discharged through the common pipe 56 to any suitable reservoir (not shown).

5 The cylinder 9 is connected by a pipe 57 to a three way valve 58, one branch of which is connected by a pipe 59 to the reservoir 46, and the other branch 60 of which is connected to the pipe 47 leading from the source
10 of high pressure fluid 45. The cylinder 12 for actuating the lower platen is connected by a pipe 61 to a three way valve 62, one branch of which is connected by a pipe 63 to the reservoir 46, and the other branch 64 of
15 which is connected to the pipe 47 leading from the reservoir 45 carrying the source of high pressure fluid.

When the press is used for pressing salt into cakes it is desirable to prevent the
20 entrance of salt into the ends of the nuts, which entrance might cause rusting of the nuts to the tie rods with consequent difficulty in adjusting the nuts as desired. Accordingly the tie rods do not pass all the way
25 through the nuts, and plates 65 are secured across the open ends of the nuts in any suitable manner such as by small cap screws 66. A gasket 67 may be interposed, if desired, between each plate 65 and the end of the nut,
30 so as to effectively seal the open ends of the nuts.

The operation may be stated as follows. Assuming that the upper and lower platens are in the relative positions shown in Fig. 1,
35 the material, such as salt which is to be compressed into a cake is measured out in the desired quantity and placed in the hopper 26. The hopper is then shifted over the upper end of the cavity in the mold lining,
40 and the salt thereupon falls into the passage. The hopper then is shifted out of the path of the upper platen, which position is shown in Fig. 2. The operator then manipulates the valve 49 so as to admit some of the
45 compressed fluid into the cylinders 41, thus causing a lowering of the upper platen 7. The cylinder 9 must be opened during this movement in order that the suction will not retard or prevent movement of the platen 7
50 downwardly. Accordingly at the same time, the valve 58 is operated to connect the cylinder 9 with the reservoir 46, and thus as the upper platen 7 moves downwardly and the piston or plunger 10 moves out of the cylinder 9, the piston will draw into the cylinder
55 a quantity of liquid from the reservoir 46 which, however, is not under pressure. It is also necessary or desirable to open the cylinders 39 in order that they will not oppose the downward movement of the platen 7 and accordingly the valve 55 is operated to connect the cylinders 39 to the common
60 pipe 56. Thus the liquid which has been held in the small auxiliary cylinders will be discharged through the common or waste

pipe 56. This downward movement will continue until the die 21 which is carried by the platen 7 enters the upper end of the passage in the mold lining and this upper platen comes to rest against the lug 30. This position of the upper platen is shown in Fig. 6. The operator then closes valves 49 and 58, opens the valve 62 to connect the reservoir 46 to the lower cylinder 12, and also operates the valves 51 and 53 to connect
75 them to the discharge or waste pipe 56 so that the cylinders 33 and 12 will not offer any material resistance to the movement of the lower platen. It is desirable, however, for the operator to operate the valve 53 so as to connect the pipe 52 to the source of high pressure fluid 45, so that the cylinders 36 will receive a high pressure fluid. In that event the plungers 32 will raise the main piston 13 to elevate the lower platen 8 and
80 cylinder 12 will be filled from reservoir 46. When the material can be compressed no further by cylinders 36, valve 62 is operated to admit pressure fluid into cylinder 12 to further compress the material. As the platen 8 moves upwardly the die 22 will be forced along the passage in the mold lining and will compress the material, such as salt, which has been placed in the molds. Such a relative position of the parts is shown in
85 Figs. 4 and 7. The size of the charge of material to be compressed is preferably such that when the pressure is sufficient to compress the cakes about as completely as possible, the lower die 22 will have about reached the beginning of the tapered portion of the mold cavity as will be apparent from the drawings. During this compression of the material in the mold it will be obvious that some of the pressure of the lower platen will be transmitted through the cake to the upper die and through it to the upper plunger. During this upward movement of the lower platen it will be understood that the valve 58 has been operated to cut off the connection between the pipe 57 and both of its branches 59 and 60 so that the liquid from the reservoir 46 which has been admitted to the cylinder 9 will be trapped therein and held against removal. This quantity of liquid in the cylinder 9 serves as a buffer against which the pressure of the lower platen acts. The upper piston or platen, however, will not be subjected to the same pressure as that exerted by the lower die for the reason that there is considerable frictional resistance to the movement of the cake in the mold lining which will prevent equalization of pressure. However, as the pressure on the cake increases by reason of the upward movement of the lower platen, the upper platen will be elevated slightly due to the expansion of the walls of the upper cylinder and the compression of the liquid in the cylinder 9 which

