Jan. 2, 1923. **1,441,196.**

L. A. FREEDMAN.

CONVEYING MECHANISM FOR DRY BATTERY MACHINES.

ORIGINAL FILED MAY 13, 1916. 3 SHEETS—SHEET 1.

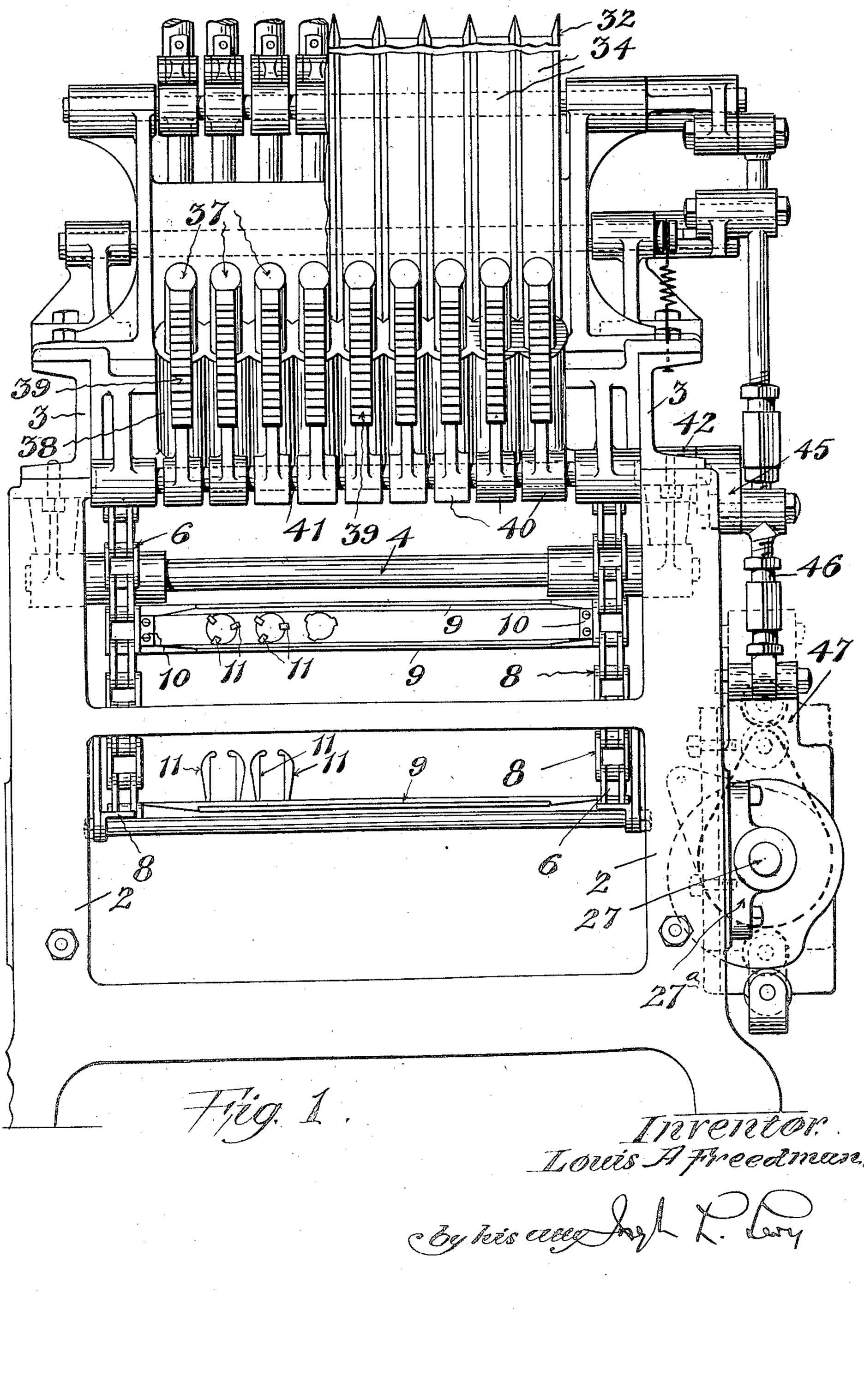

Fig. 1.

