Feb. 14, 1933. A. J. HELFRECHT 1,897,612

TAMPING MACHINE

Filed May 6, 1930 2 Sheets-Sheet 1

Fig. 1.

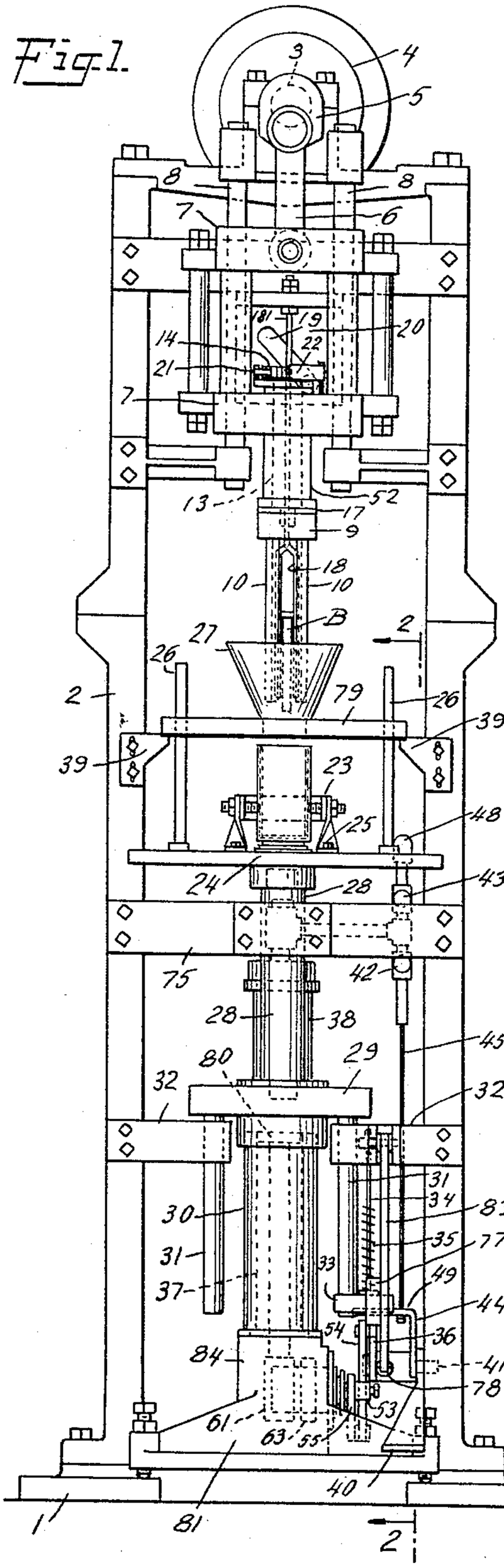

Fig. 3.

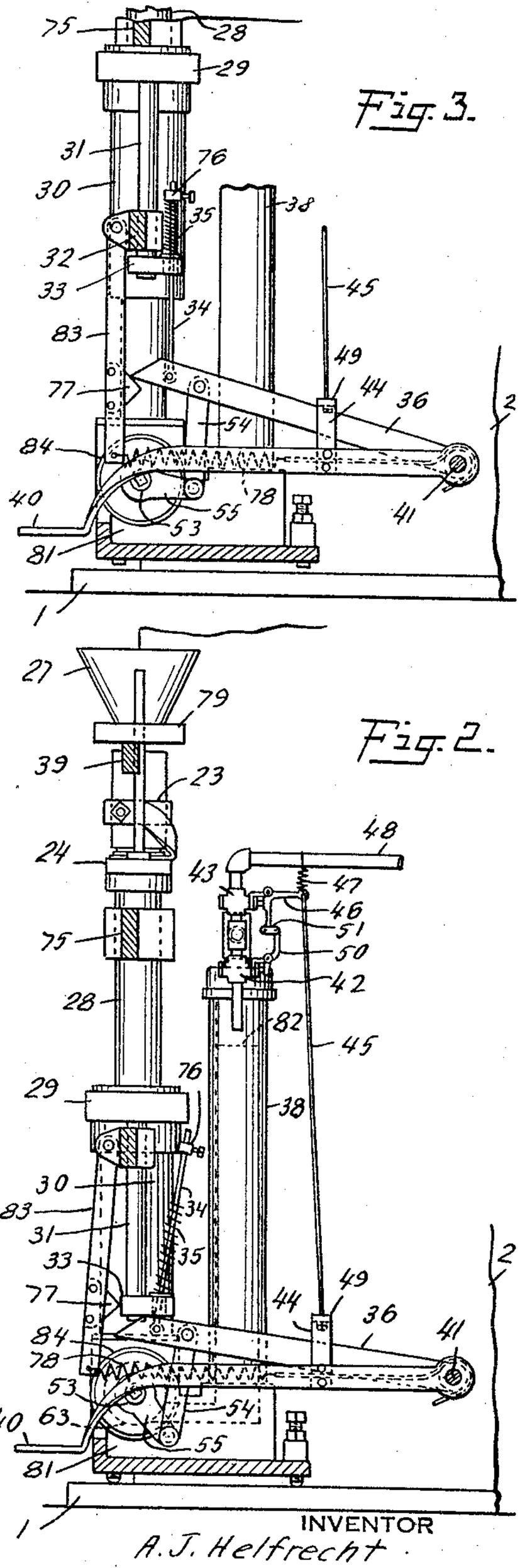

Fig. 2.

