To all whom it may concern:

Be it known that I, HENRY T. LANG, a citizen of the United States, residing at Fremont, in the county of Sandusky and State of Ohio, have invented a certain new and useful Improvement in Dry-Cell-Tamping Apparatus, of which the following is a full, clear, and exact description.

This invention relates to machines for tamping or otherwise compacting the "mix" around the electrode in the so-called "dry cells". The improvements set forth in the following description are applicable to tamping machines in general, but for purposes of explanation will be described with reference to the one shown in United States Patent 641,546.

It is the usual practice with tamping machines to have the operator drop the carriage when the mix is tamped in the cell to the proper height. Since this depends on the operator's judgment it is difficult to obtain cells tamped to a uniform height. In the patent referred to, the platform containing the dry cell can is heavily counter-weighted to yieldingly resist the downward movement of the cell in the tamping operation. When the operator judges the cell to be tamped to the proper height it is necessary for him to throw his whole weight onto the control pedal to bring the platform below the tamping plungers. In doing this he is obliged to perform considerable work in raising the heavy counterweight.

One object of the invention is to provide an arrangement for automatically tamping the mix to a uniform height in the cell containers.

Another object is to relieve the operator of all heavy work in connection with the tamping operation.

Other objects will appear in the appended description.

In the drawings:

Fig. 1 is a front view of the apparatus with certain parts in cross section.

Fig. 2 is a cross section of the lower part of the apparatus taken on the line B—B of Fig. 1.

Fig. 3 is a cross section of the piston valve with the piston in a different position from that shown in Fig. 2.

Fig. 4 is a somewhat diagrammatic view of a modified controlling system adapted to be used in connection with the tamping machine shown in Fig. 1.

In all of the views the apparatus is shown more or less conventionally and will be understood not to be a working drawing.

Referring to Fig. 1, the apparatus consists of a bench 1 suitably supported by a number of legs 2. A vertical cylinder 3 is closed at the top by a head 4 which is attached to the under side of the bench by means of a projecting flange 5. The lower end of this cylinder is closed by a head 6 having an opening and a stuffing box 15 for a piston rod 14 attached to the piston 12. The cylinder has four ports, 7, 8, 9 and 10, for admission and expulsion of fluid under pressure.

The upper edge of the piston has a projection 13 which, in the position shown in Figs. 1 and 2, covers the opening 9. At the other end the piston rod 14 is attached to a cross bar 16 in the ends of which are secured vertical rods 17 and 18 that pass through openings in the bench 1 and are fastened at the upper end to a bar 20 which is secured to the dry cell carriage 81 in the patent referred to. The stroke of the piston and carriage is limited by stops 11 fastened to the under side of the bench 1. At the upper end of the stroke the stops 11 engage adjustable collars 11’ on rods 17 and 18, and the downward stroke is limited by engagement of the stop with adjustable collars 11” on rods 17 and 18.

The cylindrical casing 23 of a controlling piston valve is supported at the rear end of the bench 1 in any suitable manner. For example, the valve may pass through an opening 21 in the bench and be vertically suspended by means of a flange 23 of the valve casing, as shown in Fig. 2. Any other means of support may be employed, however. The limit of upward movement of the piston 24 of the valve is controlled by means of an adjustable stop 25 fitted on the piston rod 28 and the downward movement is similarly controlled by adjustable screws 26 in the bottom 27 of the casing. The piston rod 28 projects through the lower end 27 of the valve casing and at this point a suitable packing gland 28’ is provided. A foot lever 29 pivoted to support 30 is depressed against the action of a spring 29’ fastened
between the frame 2 and the front of the lever. The rear end of the foot lever is adapted to engage the rod 28 when the foot lever is depressed, to permit the operator to raise the valve piston 24.

The construction of the piston valve 22 for controlling the operation is as follows:—

Near the top of the casing are placed two ports 31, 32. By suitable adjustment of the stop 25 the piston 24 is prevented from rising high enough to close these ports at any time. The port 31 is connected with the opening 9 of the cylinder 3 by a pipe 33 having a regulating valve 34 in the circuit.