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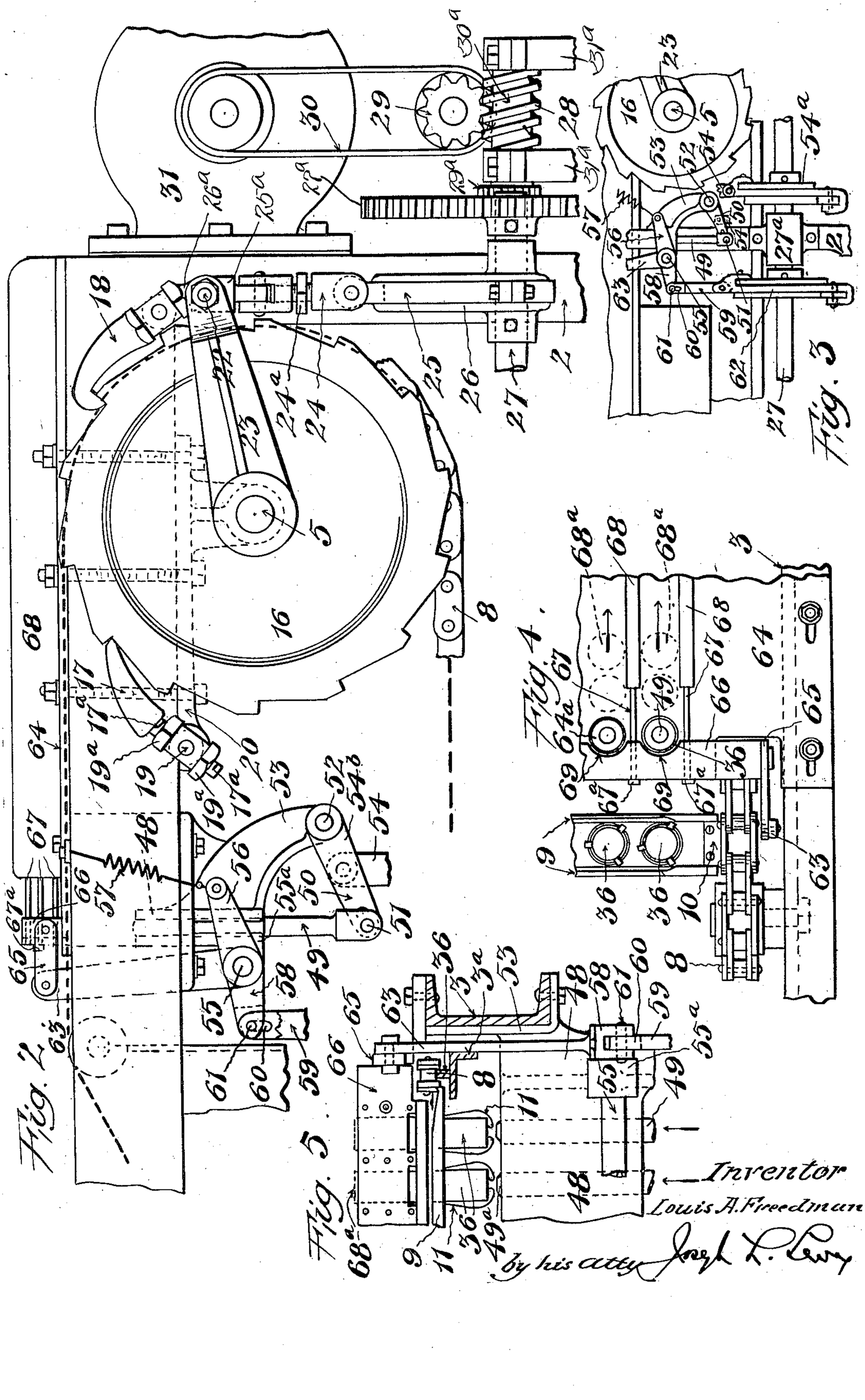

Fig. 3

Fig. 4.

Fig. 2.

Fig. 5.

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ORIGINAL FILED MAY 13, 1916. 3 SHEETS—SHEET 3.

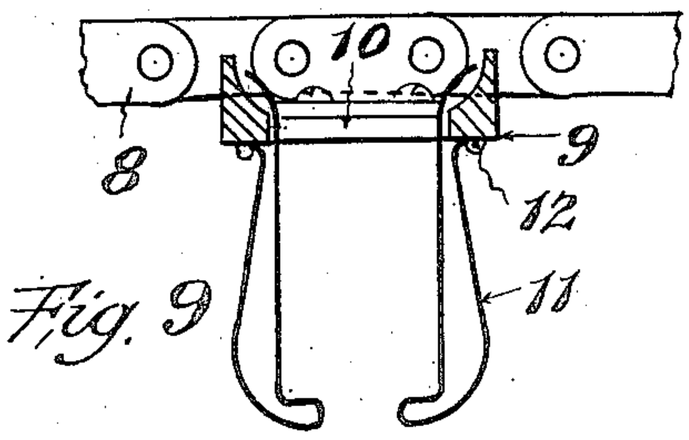

Fig. 9

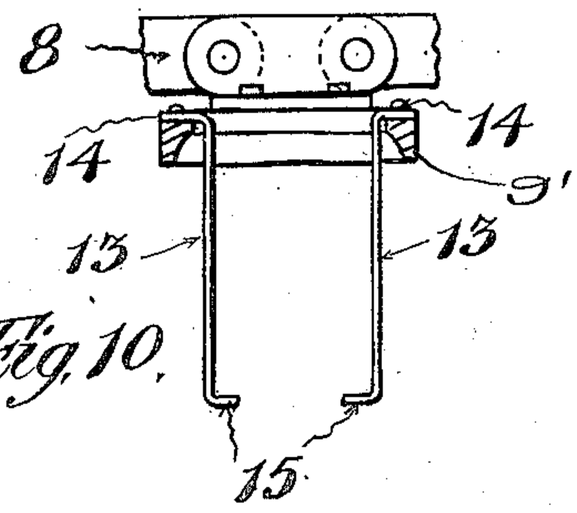

Fig. 10.