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Fig. 4.

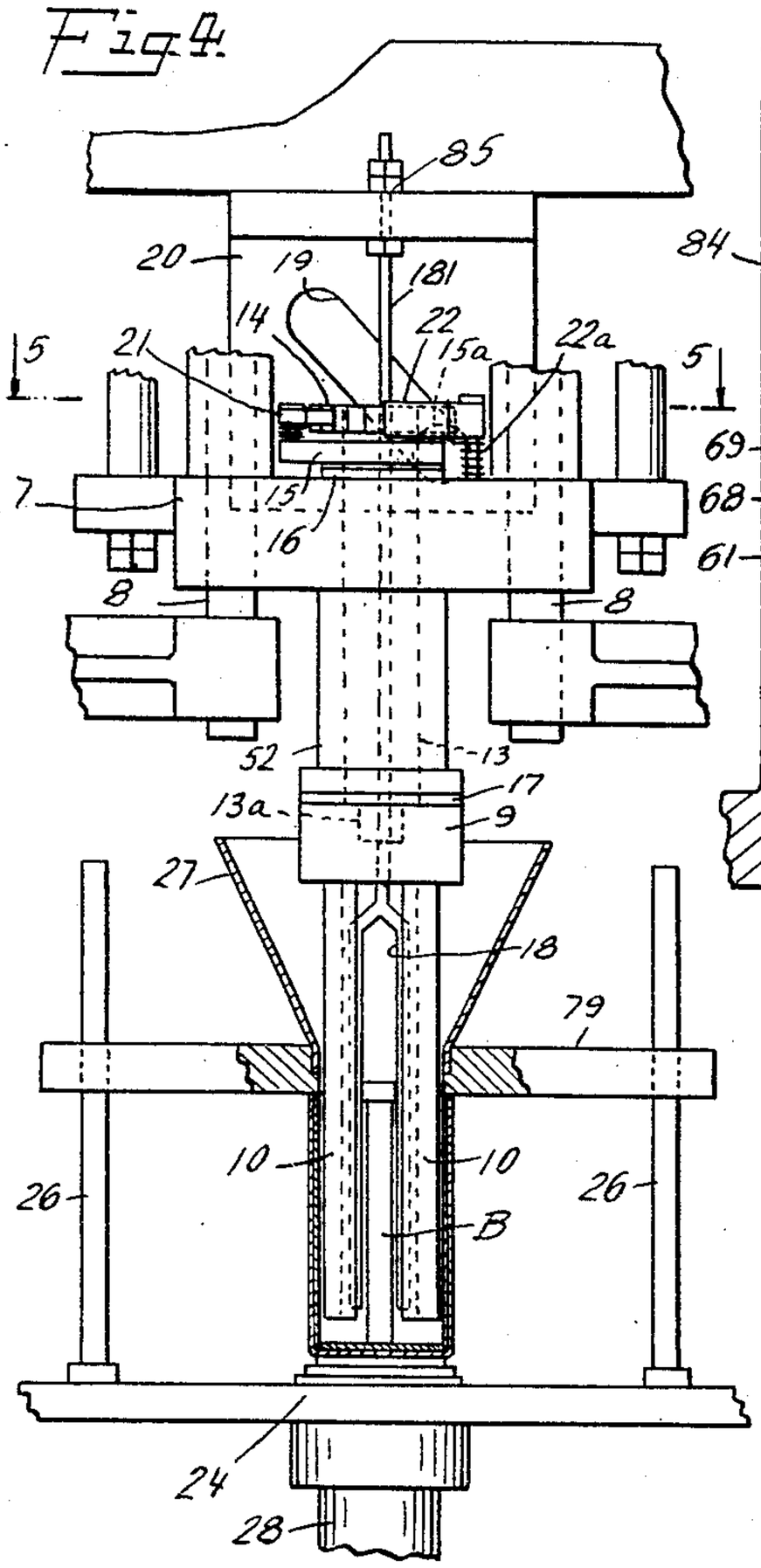

Fig. 6.