Below openings 31, 32 in the casing are two diagonally opposite openings 35, 36 which branch on the interior to form double valve openings. A pipe 37 connects opening 35 with the port 7 of the cylinder and the opening 36 is connected to a cistern 38 by means of a pipe 39. A by-pass 40 connected, to the pipes 37 and 39 has a check valve 41 therein which permits water to be drawn from the cistern at certain periods of the operation.

A third pair of oppositely placed openings 42, 43 placed below the second pair 35, 36, are similarly bifurcated. The opening 42 connects with the opening 8 through a pipe 44' and the opening 43 communicates with a source of water pressure by a connection 44. Connection is made from opening 32 to the pipe 44 by a lead 45 having a check valve 46 therein to permit water to be discharged, but not admitted, through the pipe 45.

Another pair of openings 47, 48 in the casing, similar to the second and third pair, are connected by pipes 49 and 50 respectively to opening 10 and pipe 44. Between the two pipes 49 and 50 is by-pass 51 having a check valve 52 in circuit which is adapted to allow water to pass only in the direction from 49 to 50.

Near the bottom of the casing is a single opening which is connected to pipe 52' by a lead 53 having a check valve 54 therein, which allows water to pass only in the direction from 52' to 53. The members 56 and 57 are adjusted to prevent the piston from covering the port 52' at any time and to completely close inlet port 48 and discharge port 36 when the valve piston is at the bottom of its stroke.

The piston 24 of the valve controls the opening and closing of the three pairs of oppositely placed bifurcated ports, 33, 36, 42, 43 and 47, 48, by means of six rings or disks 55, 56, 57, 58, 59 and 60. The disk 55 controls the opening and closing of the upper branch of passages 35 and 36 and the disk 59 controls the opening and closing of the same passages. In a similar manner the rings 57 and 58 control the opening and closing of passages 42 and 43, and 59 and 60 control the opening and closing of passages 47 and 48.

The details of the tamper used in connection with the arrangement are described in the patent previously mentioned, and will not be set forth herein, but to fully understand the invention, certain features of such structure will be briefly described.

The tamper, which rests on the bench 1, consists of a supporting frame 63 having a crank wheel 64 driven by a rotating shaft 65 and connected by a link 66 to a cross-head 67 adapted to slide between guides 68, 69.

Tamping plungers 74 are secured to the reciprocating crosshead and are adapted to be intermittently revolved by ratchet and pawl mechanism 75. Spring clips 72 are located between the tamping plungers to hold the carbon electrode in place.

The operation of the apparatus is as follows:—

Having inserted a carbon electrode between spring clips 72 and placed a can 77 on the carriage 81, the operator depresses the pedal 22 which raises the piston in the piston valve to the position shown in Fig. 2. In doing this the small amount of water above the piston 24 is forced back by the pressure exerted through check valve 46 and pipe 45 into the source. In this position the openings 35, 36, and 47, 48 are open. Water is therefore admitted at the base of the cylinder 3 through pipes 49 and 50 from the source, which raises the piston 12 and forces the water in the upper part of the cylinder 3 out through pipes 37 and 39 into the cistern 38. At this time no water passes into pipe 33 as port 9 is covered.

The location of ports 35 and 42 and the controlling disks 55, 56, 57, 58, 59 is such that water from the source cannot at any time pass by way of ports 43, 44, passage 44', cylinder 3, passage 37, and valve ports 35, 36 to the cistern 38.

The upward movement of the piston continues until it assumes the position shown in dotted lines in Fig. 2 in which position the port 9 is just uncovered by the bottom edge of the piston. Water from the lower part of the cylinder then passes into the piston valve by way of pipe 33 through valve 34 into the chamber 84 in the upper end of the valve casing. Prior to this the pressure from the source applied through pipe 45 maintained the check valve 46 of the chamber 84 closed, but the water pressure admitted from the cylinder acts on the upper surface of the valve piston and forces it down again to assume the position shown in Fig. 3, due to the greater effective area of the upper side of the piston. The speed at which this movement takes place may be controlled by adjusting the valve 34.