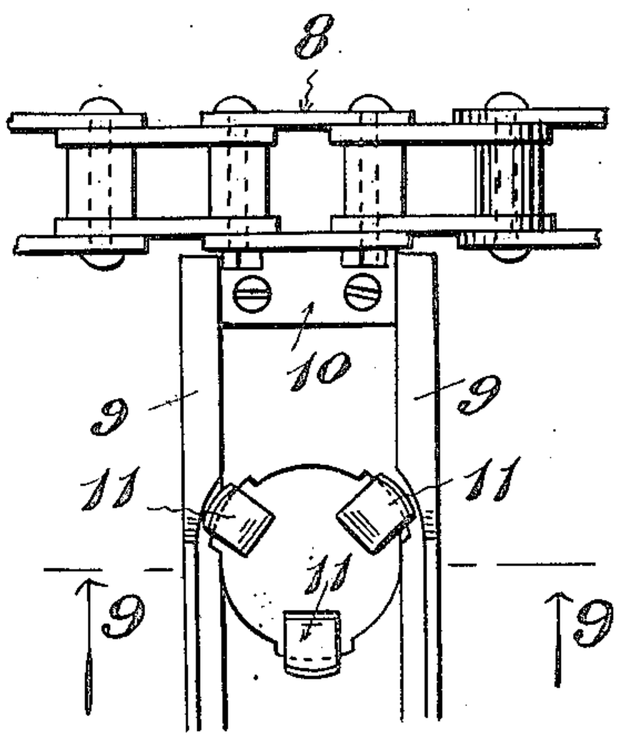

Fig. 8.

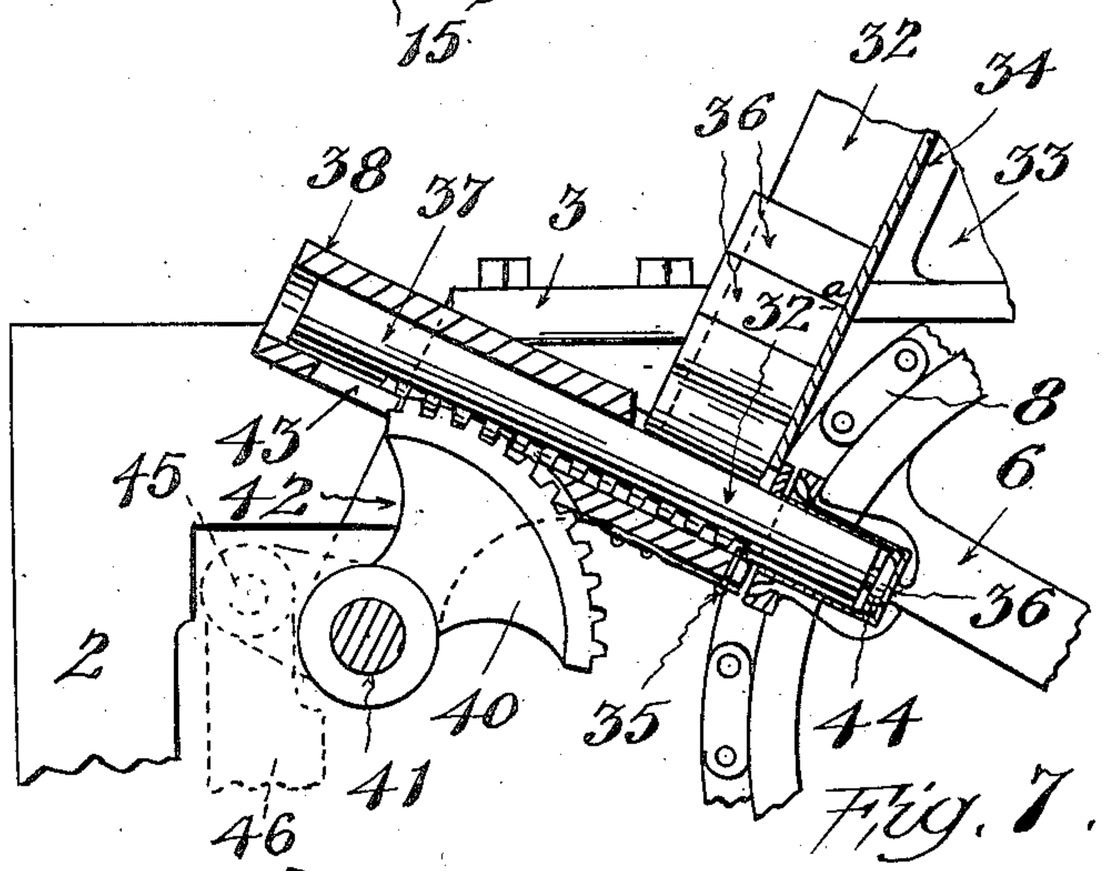

Fig. 7.