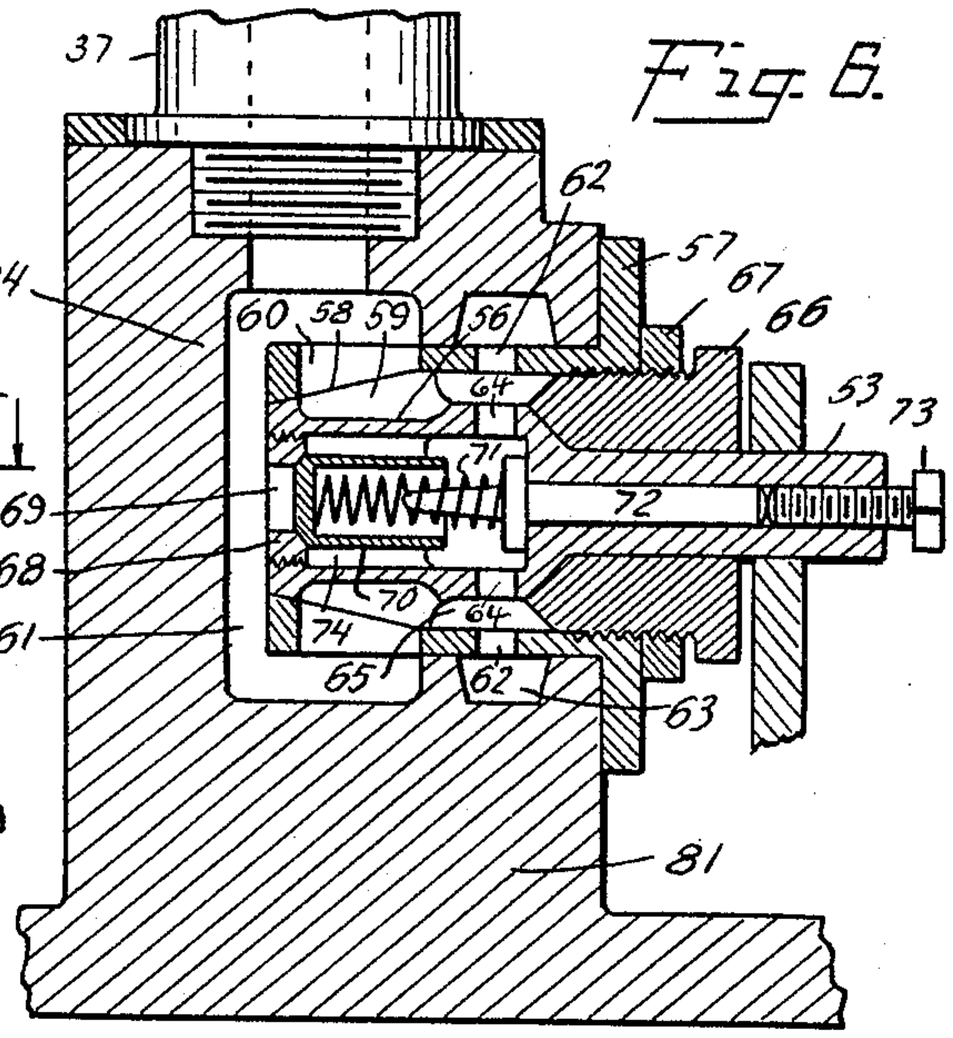

Fig. 7.

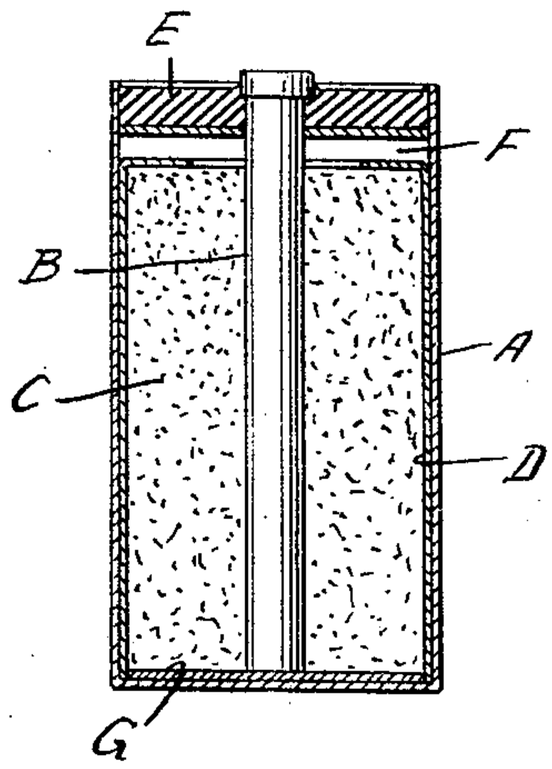

Fig. 5.

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TAMPING MACHINE

Application filed May 6, 1930. Serial No. 450,123.

This invention relates to apparatus for compacting plastic material, and more particularly to apparatus for tamping moist depolarizing material for dry cell cores.

The principal object of the present invention is to provide an improved apparatus for tamping plastic material in molds or containers to impart uniform density to the tamped product.

It is a further object of the invention to provide an apparatus of the character described which is capable of regulating the density and height of the tamped product at the will of the operator.

Other and further objects will become apparent as the following description progresses, which is to be taken in conjunction with the accompanying drawings, in which

Fig. 1 is a front elevation of a tamping machine which embodies my invention;

Fig. 2 is a vertical, sectional view of a portion of the tamping machine on line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 with the parts in a different position in the cycle of operations;

Fig. 4 is a fragmentary front enlarged view of the tamping device and carbon rod holder and means for superimposing a rotary motion upon the reciprocating motion of the tamping device, parts being shown in section;

Fig. 5 is a sectional view on line 5—5 of Fig. 4;

Fig. 6 is a sectional view of valve mechanism forming a part of the tamping machine; and,

Fig. 7 is a sectional view of a dry cell which illustrates one method of arranging a mass of depolarizing material in the lined zinc container thereof.