At this stage of the operation the dry cell

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container 77, the carriage 81, the piston 12
and shelf 79 are elevated to positions shown
in dotted lines in Fig. 2. The cell is then
ready to be tamped. During this time the
tamping plungers are idly reciprocated into
and out of the dry cell can and tamping is
started by the operator feeding mix through
the opening 75 into the container 77 from
the shelf 78. As the material is compacted
in the can, the tamping force is transmitted
to the carriage 81, and by means of rod 83
to the frame made up of plate 20, rods 17,
18, and plate 16. The pressure thus applied
to the piston rod 14 by the reciprocating
stamps 74 overcomes the water pres-
sure applied to the under side of the piston
and the descending piston forces the water
back into the source through pipes 49, check
valve 52 and pipe 51. While the piston is
descending the space in the upper part of the
piston communicates with the cistern 38 by way of pipes 39, 40, check valve 41
and pipe 37, thereby providing for the in-
trance of water as the piston descends. Con-
tinuous downward movement of the piston
12 is caused by the operating mix into the cell and when a predetermined
amount has been tamped therein, the upper
ege of the piston 12 uncovers the port 8
in the cylinder (the valve being in the po-
sition shown in Fig. 3), and water from the
source passes through pipe 44, valve ports
42, 43, and pipe 44” to exert full pressure
15 on the upper face of the piston 12. Inas-
much as the effective area of the lower face
is less than the upper surface by an amount
equal to the area of the piston rod 14, the
pressure on the top forces the water out of
the space below piston 12 through pipe 49,
check valve 52 and pipe 51 into the water
pressure system. This action causes the pis-
ton to descend rapidly until it reaches its
lowest position, as shown in Fig. 2. When
the carriage drops to this point the finished
cell is removed and another container fitted
in the carriage. After inserting a carbon
electrode in the clips 72 the operation is
then repeated.

In Fig. 4 a modified controlling system is
shown which is similar to that of Figs. 2
and 3 but is somewhat simpler. Correspond-
ent parts of the two systems are designated
by the same reference characters. A source
of pressure in this instance a pump
is used. Since the fluid circuit is closed
in the manner described hereafter, oil or
other lubricating fluid may be used therein
instead of water, as in the arrangement pre-
viously described.

The main cylinder 3 is supported from
the bench 1 and connected to the tamping
device through suitable framework attached
to the piston 14 in a manner similar to that
shown in Figs. 1 and 2. The cylinder has
three ports 7, 8 and 10 and stops 11 con-
trolled by adjustable collars 11’ and 11” as
in Fig. 2.

The casing 22 of the controlling valve will
be fastened to the bench 1 or main cylinder
in any convenient manner. Within the cas-
ing is a valve piston 24 and the upper and
lower limits of its stroke are controlled re-
spectively by the adjustable stop 25 on the
piston rod 28 and the stops 26 in the bottom
27 of the casing. The piston rod 28 passes
through the bottom of the casing and is
provided with a packing gland 28” as in
Fig. 2.

The piston valve casing 22 has two ports
35, 36 near the top, the former 35 being
connected by means of a passage 37 to port
7 of the main cylinder. Port 36 is connected
to a cistern 38 through a pipe 39 having a
regulating valve 86 therein. A passage 40
with a check valve 41 located therein con-
nects port 36 with passage 37 and consti-
tutes a by-pass to permit fluid to be drawn
from the cistern during certain periods of
the operation without passing through the
piston valve. In addition to ports 35, 36, 90
the casing 22 has an intermediate port 42
connected to the opening 6 through passage
44” and two oppositely placed lower ports
47, 48. Port 47 is connected to opening 62
through passage 49 which is in communi-
cation with port 48 through a by-pass 50 and
check valve 52 adapted to permit fluid to
flow at certain periods of the operation from
passage 49 to port 48 without passing
through the piston valve casing.