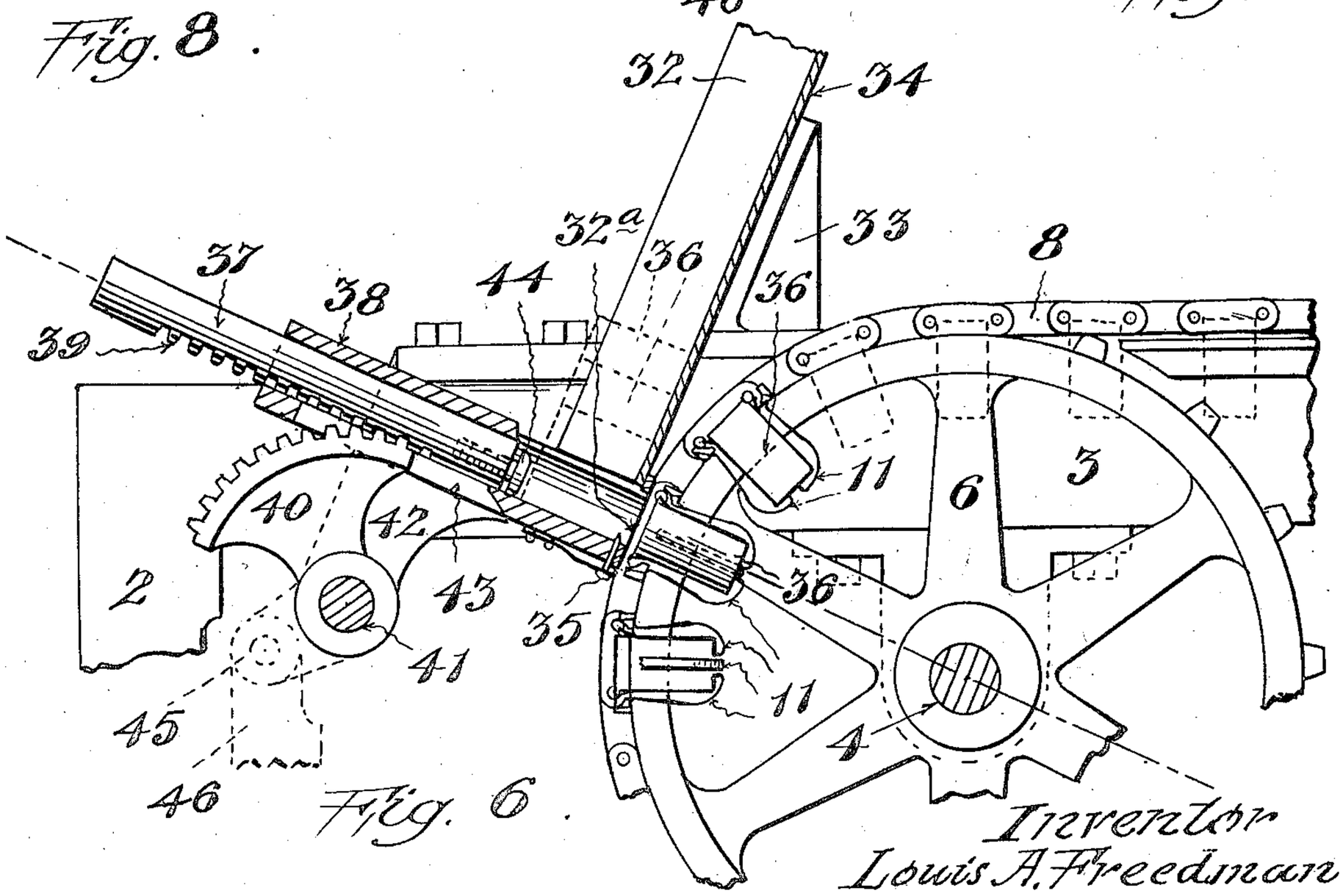

Fig. 6.

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Patented Jan. 2, 1923. 1,441,196

UNITED STATES PATENT OFFICE.

LOUIS A. FREEDMAN, OF NEW YORK, N. Y.

CONVEYING MECHANISM FOR DRY-BATTERY MACHINES.

Original application filed May 13, 1916, Serial No. 97,441. Divided and this application filed June 18, 1919, Serial No. 305,014. Renewed December 4, 1922.

To all whom it may concern:

Be it known that I, LOUIS A. FREEDMAN, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a certain new and useful Improvement in Conveying Mechanism for Dry-Battery Machines, of which the following is a specification.

This invention relates particularly to a conveying mechanism for transporting battery shells, or receptacles of any kind, while various operations, such as filling, heating, cooling, and the like, are performed on these articles, and the object of this invention is to provide a mechanism of the character above described, in which the shells or other receptacles are automatically inserted into a conveyor, with suitable mechanism for moving the conveyor, and also to provide mechanism for automatically ejecting completed or filled receptacles from the conveyor.

This application is a division of my copending application Serial No. 97,441, filed May 13th, 1916, renewed May 27, 1922, Serial No. 564,219.

With these objects, and other objects which may hereinafter appear, in view, I have devised the particular arrangement of parts hereinafter set forth, and more particularly pointed out in the claims appended hereto.

Reference is to be had to the accompanying drawings, forming a part hereof, in which

Figure 1 is an end view of a portion of a battery making machine, provided with my improved conveying mechanism, and disclosing the shell inserting mechanism which is preferably mounted at this end of the machine,

Figure 2 is a side elevation of the conveyor-operating mechanism, together with the mechanism for ejecting the filled shells,

Figure 3 is a side elevation of the shell-ejecting mechanism,

Figure 4 is a plan view of a portion of the shell ejecting mechanism,

Figure 5 is an end view, partly in section, of the mechanism shown in Figure 4,

Figure 6 is a side elevation, partly in section, a portion of the mechanism for inserting empty shells in the conveyor,

Figure 7 is a side elevation, partly in section, of the shell inserting mechanism, disclosing the manner in which the shell inserting plunger operates to insert a shell in the conveyor,

Figure 8 is a plan view of a portion of the conveyor, showing a portion of one of the cross braces and shell holding clips secured thereto,

Figure 9 is a sectional view on the line 9—9 of Figure 8, looking in the direction of the arrows, of one of the shell holding clips, and

Figure 10 is a sectional view of another form of shell holding clip.