Referring to Fig. 7, the dry cell illustrated comprises zinc electrode A which is of the usual tubular shape and which forms a container for the cell materials. Adjacent the interior of electrode A there is a lining D of bibulous material, such as paper or cloth, which may contain the electrolyte. Insulating disc G rests upon the bottom of electrode A. A compacted mass C of depolarizing material, sometimes called the "core", is arranged within the lining D. A carbon rod B is embedded in the core. The lining D may extend above the top of the mass, and, after the latter is compacted, the lining may be folded down upon the top surface of the compacted mass as shown. The depolarizing material may be a moist plastic mixture of manganese dioxide, carbon, and graphite and may also contain electrolyte materials such as ammonium chloride and zinc chloride. Above core C is the usual expansion space F. The top of the cell is closed by wax or pitch seal E. In this type of cell the depolarizing mix usually is compacted or tamped within the lined zinc electrode A. My improved tamping machine is adapted to compact the material in such manner.

In the pasted type of dry cell, a layer of gelatinous electrolyte surrounds the depolarizing core and the material is not tamped within the lined zinc electrode. The cores, however, are tamped in molds and then introduced individually in proper size and shape into the zinc electrode. My improved apparatus is likewise adapted to tamp the material into such forming molds.

My apparatus need not be limited to the tamping of dry cell depolarizing material, but is equally well suited to the tamping of other plastic materials.

Fig. 1 shows the essential parts of a tamping machine embodying my invention. The tamping machine consists of base 1 upon which is mounted frame 2. A shaft 3 (shown by dotted lines) is rotatably mounted at the top of the framework and is driven by a belt, or other suitable means, through pulley 4. A crank 5 is mounted upon one end of shaft 3 and rotates therewith. A connecting rod 6 is fastened to crank 5 as by means of

a collar and a pin. The lower end of connecting rod 6 is fastened to the top member of bracket 7 as by means of a pin. The rotary motion of the shaft is thus translated into vertical reciprocating motion of the bracket. Bracket 7 is guided in its movement by guide rods 8.

As illustrated most clearly in Figs. 4 and 5, tamping fingers 10 are clamped in a chuck 9. The chuck is threaded to a reduced portion 13*a* of shank 13. This shank is attached to, or is integral with a ratchet wheel 14. Said shank passes through a cam follower base 15, a washer 16, and the bottom member of bracket 7. The bracket is provided with a depending member 52. Shank 13 passes through this member and washer 17, and is fastened to chuck 9. Rotation of ratchet wheel 14 is transmitted to chuck 9 and tamping fingers 10. A carbon rod holder 18 is arranged between the tamping fingers 10. It is provided with a shank 181 which passes through chuck 9, shank 13, and ratchet wheel 14 and is rigidly fastened to a protruding portion of block 20 as shown at 85. A roller type cam follower 15*a* is fastened to cam follower base 15 and runs in a cam slot 19 which is cut into a block 20. Block 20 is rigidly mounted in a stationary manner upon the frame of the machine. Cam 19 is arranged diagonally so that as the bracket 7 moves upward the cam follower moves to the left to cause pawl 21 to engage ratchet wheel 14. This causes the ratchet wheel with attached chuck and tamping fingers to turn about a vertical axis. A brake 22 is constantly urged toward the ratchet wheel by a resilient spring member 22*a* to prevent the ratchet wheel and attached parts from turning after the pawl has stopped its forward motion. As the bracket moves downward, the cam follower moves back along the cam bringing the pawl, which slides over the teeth of the ratchet wheel, back to its original position.

In the type of machine and dry cell illustrated, the depolarizing mix is tamped into the lined zinc container and around the positive electrode or carbon rod of the cell. The container A with the liner D and bottom disc G form a mold for the depolarizing core. It is understood, however, that any other form of mold may be used as when making cores for a pasted dry cell. The lined zinc container or can rests upon a support 24, usually called a tamping block. The can is held in an upright position during the tamping operation by means of a guide bracket 23 which bears against its sides. The guide bracket is fastened to tamping block 24 by means of bolts 25. The tamping block is fitted over the top end of a ram 28 by a friction or screw fit. The lower end of ram 28 is similarly joined to an intermediate guide member 29. The guide member is in turn similarly joined to the top of cylinder 30. The upper end of cylinder 30 is closed. The intermediate guide member carries guide rods 31 which slide in guides 32 carried by the frame.

A casing rests upon base 1. A piston 37 extends upwardly therefrom. Piston 37 is actually a cylinder, being hollow and open from end to end. Piston 37 fits within cylinder 30 in a fluid-tight manner but still permits free reciprocal relative movement between the two. The lower end of piston 37 communicates with a passageway within casing 81 which leads to reservoir 38 (see Figs. 2 and 3). A suitable fluid, such as oil, partially fills the system and its movement is controlled by a valve mechanism to regulate the height and density of the tamped product.

The valve mechanism is shown in detail in Fig. 6. It consists of a valve body 84, shown as forming an integral part of casing 81, but it may be a separate valve body insertable into casing 81. The interior of the valve body is generally cylindrical in shape with enlarged circular cavities 61 and 63 at its inner and outer end-portions respectively. Cavity 61 communicates with hollow piston 37, while cavity 63 communicates with reservoir 38. A cylindrical sleeve 57 fits into valve body 84 and its inner and outer end-portions respectively are arranged adjacent the cavities 61 and 63 in the valve body. The sleeve 57 may be secured to the valve casing 81 in any suitable manner as by bolts (not shown) passing through the flange of the sleeve and received in the body of the valve casing. The end-portions of the sleeve are provided with holes 60 and 62 which register with cavities 61 and 63 respectively.