The opening and closing of the ports 35,
36, 42, 47 and 48 is controlled by means of
the following passages and openings in the
piston 24. A circular upper passage 87 in
piston 24 has openings 87’ and 87” adapted
to connect the ports 35 and 36 when the pis-
ton is raised against the upper stops 25.
The port 48 is connected at all times to a
lower passage 88 through a slot 89 in the
piston. Opposite to the slot the piston has
110 two openings 90 and 91 connected to the
passage 88. The lower opening 91 connects
the port 48 with the port 47 when the top
of the piston is raised against the upper
stops 25 and the upper opening 90 connects
the port 48 with the port 42 when the pis-
ton is lowered against the bottom stops 26.
The passage 88 is connected with the space
above the piston at all times by the passage
92 and is likewise connected with the space below
the cylinder through openings 93. A set
screw 103 is fitted in the casing 22 and co-
operates with a groove 106 in the piston 24
to prevent it from turning.

While for purposes of illustration and de-
scription I have shown and described the
main cylinder 3, valve cylinder 22 and check
valves 41 and 52 as being constructed sepa-
ately, in practice the two cylinders 3 and
22 and the check valves 41 and 52 will be
built in a single casing and the direct connecting passages 37, 47 and 49, and by-pass connections 50 and 42 are all cast therein.

From port 48 fluid may pass through a pipe 94 to the cistern 38 when the pressure rises sufficiently to open a pop valve 95.

The inlet side of pump 83 is connected through a pipe 96 to the cistern 38 and the outlet through a pipe 97 to a pressure tank 98. The pipe 94, leading to the cistern 38 is connected to the pressure tank 98 through pipe 99 and controlling valve 100.

The inlet pipe 97 and the outlet pipe 99 of the pressure tank 98 each have a check valve 101, 102 therein to allow fluid to pass only in one direction. A connection 103 having a valve 104 therein is connected to pipe 94 and passage 37.

In the operation of this system the pump 24 is first placed in operation to raise the pressure in the pressure tank to the required value. *The electrode is fitted in the spring clips 72 and the can 77 is placed in the carriage 81 as previously. The foot pedal 25 (Fig. 2) is then depressed, thereby raising the piston 24 of the valve to the position shown in Fig. 4. To do this it is only necessary to apply a force sufficient to overcome the spring 29* (Fig. 2) and the fluid pressure on an area equal to that of the piston rod 28. This is due to the fact that the passage 92 and 93 communicate with the passage 88 so that pressure transmitted from the pressure tank 98 will be applied to both the top and bottom faces of the piston at all times. In the modification of Figs. 2 and 3 the operator when first applying pressure had to use sufficient force to overcome the combined force of the pressure on the entire top area of the piston and a vacuum created on the lower face of the piston. This force had to be applied until the edges of the rings 59 and 60 uncovered the ports 47 and 48 (Figs. 2 and 3) when the operator worked against the same pressure as in Fig. 4.

By raising the piston to the upper end of its stroke, opening 91 is placed opposite port 47 and pressure is applied to the lower face of the piston 12 to raise the tamping frame and can to the uppermost tamping position, as shown in dotted lines. During this upward movement the operator maintains the foot lever 29 depressed and the fluid above the piston 12 is forced out through port 7 by way of the valve passages 37 and 87 into the cistern 38.

When the operator removes his foot the foot lever is returned by the spring 29* and the valve piston 24 descends due to its own weight and the greater pressure acting on the upper face, until the bottom reaches the stops 26. In this lower position port 47 is closed and opening 90 comes directly opposite port 42. As in Fig. 3 the ports 53 and 42 and the ports 87', 90 and 91 of the piston are located so that water from the pressure tank cannot at any time pass to cistern 38 by way of passage 88, port 42, passage 44', chamber above piston 12, passages 37 and 87 to pipe 39.

When the valve piston 24 has reached this position, in which it was originally, the operator feeds mix and commences the tamping operation. The tamping operation forces the piston 12 downward and since valve port 48 is closed as previously described, the fluid under the piston is forced into the cistern 38 through port 10 by way of check valve 32 and pipe 94, and opens pop valve 95 when the pressure becomes sufficiently high. During this operation the liquid cannot be forced into the pressure tank 98 on account of check valve 102. Fluid from the cistern 38 fills the space above the piston 12 as it descends during the tamping operation, but since valve 86 ports 35 and 36 are now closed, this fluid is drawn through check valve 41.