Throughout the various views of the drawings, similar reference characters designate similar parts.

Generally, the mechanism disclosed in this application is divided into three parts, the first being a conveying mechanism which carries the battery shells from one end of the machine to the other and preferably with an intermittent movement; the second part comprises means for inserting the empty shells into clips arranged on the conveyor; and the third part comprises an ejecting means for the filled shells. In the preferred embodiment of my invention, the shell inserting mechanism is placed at one end of the machine, and the shell ejecting mechanism at the other end, all battery-making operations taking place within the space situated between these two mechanisms. While I will hereinafter specifically refer to a battery making machine, and also refer to the receptacles as "battery shells," it will be understood that the mechanisms to be hereinafter described may be utilized in many forms and types of machines, so I do not limit or confine my invention specifically to battery making machines.

In the preferred embodiment of my invention, as shown in the accompanying drawings, 1 indicates a portion of the frame of the machine to which my improved conveying mechanism is applied. The frame is preferably of a substantially narrow width and is provided with suitable supports, as at 2, and with the longitudinally extending upper side members 3.

Mounted adjacent the two ends of the machine are transversely extending shafts 4 and 5. The shaft 5 is the driven shaft, and is rotated intermittently by suitable driving mechanism to be hereinafter described.

Adjacent the ends of each of these shafts

are sprockets 6, and the sprockets on the shaft 5 connect the sprockets on the shaft 4 by chains 8, whereby the rotation of the shaft 5 by the driving mechanism hereinafter referred to causes a rotation of the shaft 4. These parallel chains 8 constitute the conveying mechanism, and they are connected by cross bars 9. These cross bars 9 are connected to the sides of the chains by L-shaped members 10, and each cross bar is provided with a plurality of perforations upon which are mounted resilient clips or fingers 11 which are adapted to receive, hold and carry the battery shells. In the construction of the spring clips shown in Figure 9, three fingers are shown and each finger consists of a strip of flat resilient material, having one of its ends secured to the cross bar 9 as at 12, and then this spring strip extends downwardly and then outwardly and then inwardly parallel with the bottom of the shell adapted to be embraced by the fingers; and thence upwardly and parallel with the sides of the shell and thence outwardly and away from the shell so that the three fingers comprising each clip form a flared opening at their upper ends, whereby the shells may be readily inserted between each set of fingers by the shell inserting mechanism hereinafter described.

In Figure 10 is shown a modification of a form of a shell holding clip. Here the fingers are made of flat spring metal with their upper ends bent at right angles to the body of the clips 13, and fastened to the cross bars 9′, as at 14. The lower ends 15 of the fingers are bent inwardly and towards one another as shown. This form of clip may be substituted for and used in place of that shown in Figure 9.

The sets of clips are placed side by side in the cross bars, the number of sets being limited by the length of the cross bars extending across the machine, and by the number of batteries desired to be operated upon all at one time in any one row across the width of the machine.

Conveyor actuating mechanism.

Situated at one end of the machine is the conveyor actuating mechanism which is concentrically constructed about the transverse shaft 5. The transverse shaft 5 is supported by two bearings which are slidably mounted on the side frames 3 of the machine in such a manner that the pair of sprockets 6, 6, fixed to shaft 5, which carry the chains 8, 8 may be moved backward or forward in the direction of the length of the machine so as to control the amount of slack in the chains 8, 8 at all times.

Only one of these bearings designated as 20 for shaft 5 is shown, and the other is of the well known pillow block type, both bearings having slotted holes therein for allowing the bolts which mount them on side frames 3 to hold the transverse shaft 5 in any desired place thereby controlling the slack in the chains 8, 8. Fixed on the shaft 5 in addition to the chain sprockets 6, 6 is the ratchet wheel, 16, which is adapted to be engaged by the pawls 17 and 18. The pawl 17 is pivotally mounted on the bearing 20 by the pivot block 19 which is pivotally fixed into the extension on bearing 20. This construction permits the pawl 17 to move back or forward as desired, to move the shaft 5, and thus control the slack in the chains 8, 8. With the exception of the provision for holding the pivot block 19, the bearing 20 is identical with the other bearing not shown, which supports transverse chain sprocket shaft 5 on the other side of the machine. The purpose of the pawl 17 is to control any backward rotation of the shaft 5 and conveyor chains 8, 8 carried by the sprockets 6, 6 which are controlled by the adjustment constructional features of the combination of the lock nuts 19^a mounted upon the threaded portion 17^a of pawl 17. By altering the position of the lock nuts 19^a upon the threads 17^a the engaging face of the pawl 17 can be changed so as to exactly fix the permissible amount of backward movement of the ratchet wheel 16.