The valve is of the rotatable plug type. A hollow plug 56 is seated within sleeve 57 upon a frusto-conical surface indicated by line 58. Adjacent the seat, the plug is provided with grooves 59. Plug 56 is narrowed toward its outer end-portion to provide annular space 65 between it and sleeve 57, which annular space registers with holes 62. The plug is held in place by adjusting nut 66 which is threaded into the outer end of sleeve 57. Adjusting nut 66 is locked in position by lock nut 67. A hollow valve stem 53 is carried by the plug 56 and projects outside the valve body. Its end-portion is frictionally engaged by operating arm 55.

In the open position of the valve, as shown in Fig. 3 grooves 59 register with ports 60 in the sleeve. The grooves 59 communicate at all times with the annular space 65 between the outer end-portions of plug 56 and sleeve 57. Communication between annular space 65 and cavity 63 is provided by holes 62 in sleeve 57. As many such holes may be provided as are found to be necessary to afford

the desired rate of flow of fluid through the valve mechanism.

An opening 69 is provided in the inner end of plug 56. A relief valve 70 is urged against its seat upon the inside periphery of this opening by a spring 71. The opposite end of spring 71 rests against a flange on a pressure adjusting rod 72. This rod is mounted in the hollow valve stem 53. A bolt 73 is threaded into the outer end portion of the valve stem in abutting relation to adjusting rod 72. This permits adjustment of the pressure of valve 70 against its seat. Relief valve 70 is guided in its longitudinal motion by ribs 74, extending inwardly from the sides of plug 56. Communication between the interior of the plug and annular space 65 is maintained by means of holes 64 in the plug. The end portion 68 of plug 56 may be removable, as indicated, to permit access to its interior.

It is thus seen that the relief valve affords communication in by-pass relation to that furnished by the plug valve. Fluid may flow from chamber 61 to the annular space 65 in one instance through opening 69 thence through the interior of plug 56 and thence through holes 64. In the second case it flows through ports 60, thence through grooves 59 to annular opening 65.

The plug valve is moved to its closed position by rotation of plug 56 through a sufficient angle to bring grooves 59 out of register with ports 60, the angularity of such movement being, of course, dependent upon the size of the ports and grooves.

The present valve arrangement is convenient in that it is compact and occupies only a small space within casing 81. However, they do not need to be arranged one within the other, but any sort of exterior by-pass arrangement will serve as well. The plug valve may be replaced in such case by an ordinary stop cock or any form of rapid flow valve which will open and close upon single movements of the valve-operating means.

Rather than recite a separate detailed description of the valve operating mechanism, a cycle of tamping operations will be described and apparatus descriptions will be introduced as they become essential to a complete understanding of the invention.

The normally inactive position of the machine is that shown in Figs. 1 and 2. In this position cylinder 30 rests upon the enlarged base of piston 37 and tamping block 24 is below the position occupied during tamping. In this position the fluid fills the clearance space 80 between the top of piston 37 and the closed end or head of cylinder 30 which forms an expansible chamber as will be explained hereinafter. The fluid also fills the passages within casing 81 and fills the reservoir to a level indicated by dotted line 82 which is at least higher than the cylinder head. Hopper 27 is supported upon cross-member 79 which rests upon lugs 39, fastened to the framework of the machine.

A suitable mold or container such as a lined zinc can as heretofore explained, is first placed upon tamping block 24, within guide member 23. The embedding of carbon rod B of Fig. 7, which takes place simultaneously with the compacting of the depolarizing mass, will be explained hereinafter. Tamping block 24 is then raised to its normal tamping position as shown in Fig. 4. To accomplish this operation, the operator depresses foot lever 40 which, together with lever 36, is fulcrumed upon pin 41 which is fastened to framework 2. Depression of lever 40 performs a triple function. First, through a chain of connections, comprising a lug 44, a rod 45, and a bell crank lever 46, an inlet valve 43 is opened. This supplies pneumatic pressure from a high pressure supply pipe 48 to the surface 82 of the fluid in reservoir 38. Second, through the same chain of connections and the extension thereof comprising link 51 and an actuating lever 50, an exhaust valve 42 of the reservoir 38 is closed. This prevents the dissipation of the mentioned pneumatic pressure. Third, by means of a chain of connections comprising a horizontal projection 49 on lug 44, lever 36, and a link 54, operating arm 55 of valve 56 (see Fig. 6) is maintained in its open position. Under the influence of the pneumatic pressure, rapid flow of fluid from reservoir 38 into piston 37 takes place. This action lifts cylinder 30 to its upper position, carrying with it guide member 29, ram 28, and tamping block 24. During this upward movement the top of the container or mold engages the bottom surface of cross member 79 and raises it, together with hopper 27 to the latter's upper position, as shown in Fig. 4. Cross-member 79 is guided laterally by guides 26 which are mounted upon tamping block 24. The upward movement is stopped by engagement of guide member 29 with the bottom surface of cross-member 75 of the main frame 2.