When the main cylinder piston 12 has descended to a point where port 8 is uncovered, pressure will be admitted on top of the piston through opening 90, port 42 and passage 44*, and will force the piston 12 and connected tamping frame rapidly downward to permit the cell to be removed. The fluid forced out from below the piston 12 passes through check valve 52 into valve passage 88, opening 90, port 42, passage 44* and port 8 into the space above the cylinder, together with an additional quantity from the pressure tank 98 equal to the decrease in displacement of the piston 14 in the cylinder 3.

The pump 85 may be operated either continuously or intermittently to remove the oil deposited in the cistern during tamping and pump it into the pressure tank 98 to maintain the desired pressure. If the pump is operated continuously, oil will be forced through the pop valve 95 whenever the carriage is stationary, and if operated intermittently the stopping and starting will be controlled by the pressure in the tank.

In this arrangement the pressure tamped against is that required to open the pop valve 95 and the force required to open it must be greater than that directly applied by the pressure tank through pipes 99 and 94 or the oil would continually run from the tank to the cistern and then be pumped back to the tank.

If for any reason it is desired to adjust the tamping sticks or tamping mechanism with the piston 12 raised to its upper position and without a can in position, the tamping force cannot be readily applied to force the piston down. In this instance the valve piston 24 is permitted to descend and additional means is provided to force the carriage down. This consists of the connection 103 and valve 104 which is opened to apply...
pressure from the tank 8 to the upper face of the piston 12. When the piston is lowered this valve is closed and is ordinarily maintained closed during operation.

5. With the controlling arrangements described it is unnecessary for the operator to judge when the cell is tamped to the proper height. The opening 8 controls the descent of the piston and carriage so that when the upper edge of the piston descends beyond this point the cell drops quickly to prevent mix from being tamped therein.

While I have described my invention as applied to a reciprocating tamper, it will be obvious that it could be applied to others, such as the screw type. In fact, the invention is applicable to any tamping apparatus in which the cell recedes from the tamping means while being tamped.

20. The particular arrangement of ports in the main cylinder and valve cylinder shown and described is well adapted to accomplish the desired results, but it will be obvious that many modifications could be made without departing from the spirit of the invention.

Having described my invention, what I claim is:

1. In dry cell tampers, a can carriage, means for tamping the mix in the can, means adapted to permit yieldingly-resisting movement between said carriage and tamping means as the mix is tamped into the can and means whereby the can carriage and the tamping means are automatically separated when the mix reaches a predetermined height in the can.

2. In dry cell tampers, a movable can carriage, means for tamping the mix in the can, means for yieldingly resisting the movement of said can carriage as the mix is tamped in the can and means whereby the can carriage is automatically withdrawn from the tamping means when the mix reaches a predetermined height in the can.

3. In dry cell tampers, a carriage adapted to support a dry cell can and to move parallel to the can’s axis, means for tamping the mix in the can, means including a piston adapted to yieldingly resist the movement of said carriage, and means for admitting pressure to the piston to forcibly remove the can carriage from the tamping region when the mix reaches a predetermined height in the can.

4. In dry cell tampers, a can carriage, a cylinder, a piston in the cylinder connected to the carriage, means for yieldingly resisting movement of the can carriage, a connection adapted to admit pressure to the cylinder at one side of the piston, and means for closing said connection until the mix is tamped to a predetermined height in the can.

5. In dry cell tampers, a can carriage, a cylinder, a piston in the cylinder connected to the carriage, a connection adapted to admit fluid pressure in the cylinder at one side of the piston, a connection adapted to admit fluid pressure to the other side of said piston and means for closing said last mentioned connection until the mix is tamped to a predetermined height in said can.

6. In dry cell tampers, means for tamping the mix in the cell can, a cylinder secured to said tamping means, a piston in said cylinder, a can carriage connected to the piston, said piston having a greater effective area on one side than on the other, a connection admitting fluid pressure to the side of the piston of lower effective area, a connection to admit fluid pressure to the side of the piston of greater effective area, a discharge reservoir and a third connection between said last mentioned side of the piston and the discharge reservoir.