The pawl 18 is pivotally connected at 22 to pawl radius arm 23, which has its inner end loosely mounted on the hub of the ratchet wheel 16 on the shaft 5. The radius arm 23 with the pawl 18 is also pivotally connected at 22 by a series of links 24, 25^a and 26^a to an eccentric strap 25 driven by an eccentric 26 fixed on the main shaft 27 which extends longitudinally of the entire length of the machine.

By the action of the eccentric 26 on the main shaft 27 of the machine, it is clear that when the main shaft 27 rotates, the radius arm 23 with pawl 18 pivotally connected thereto at 22, is caused to oscillate backward and forward concentrically about the center of shaft 5 due to the adjustably extensible universal connecting links 24, 25^a and 26^a. The coupling bolt link 24^a is used to lengthen out or shorten at will, the distance between the points 22 and 23, and the center of shaft 27.

The main shaft 27 has a gear 27^a fixed on it at one of its ends and this gear 27^a meshes with and is driven by a gear 29^a which is fixed upon a worm shaft 30^a on which is mounted a worm 28. The worm shaft 30^a is mounted to rotate in bearings 31^a and is driven by a gear 29 driven by a belt 30 from a motor 31 fixed to the machine.

By the mechanism just described, the action of the conveyor will be apparent. The pawl 18 is concentrically reciprocated about the center of ratchet wheel 16 by means of

the eccentric 25, and as it is thus moved, it engages the teeth on the ratchet wheel 16, tooth by tooth, and thereby intermittently rotating it. On the downward movement of the pawl 18, the ratchet wheel 16, and thus the conveyor, is being moved, and during the upward movement of the pawl 18 the conveyor is not moving, and it is during these pauses or dwells in the movement of the conveyor that operations upon the battery shells held by the conveyor take place.

If for the reason of the chain being lengthened due to wear or stretching, or expansion in the direction of its length, caused by the rise in temperature due to the chain passing through any heating tanks which may be located on this conveying mechanism, it may be found necessary to take up the slack in the chains 8, 8. For this purpose the shaft 5 with everything mounted thereon can be shifted back or forward without altering any of the adjustments of the concentric reciprocating action of the ratchet pawl 18 or the back stop pawl 17 by reason of its construction heretofore described. The number of teeth on the ratchet wheel 16 is the same as the number of cross pieces 9 that are spaced on the chain 8. In this way it is clear that each time the pawl 18 engages a tooth on the ratchet 16 and moves it ahead until the retaining pawl 17 falls into place, each cross piece will be moved forward far enough so that each succeeding cross piece will occupy the place previously occupied by the preceding cross piece.

Inserting mechanism.

At the opposite or front end of the machine is situated the mechanism for inserting empty shells in the conveyor. At 32 are shown the inclined shell holding slideways. There are a series of these slideways, the amount of slideways being governed by the amount of sets of shell holding clips on each cross member 9 of the conveyor. The slideways are placed parallel to one another and all are supported on a suitable bracket 33 fixed to the side rails 3 of the frame of the machine. These inclined slideways are so arranged and disposed that they hold the unfilled shells 36 of the batteries, so that the cylindrical surfaces of the shells stack one against another, and the bottoms of the shells rest against the bottom plate 34 of the slideways 32.

The lower end of each slideway 32 is cut away as at 32ª, and a spring pressed bolt 35 normally holds the bottom shell in position from falling through the openings 32ª. This spring pressed bolt 35 is thrust aside by the shell whenever a plunger 37 is forced into the lowermost shell by mechanism which will be described below. In addition to this, the spring pressed bolt 35 tends to hold the lowermost shell in each slideway from sliding through 32ª into the conveyor until pushed therein by the plunger 37.

At the bottom of each shell slideway 32 is placed a plunger guideway 38, which is opposite a corresponding set of clips in cross piece 9, and so located that the center line of the plunger guideway is directly in line pointing towards the center line of the transverse chain sprocket shaft 4 which has mounted upon it the pair of sprockets 6, 6 for chains 8, 8. The chains 8, 8 are designed to carry the cross pieces 9 in a manner already described so that when the sets of clips 11 holding the battery shells 36 in cross piece 9 are in registration with and come properly to rest underneath and close to this inserting mechanism, then each plunger is centered up concentric with its respective set of clips for holding the cup about to be inserted therein.

This plunger 37 is provided with a toothed under surface or rack portion 39, which is adapted to engage a segmental gear 40 mounted on an oscillating cross shaft 41, which extends transversely of the machine, and is mounted in bearings 42 on the side members 3 of the frame of the machine.

The plungers 37 are moved by the segmental gears 40 in guideways 38 in a direction which is normal to the pitch circle of the chains 8, 8 on sprockets 6, 6 of the shaft 4, as will be seen by the drawing, Figure 6, which shows the center line of plungers 37 passing through the center of shaft 4.