A lug 33 is fastened to the lower end of the right guide rod 31 of Fig. 1. A rod 34 is fastened to lever 36 adjacent its free end and extends upwardly. This rod is free to move longitudinally through a hole in lug 33. A spring 35 surrounds the rod 34. As lug 33 rises with the tamping block and its attached mechanism, which will be called the tamping block mechanism, the lug compresses spring 35 (see Fig. 3) between itself and a collar 76 which is fastened to the upper end of rod 34. When the tamping block has reached its upper position, the pressure is released from foot lever 40. The compression of spring 35 tends to relieve itself and lifts lever 36 and also raises lever 40. Additional means, such as spring 47 attached between supply pipe 48

and rod 45, may be provided to assist in lifting lever 40.

A bar 83 is pivotally suspended from the stationary guide member 32 at the right side of Fig. 2. This bar carries a lug 77 at its near-mid-portion. The bar is resiliently urged to the right at its lower end by means of a spring 78 which is attached thereto and to a stationary part of the machine such as pin 41. As lever 36 ascends, its end strikes lug 77, pushing it to the left. After the lever has passed the lug, the latter returns to its former position. The upward movement of levers 36 and 40 performs a triple function which is the reverse of the function performed by the depression of lever 40. First, it causes the closure of valve 56; second, the closure of air inlet valve 43; third, the opening of air exhaust valve 42. This operation is essentially automatic since it requires no energy other than the removal of restraint from lever 40. The operation of the last two valves relieves the pneumatic pressure from the surface of the fluid in reservoir 38.

The reciprocating tamping tools 10 are in continuous operation and the tamping operation is started by the operator pouring into hopper 27 substantially the correct quantity of moist plastic depolarizing material to form a single tamped core. The cooperation of tamping fingers 10 with hopper 27 is such that before each tamping blow a small quantity of material is automatically fed by gravity into the mold through the openings between adjacent tamping fingers and between the tamping fingers and the lower edge of the hopper. When sufficient of such material has been fed into the container and collects beneath the tamping fingers, considerable pressure is exerted on the material, which pressure is imparted in turn to the tamping block. The pressure from the blow is transmitted to the fluid column between piston 37 and cylinder 30. Plug valve 56 is normally closed during the tamping operation and the total pressure of the blow is concentrated upon relief valve 70. The closing pressure exerted by spring 71 is adjusted so that it is less than the desired pressure of the tamping blow. When the material being tamped has reached a definite density its resistance to further compression equals substantially the difference between the pressure of the tamping tools and that of spring 71. Further descent of the tamping tools causes descent of the tamped material together with the tamping block mechanism. Fluid is forced into the interior of valve 56 and may continue on through openings 64, annular space 65, holes 62, and cavity 63 to reservoir 38. It is readily appreciated that the density of the tamped material is easily regulated by manipulation of adjusting rod 73.

As mentioned heretofore, the plastic material is fed in portions before each blow of the tamping tools and the tamping block mechanism descends with each blow. As the tamping mechanism descends, lever 36 descends with it until it engages lug 77. There it rests until lug 33 engages the top of lever 36. Then with the further descent of the tamping mechanism lug 33 pushes lever 36 past lug 77 and lever 36 drops to its lowermost position, opening rapid flow valve 56. The weight of the tamping block mechanism forces the fluid through the valve into reservoir 38, and the tamping block descends to its lower position. It is evident that by adjusting the position of lug 77 relative to lug 33, the height of the tamped product may be regulated accurately.

The operation of embedding a carbon rod in proper position in the depolarizing mass is as follows. At the same time that the empty container or mold is placed upon tamping block 24, a carbon rod is inserted partially into holder 18 where it is engaged with a weak frictional engagement. When the container has ascended to its upper position the carbon rod rests upon its proper support within the container usually on the bottom of the container. The first tamping operation in which the tamping tools are maintained at an appreciable distance above the bottom of the container compresses a sufficient depth of material about the rod compactly enough so that upon descent of the tamping block the light frictional resistance of holder 18 is overcome and the rod descends with the compacted material. In the ordinary 6 inch dry cell a minimum distance of about ½ to ¾ inch is maintained between the bottom of the tamping tool and the bottom of the receptacle. Holder 18 continues to assist in positioning the carbon rod until the latter is entirely removed from the former. The material also may be tamped without the carbon rod, in which case it may be forced into the core after the tamping operation is finished.

After the tamping block with the tamped product has dropped to its lowermost position, the operator removes the container or mold and replaces it with an empty one and the cycle of operations is repeated. Any loose, untamped material may be removed by up-ending the container or mold.

It is readily appreciated that the operating and control mechanism illustrated is not the only form which may be used. Some of the operations easily may be made automatic, and a number of changes may be made in the mechanical arrangement, some of which have been indicated heretofore.