7. In dry cell tampers, a tamping arrangement for the cell cans, a vertical cylinder, a piston in said cylinder, a can carriage connected to said piston, a port at the bottom of said cylinder connected to a fluid pressure source, a port at the top of said cylinder connected to a discharge reservoir, a third port intermediate to said first and second mentioned ports adapted to be covered by the piston throughout a portion of its travel, and means for controlling the admission of fluid through said ports.

8. In dry cell tampers, tamping means for the cell cans, a vertical cylinder, a piston in said cylinder, a can carriage connected to said piston, a port for admitting pressure in the lower end of said cylinder, a second port in the upper end of said cylinder, a third port intermediate to said first and second mentioned ports adapted to be covered by the piston in the upper part of its stroke, connections from the first and third ports to a source of fluid pressure and from the second port to a discharge tank, controlling valves for the connections leading to said ports, a check valve around the controlling valve in the pipe connected to the first mentioned port adapted to permit discharge of water from the cylinder, and a check valve around the controlling valve in the connection leading to the second mentioned port adapted to permit water to pass into the cylinder.

9. In dry cell tampers, tamping means for the cell cans, a vertical cylinder connected thereto, a piston in the cylinder, a carriage connected to the piston, a port at each end of the cylinder and in an intermediate portion thereof, a piston valve casing having a port connected to each of the ports in said cylinder, a valve piston in said casing adapted to open and close the ports in said casing, a source of pressure and means for connecting...
the upper portion of said valve casing to said source.

10. In dry cell tampers, a stationary cylinder, a piston therein, a can carriage connected to the piston, a port for admitting pressure to one end of said cylinder, a second port at the other end of said cylinder, a valve controlling the admission of fluid pressure to the first port, a check valve around said controlling valve and means for closing said controlling valve.

11. In dry cell tampers, dry cell tamping means, a vertical cylinder secured thereto, a piston in the cylinder, a can carriage connected to the piston, a port for admitting fluid pressure to the lower end of the cylinder, a second port in the upper end of said cylinder, connections to said ports, valves controlling said connections, means for simultaneously opening and closing said valves, a check valve around each of said controlling valves and means for closing both of said controlling valves when the piston is in its upper limit of stroke.

12. In dry cell tampers, means for tapping the mix in the cell cans, a stationary cylinder, a piston in said cylinder, a can carriage connected to the piston, connections for admitting pressure to one end of the cylinder, a valve in said connections and means activated by the movement of the piston in the cylinder to control said valve.

13. In dry cell tampers, means for tapping the mix in the cell cans, a stationary cylinder, a piston therein, a can carriage connected to said piston, connections for admitting pressure to one end of the piston, exhaust connections at the other end of said cylinder, controlling valves in both of said connections and means for closing said valves after the piston reaches the end of the upward stroke.

14. In dry cell tampers, means for tamping the mix in the cell cans, a stationary cylinder, a piston therein, a can carriage connected to said piston, an inlet connection for admitting pressure to one end of the cylinder to force the piston to the other end thereof, an exhaust connection in said other end of the cylinder, controlling valves for said connections, check valves around said controlling valves, a third connection to the intermediate portion of the cylinder, a valve in said third connection and means controlled by the position of the piston in the cylinder to open said third mentioned valve and means for closing said first mentioned valves.

15. In dry cell tampers, tamping means for the cell cans, a vertical cylinder connected thereto, a piston in the cylinder, a carriage connected to the piston, a port at each end of the cylinder and in an intermediate portion thereof, a valve casing having a port connected to each of the ports in said cylinder, a valve piston in said casing adapted to open and close the ports in said casing, and a fourth port in the intermediate portion of said cylinder connected to the upper portion of said valve casing.

16. In dry cell tampers, means for tapping the mix in the cell cans, a stationary cylinder, a piston in said cylinder, a can carriage connected to the piston, connections for admitting pressure to one end of the cylinder, a piston valve in said connections having a greater effective area on one side than the other, a source of pressure and means for simultaneously connecting both sides of the valve with the source of pressure.

In testimony whereof, I hereunto affix my signature.

HENRY T. LANG.