To permit proper meshing of the teeth of the segmental gear 40 and the toothed portion 39 of the plunger, the plunger guide 38 is slotted as at 43. The end of the plunger 37 which enters the cup is provided with a spring-pressed end 44, which is adapted to come into contact with the bottom of the shell which is lowermost in the column or pile of shells in the slideway and force the same forward through the openings 32ª against the resistance of spring pressed bolt 35 into its corresponding set of resilient clips 11 on that one of the cross members of the conveyor at rest opposite the openings 32ª of the cell inserting mechanism. The telescopic spring pressed end 44 of the plunger 37 is a precautionary means to assure proper contact between the bottoms of the clip fingers and shells in spite of varying depths of shells and also assures the proper compensation in the length of forward movement of the plungers 37 required to properly seat all shells between the clips 11 in the cross piece 9 of the conveyor and yet at the same time not to push any one or more shells out through the bottom of a set of clips.

The shaft 41 is oscillated at the proper time, which is during one of the pauses in

the movement of the conveyor, by means of a crank 45 fixed to one of its ends, which engages a link 46 which is preferably adjustable as to length, and this link 46 is connected to suitable cam mechanism 47 which is driven by the main shaft 27 of the machine. It will be understood from the foregoing that for every revolution of the main shaft 27, the plungers 37 are driven forward to force a shell into its respective set of clips and then the plungers move backward withdrawing far enough so as to allow the next shell that is in the bottommost position in each slideway 32 to drop down into each plunger guideway 38, in position awaiting to be forced into the next set of clips situated on the next cross piece mounted on the chain, upon the next subsequent forward movement of the plungers 37.

It will also be understood that the plunger mechanism is identical for each slideway and operates identical for each longitudinal line of clips in the machine.

After the shells have been inserted into the clips 11, they are carried by the conveyor to various mechanisms which are placed on the frame of the machine. These various mechanisms fill, heat, cool and perform other operations on the shells while these shells are held in the conveyor during the intermittent pauses as well as at other times while on their way on the conveyor, and when the shells reach the ejecting mechanism, now to be described, these operations having been performed, the filled shells are ready to be ejected from the conveyor.

Ejecting mechanism.

The ejecting mechanism is shown in Figures 2, 3, 4 and 5. On the inside of the longitudinal side members 3 of the machine and extending downwardly from the main body 48 of the ejector mechanism are located brackets 53, which are united by the transverse section 48, which is provided with a plurality of parallel vertically extending perforations through which vertically reciprocating ejecting plungers 49 move. Each of these plungers is so placed as to be in direct alignment with a shell when held in the clips 11 so that upon its upward movement, the plunger is adapted to contact with the bottom of the shell and force the shell upward and out of engagement with the fingers 11 of the clip. The upper end of each plunger is beveled as at 49[a] so that they can pass in between the clips should no shell be held therein.

Each plunger 49 is connected to a suitable crank 50 by means of a slotted pivot construction at 51, and each crank 50 is fixed on an oscillating shaft 52 which has its ends mounted in the brackets 53. The shaft 52 is oscillated at the proper time by means of a link 54 attached as shown to a lever 54[b] mounted on the shaft 52 which is reciprocated by means of suitable cam mechanism 54[a], on the main shaft 27 of the machine.

The bracket 53 is provided with an extension in the form of a bearing 55[a] and in this bearing is mounted a shaft 55 which extends transversely of the machine and upon which is fixed a number of crank arms.

One of these arms 56 has its end attached to a coil spring 57 which has its upper end attached to a fixed part of the machine on the longitudinal frame member 3. This spring 57 is a retractive spring, and normally holds the arm 56 in the position shown. Another arm 58 is fixedly mounted on the shaft 55, and is connected at its end to a link 59 which has a slot 60 in which a pin 61 on the lever 58 extends. The link 59 extends to suitable cam mechanism 62 on the main shaft 27 of the machine, which causes the link 59 to reciprocate once in each revolution of the shaft 27.

Another arm 63 is one of a pair that is fixed on the shaft 55 and which runs in a substantially vertical direction to above the level of the table plate 64 where both arms 63 are attached by links 65 to the cell pusher slide 66. This cell pusher slide 66 has a series of perforations for the parallel fingers 67 which serve as partitions, to pass through the pusher slide 66. On one end of the parallel fingers 67 they are made fast into the ends of the vertical divisional plates 68, and at the other end the parallel fingers 67 are provided with the enlarged head construction 67[a] so as to act as a limit stop for the backward movement of the cell pusher slide 66, which slides backward and forward on them.

The table plate 64 is slidably mounted upon the side members 3. This table plate 64 in combination with the divisional plates 68 extending in a direction parallel with the chain travel, forms the means for receiving the cells in parallel rows 68[a] as they are ejected from the machine.

Therefore, in each alley on the table 64 and similar to the openings 32[a] in the shell inserting mechanism are the openings 64[a] in the table plate 64 which are so located to be directly above and in line with the ejector plunger 49.

The slide 66 is provided with semi-circular recesses 69 which fit the cylindrical sides of the shells 36 when they have been raised by the plungers as shown in Figure 4, and are shaped in contour so that they are positioned slightly back from the perforation openings 64[a] in plate 64.