I claim:

1. A machine for tamping dry cell depolarizing mix comprising, in combination, a reciprocating tamping tool, a tamping block to receive a receptacle for the material to be tamped, means for positioning a carbon rod

centrally upon the bottom of said receptacle, means for feeding depolarizing material into said receptacle and about said carbon rod, a movable cylinder supporting said tamping block, the upper end of said cylinder being closed, a stationary open-ended hollow piston within said cylinder, a reservoir connected with said hollow piston, a fluid confined within and partially filling said reservoir, hollow piston, and cylinder, a valve mechanism between said hollow piston and said reservoir, said valve mechanism comprising a valve body, a rapid flow valve within said body, a relief valve also within said body in by-pass relation to said rapid-flow valve, said relief valve opposing with regulable resilient pressure the flow of said fluid from said hollow piston, said pressure being adapted to be maintained at less than the pressure of said tamping blows, means to automatically open said rapid flow valve when said tamping block has descended to a predetermined point, means operable at will while said block is at its lower position to maintain said rapid flow valve in its open position and to apply pneumatic pressure upon the surface of fluid in said reservoir to cause said fluid to flow into said cylinder, and means for closing said rapid flow valve and relieving pressure from the surface of fluid in said reservoir when said tamping block reaches its initial tamping position.

2. A machine for tamping a mass of dry cell depolarizing mix comprising, in combination, a reciprocating tamping tool, means for feeding depolarizing material beneath said tamping tool, a tamping block mechanism beneath said feeding means and tamping tool and adapted to support a receptacle to receive the material to be tamped, means for positioning a carbon rod within said mass of depolarizing mix, a chamber beneath said tamping block mechanism, a fluid within said chamber, said fluid being confined by and supporting said block mechanism, a reservoir in communication with said chamber, a relief valve opposing with a resilient pressure the flow of said fluid from said chamber to said reservoir, means to regulate said resilient pressure, said pressure being maintained at less than the pressure of said tamping blows, a normally closed rapid flow valve between said chamber and said reservoir in by-pass relation to said relief valve, means to automatically open said rapid flow valve upon descent of said block to a predetermined position, means operable at will to maintain said rapid flow valve in the open position and to apply pressure upon the surface of fluid in said reservoir to return said fluid to said chamber and raise said block, and means to automatically close said rapid flow valve and relieve the pressure from the surface of said fluid upon return of said block mechanism to its initial tamping position.

3. A machine for tamping moist plastic material comprising, in combination, reciprocating tamping tool, means for feeding plastic material beneath said tamping tool, means to hold said material while it is being tamped, a fluid column confined beneath and supporting said material holding means, a reservoir in communication with said column and adapted to contain a fluid partially filling said reservoir, a relief valve opposing with regulable resilient pressure the flow of fluid from said column to said reservoir, said pressure being maintained at less than the pressure of said tamping blows, a normally closed rapid-flow valve between said column and said reservoir in by-pass relation to said relief valve, automatically operable means to open said rapid-flow valve upon descent of said material holding means to a predetermined point, means operable at will to maintain said rapid flow valve in the open position and to return said fluid from said reservoir to increase the height of said column and raise said material holding means, and automatically operable means to close said rapid-flow valve upon return of said material holding means to its initial tamping position.

4. In a machine for tamping a core of moist plastic material, means for regulating the height and density of said core comprising, in combination, a mold to shape said core, a tamping block to support said mold, a movable cylinder supporting said tamping block, the upper end of said cylinder being closed, a stationary open-ended hollow piston within said cylinder, a reservoir connected with said hollow piston and adapted to contain a fluid confined within and partially filling said reservoir, hollow piston, and cylinder, a valve mechanism between said hollow piston and said reservoir, said valve mechanism comprising a valve body, a rapid flow valve within said body, a relief valve within said rapid flow valve in by-pass relation to said rapid flow valve, said relief valve opposing with resilient pressure the flow of said fluid from said hollow piston, means to regulate said resilient pressure, said pressure being maintained at less than the pressure of the tamping blows, said rapid flow valve being normally closed during said tamping operation, means to automatically open said rapid flow valve when said tamping block has descended to a predetermined point, means operable at will while said block is at its lower position for maintaining said rapid flow valve in the open position and applying pneumatic pressure upon the surface of fluid in said reservoir to cause said fluid to flow into said cylinder, and automatic means for closing said rapid flow valve and relieving pressure from the surface of fluid in said reservoir when said tamping block reaches its initial tamping position.

5. In a machine for tamping a core of moist

plastic material, means for regulating the height and density of said core comprising, in combination, a mold to shape said core, a tamping block supporting said mold, a regulable fluid column confined beneath and supporting said tamping block, a reservoir in communication with said column, said fluid partially filling said reservoir, a relief valve opposing with regulable resilient pressure the flow of fluid from said column to said reservoir, a rapid-flow valve between said column and said reservoir, automatically operable means to open said rapid-flow valve upon descent of said tamping block to a predetermined point, means operable at will to maintain said rapid flow valve in the open position and to increase the height of said column and raise said tamping block, and automatically operable means to close said rapid flow valve upon return of said tamping block to its initial tamping position.

6. In a machine for tamping plastic material, means for regulating the height and density of the tamped material comprising, in combination, means for holding and supporting said material while it is being tamped, a fluid column to support said holding means, a reservoir in communication with said column, a relief valve to resist with regulable resilient pressure the flow of fluid from said column to said reservoir, and a rapid flow valve operable automatically when said tamped material has reached a predetermined height to permit the free flow of fluid from said column to said reservoir, said flow being caused by the weight of said material and material holding and supporting means.