has been admitted thereto and locked therein. After the cake has been compressed to the maximum extent by the upward movement of the lower platen the operator then operates the valve 58 so as to connect the pipe 57 to the pipe 47 and thus admit the high pressure fluid to the upper cylinder 9. The pressure upon both upper and lower platens will then be the same and therefore the pressure upon both faces of the cake being formed will be equal. The upper die will be forced downwardly slightly, and by reason of this equal pressure upon both faces the density of the cake upon both of its faces will be equal. As soon as the cake has been compressed to the maximum extent by the extremely high and equal pressure upon both faces, the valves 58 and 62 are operated so as to cut off the supply of high pressure fluid to the cylinders 9 and 12. The attendant then next operates the valve 49 to connect the upper cylinders 41 to the discharge pipe 56, and also operates the valve 55 to admit some of the high pressure fluid to the cylinder 39. Thereupon the platen 7 will be elevated to lift the upper die out of the mold and above the path of the hopper. At the conclusion of this upward movement the valves 49 and 55 are both closed so as to close communication of any sort to the cylinders 39 and 41. The attendant next operates the valve 51 to connect it to the common discharge pipe 56, and also operates the valve 53 to connect the cylinders 36 to the source of high pressure fluid with the result that the lower platen 8 will be forced upwardly and will eject the cake which has been formed from the mold lining by forcing it upwardly onto the upper face of the mold support. During this upward movement of the lower platen, the valve 62 should be in a position to connect the pipe 61 to the pipe 63 and reservoir 46 in order to allow cylinder 12 to fill with liquid from the reservoir 46. If the pressure in the cylinders 36 is not sufficient to eject or loosen the cake, the valve 62 may also be operated to connect cylinder 12 with the high pressure liquid and provide pressure upon the lower platen sufficient to loosen the cake. The valve 62 may then be reconnected to the reservoir 46. After the cake has been ejected, the valve 53 is operated to connect it to the discharge pipe 56, and the valve 51 is then operated to admit a source of high pressure fluid to the cylinders 33 which force the lower platen downwardly to starting position which is shown in Fig. 1. During this downward movement of the lower platen 8 the valve 62 should be placed in a position to connect the cylinder 12 to the reservoir 46, and the liquid which has been forced therein will be returned or supplied to the reservoir 46. During the movement of the hopper into position to supply another charge to the

mold cavity it will push the cake which has just been ejected off of the mold support 3. The lower platen is preferably lowered after the hopper 26 is over the mold cavity so that any suction caused by the downwardly moving die will draw the loose particles in the charge down into the cavity. The operation is then proceeded with as just described for the formation of another cake.

It will be noted from the foregoing that the cake is formed largely in the tapered portion of the mold cavity at just about the upper or larger end of the cavity. Therefore, when the cake is forced upwardly after the upper die is removed, the cake, which has a slightly tapered periphery, will readily be disengaged from the mold cavity walls with a minimum of displacement. In other words a minimum movement of the cake is necessary in order to completely loosen it from the cavity walls.

It will be observed that the molds and the two heads are held in a rigid structure by the tie rods and spacer sleeves, and since the platens which carry the dies are guided upon the spacer sleeves, the dies will always have a very definite path and there will be little or no possibility of the dies losing their alinement.

By the use of the extra and smaller cylinders or rams for moving the platens in both directions during preliminary movements and before it is desired to apply the full pressure to the cake, and for ejecting the cakes, a considerable saving in the consumption of high pressure fluid is afforded, with resulting reduced cost of operation. By the use of the auxiliary reservoir 45 the large cylinders may be connected thereto, so as to be filled therefrom during the adjustments of the platens preliminarily to exerting the maximum pressure upon the cake, and hence only a minor quantity of the high pressure fluid will then be required in order to bring the pressure in the large cylinders up to the desired maximum.