The cams which drive the links 54 and 59 are so timed that at the proper time, when a cross bar 9 of the conveyor carrying its spring clips filled with the completed or filled battery shells reaches a position directly above the plungers 49, the chains with

their cells come to rest and the plungers are elevated and the shells are forced out of the embrace of the spring clips upward through the table perforations 64ª and are lifted to an elevation slightly above the level of the table 64. Up to this point the slide 66 has been stationary, the slot 60 in the link 59 permitting upward movement of the link 59 without causing movement or actuation of the arms 56, 58, 63, 65 and the pin 61. The bottom of the slot 60 is reached by the pin 61 co-incidentally with the raising of the shells 36 by the plungers 49 through the table perforations 64ª to their highest point. Then the slide 66 rapidly moves forward by further lifting of the link 59 whereby the shells are swept forward from their position on top of the plungers 49 onto the table 64 and between the guides 68 in rows 68ª from whence they may be removed when desired. The plungers 49 are then lowered down far enough to clear the next row of shells approaching, the slide 66 is drawn backward against the stops 67ª where it awaits the lifting of the next row of shells.

Having described my invention, it is obvious that it is not to be restricted to the exact embodiment shown, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. In a machine of the class described, a conveyor provided with a plurality of spring clips for holding receptacles, means for inserting shells into said clips comprising a plurality of plungers and mechanism for actuating the same, ejecting mechanism comprising a plurality of plungers adapted to force the shells out of the embrace of said clips, a slide, and a table upon which said shells are adapted to be moved by said slide.

2. In a machine of the class described, a conveyor, means on said conveyor for receiving and holding a plurality of receptacles, a plurality of plungers and means for actuating the same to cause said plungers to insert receptacles into said receptacle holding means, and an ejecting mechanism comprising a plurality of plungers and means for actuating the same to cause said plungers to remove the receptacles from out of engagement with the receptacle holding means, a slide, and a table upon which said receptacles are adapted to be moved by said slide.

3. In a machine of the class described, a conveyor provided with a plurality of receptacle holding spring clips, a receptacle slideway, a plunger beneath said slideway provided with a spring pressed head for contacting with and forcing a receptacle into position in a set of spring clips.

4. In a machine of the class described, a conveyor for holding a plurality of receptacles, means for ejecting said receptacles from said conveyor comprising a plurality of vertically movable plungers, a table, and a slide adapted to move the receptacles onto said table when elevated by the plungers.

5. In a machine of the class described, a conveyor having a plurality of spring clips for holding receptacles, a plurality of plungers adapted to contact with and force said receptacles out of the embrace of said clips, a table and a slide for moving the receptacles onto the table after the same has been disengaged from the clips.

6. In a machine of the class described, a conveyor, means on said conveyor for receiving and holding receptacles, a plunger for inserting said receptacles into said receptacle holding means, and a spring pressed head on said plunger.

7. In a machine of the class described, a conveyor provided with a plurality of clips for holding receptacles and carrying the same, means for ejecting said receptacles from said clips comprising a plurality of plungers, a movable slide adapted to contact with the receptacles removed from the clips and a table upon which said receptacles are moved by said slide.

8. In a machine of the class described, means for holding a plurality of receptacles, means for removing said receptacles from said holding means comprising a plurality of upwardly movable plungers adapted to contact with said receptacles and lift the same, a slide adapted to contact with said receptacles and shift the same and a support for receiving the receptacles moved by the slide.

9. In a machine of the class described, a conveyor mechanism comprising a pair of spaced apart chains, connections between said chains, receptacle supporting members on said connections, plungers for inserting receptacles in said supporting members, means for ejecting said receptacles therefrom, said ejecting means comprising a plurality of plungers, a slide adapted to contact with the receptacles moved by the plungers and a support on which the receptacles are moved by the slide.

10. In a machine of the class described, a conveyor provided with a plurality of spring clips for holding receptacles, means for removing receptacles from said clips comprising an upwardly movable plunger adapted to contact with and lift each receptacle out of its clip, a slide adapted to contact with the lifted receptacles and a support on which the lifted receptacles are moved by said slide.

11. In a machine of the class described, a conveyor, means on said conveyor for receiving and holding receptacles, a plunger for inserting said receptacles into said receptacle-holding means, a slide way adapted to

cause successive receptacles to be positioned adjacent to the plunger and a resilient stop for retaining each receptacle in position to receive the thrust of the plunger.

12. In a machine of the class described, a conveyor, means on said conveyor for receiving and holding receptacles, a plunger adapted to enter into each of said receptacles and contact with the bottom thereof and insert said receptacles into the receptacle-holding means and a spring-pressed head on said plunger.

13. In a machine of the class described, a conveyor, means thereon for receiving and holding a plurality of receptacles, a plunger adapted to successively feed receptacles to said conveyor, a support for said receptacles in the path of movement of the plunger, and a resiliently mounted stop on said support adapted to position said receptacles on their support.

14. In a machine of the class described, a conveyor, means thereon for receiving and holding a plurality of receptacles, a plurality of plungers operating in unison to feed receptacles to said conveyor, means for ejecting receptacles from said conveyor comprising a plurality of upwardly movable ejecting plungers, a slide adapted to engage receptacles moved by said ejecting plungers and a support on which receptacles are moved by said slide.

15. In a machine of the class described, a conveyor provided with means for holding a plurality of receptacles, a receptacle slideway, a plunger beneath said slideway provided with a spring-pressed head for contacting with and forcing a receptacle into position on the conveyor and a resilient stop in said slideway for holding the receptacles in the path of movement of the plunger.

Signed at the city, county and State of New York, this 26th day of May, 1919.

LOUIS A. FREEDMAN.