7. In a machine for tamping plastic material, means for regulating the height and density of the tamped material comprising, in combination, means for holding and supporting said material while it is being tamped, a fluid column to support said holding and supporting means, a reservoir in communication with said column, means for resisting with regulable resilient pressure the flow of fluid from said column to said reservoir, and means operable when said tamped material has reached a predetermined height to permit the free flow of fluid from said column to said reservoir.

8. In a machine for tamping plastic material, means for regulating the height and density of the tamped material comprising, in combination, means for imparting tamping blows to said material, means for holding said material while it is being tamped, means for supporting said material holding means, means exerting hydraulic pressure against said support for resisting with regulable pressure the lowering of said support, said pressure being maintained at less than the pressure of the tamping blows, and means operable when said tamped material has reached a predetermined height, for lowering said tamped material out of the sphere of action of said tamping tool.

9. A machine for tamping cores from plastic material comprising, in combination, a reciprocating tamping tool, means for forming and holding said material while it is being tamped, means for feeding said material into said forming and holding means, an hydraulic support for said material forming and holding means, said support opposing the blows of said tamping tool with direct regulable pressure, said pressure being maintained at less than the pressure of said tamping blows, and means automatically operable when said tamped material has reached a predetermined height for lowering the tamped material out of the sphere of action of said tamping tool.

10. In a machine for tamping plastic material, means for regulating the height and density of the tamped material comprising, in combination, means for imparting tamping blows to said material, means for holding said material while it is being tamped, an hydraulic column for supporting said material holding means, means for resisting with regulable pressure the lowering of said hydraulic column, said pressure being maintained at less than the pressure of the tamping blows, means operable when said tamped material has reached a predetermined height, for lowering said tamped material out of the sphere of action of said tamping tool, and means for returning said supporting means to the original tamping position.

11. In a machine for tamping a core from plastic material, hydraulic means for supporting said material while it is being tamped, means controlling the movement of said hydraulic means for regulating the height and density of the tamped core, said means comprising a valve mechanism, said valve mechanism comprising a relief valve, the closing pressure of said relief valve being regulable, and a second valve in by-pass relation to said relief valve, said second valve when open, permitting the rapid flow of fluid therethrough.

12. In a machine for tamping a core from plastic material, hydraulic means for supporting said material while it is being tamped, means comprising a valve mechanism for controlling said hydraulic supporting means, said valve mechanism comprising a valve body, a relief valve in said body, the closing pressure of said relief valve being regulable, and a second valve within said body in by-pass relation to said relief valve, said second valve, when open, permitting the rapid flow of fluid therethrough.

13. In a machine for tamping plastic material, a tamping block to support the material and oppose the tamping blows, a fluid column supporting said block, a valve mechanism in communication with said column,

said valve mechanism comprising a hollow valve body, a hollow oscillatory valve seated within said body, said valve in one position permitting free flow of fluid through said body, and in a second position preventing flow therethrough, the change from one position to the other requiring but a single short movement of said valve, and a relief valve seated within said first valve opposing with resilient pressure the flow of fluid from said fluid column, said valve being provided with openings to permit exit therefrom of fluid flowing through said relief valve.

14. In a tamping machine, a movable support adapted to receive a receptacle to hold the material being tamped, tamping mechanism arranged adjacent said support, means for exerting hydraulic pressure against said support for controlling the movement of said support, means for opposing with regulable pressure the release of fluid from said hydraulic means to permit gradual lowering of the support during the tamping operation, and means controlled by the movement of said support for rapidly releasing the pressure in said hydraulic means at the end of the tamping operation.

15. In a tamping machine, a movable support adapted to receive a receptacle to hold the material being tamped, tamping mechanism arranged adjacent said support, hydraulic means to control the movement of said support, means for opposing release of fluid from said hydraulic means to permit gradual lowering of the support during the tamping operation, means controlled by the movement of said support for rapidly releasing the pressure in said hydraulic means at the end of the tamping operation, and means for delivering fluid under pressure to said hydraulic means to return said support to its initial tamping position.

16. In a tamping machine, a frame, tamping tools mounted on said frame, a tamping block movably mounted on said frame, a movable cylinder supporting said tamping block, means for delivering fluid to said cylinder to raise said tamping block to its initial tamping position, means for resisting with regulable pressure the discharge of fluid from said cylinder, whereby said cylinder and tamping block will be gradually lowered during the tamping operation, and means controlled by the lowering of said tamping block to rapidly exhaust the fluid from said cylinder and move said tamping block to its lowermost position.

17. In a tamping machine, a frame, tamping tools mounted on said frame, a tamping block movably mounted on said frame, a movable cylinder supporting said tamping block, means for delivering fluid to said cylinder to raise said tamping block to its initial tamping position, means for resisting with regulable pressure the discharge of fluid from said cylinder, whereby said cylinder and tamping block will be gradually lowered during the tamping operation, means controlled by the lowering of said tamping block to rapidly exhaust the fluid from said cylinder and move said tamping block to its lowermost position, and means for delivering fluid to said cylinder to raise said tamping block to the initial tamping position.

In testimony whereof I affix my signature.

AARON J. HELFRECHT.