It will be obvious that various changes in the details, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

Claims:—

1. In a press, a mold support, a pair of heads disposed at opposite faces of the mold support, elements connecting said heads and support to form a rigid structure, platens slidably guided toward and from said support from opposite faces thereof, a mold carried by said support and having open ends of different sizes and a tapered intermediate section connecting said open ends, dies carried by said platens to enter said mold from opposite ends, means for limit-

ing the movement of one of said dies into the larger open end of said mold, the other die being free to move through the mold, and fluid pressure means for operating the platens selectively and individually in both directions to compress material that may be placed in said mold, and provide a direct fluid pressure backing for each die during the compression of material in said mold.

2. In a press, a mold having a passage from face to face, the cross section of the passage at one end being larger than that of the other end, said end sections each being uniform in cross section for a material distance from the adjacent face, and the two end sections of uniform but different cross sections being connected by a tapered section, a die fitting and movable into and along the passage from each end to close the same and compress a charge placed in the passage, a fluid pressure ram for actuating each die and providing a fluid cushion directly opposing retraction of that die in all positions of that die along the passage, means for limiting movement of the larger die to approximately the junction between the larger end section and the tapered section, while maintaining direct fluid pressure thereon, means for admitting actuating fluid to each ram separately from the other to compress a charge between the dies in the tapered section of the passage, whereby the same density may be created on both faces of the compressed charge.

3. In a fluid pressure press, a mold having a passage from face to face, the end sections of the passage being of uniform but different cross section, the intermediate section of the passage being tapered and merging into the end sections, dies movable into and along the passage sections from each face, fluid pressure means, including a cylinder end passage, connected to each die to move it either into and along or out of the passage, a source of high pressure fluid, valves for controlling the admission of high pressure fluid from said source to the cylinder of the actuating means for each die, the valve controlling the cylinder of the means for actuating the die for the larger passage section being closable to hold therein any actuating fluid which has entered, and means for indicating when the die for the larger passage section has reached approximately the junction of that section with the tapered section so that the cylinder of the actuating means for the larger section die may be closed, whereby the larger section die may be used as a buffer against which the material of the mold may be compressed in the larger end of this tapered section by the actuation of the smaller section die, the cylinder of the actuating means for the larger section die then connected to said source to cause equal pressure upon both faces of

the material compressed in said passage, the larger section die then removed and the compressed substance ejected from the passage through the larger end by further movement of the smaller section die.

4. In a press, a mold, a platen mounted for movement toward and from the mold, a die carried by the platen and capable of entering and closing said mold, a main high pressure ram acting against said platen to force it toward the mold, and oppositely acting small rams connected to said platen for forcing it selectively in either direction toward or from the mold.

5. In a press, a mold element and a head element mounted in fixed spaced relation to one another, a platen mounted for movement toward and from the mold element and disposed between said elements, a die element carried by the platen, a relatively large high pressure ram interposed between said head element and the platen to force the latter toward the mold, and oppositely acting relatively small rams interposed between the platen and said elements, for shifting the platen selectively in either direction.

6. In a press, a mold element, a pair of head elements disposed on opposite sides of and in spaced relation to said mold elements, a platen mounted between each head element and the mold element and each movable toward and from the mold element, fluid pressure means for actuating the platens toward and from the mold element selectively, a die carried by each platen, said mold element having a mold cavity open at both faces and into and along which the die carried by the platen may move as the platens are shifted toward the mold element and the dies approach one another, and a pin carried by one platen and cooperating with the other platen to limit their approach sufficiently to prevent injury to the dies by contact with one another, if the platens should be shifted too closely toward one another without any material in the cavity to be compressed.

7. The method of pressing loose particles into cakes which comprises inserting said particles into a mold open at both ends, closing one end by a die and resisting its movement outwardly by a closed body of fluid, pressing the particles against said fluid resisted die by desired pressure, then while maintaining that pressure forcing said die against the material by at least approximately equal pressure so as to compress the material into approximately equal density upon both faces, and removing the cake from the mold.

8. The method of pressing loose particles into cakes comprising inserting said particles into a mold open at both ends, closing one end of the mold by one die, pressing the particles against that die by another die operating from the other end of the mold,

then applying at least approximately equal pressure to the said one die while holding the pressure against said another die, to compress both faces of the cake to approximately equal density, and then utilizing one of the dies to eject the cake from the mold.

THOMAS F. STACY.

10

15

20

25

30

35

40

45

50

55

60