No. 774,378. PATENTED NOV. 8, 1904.

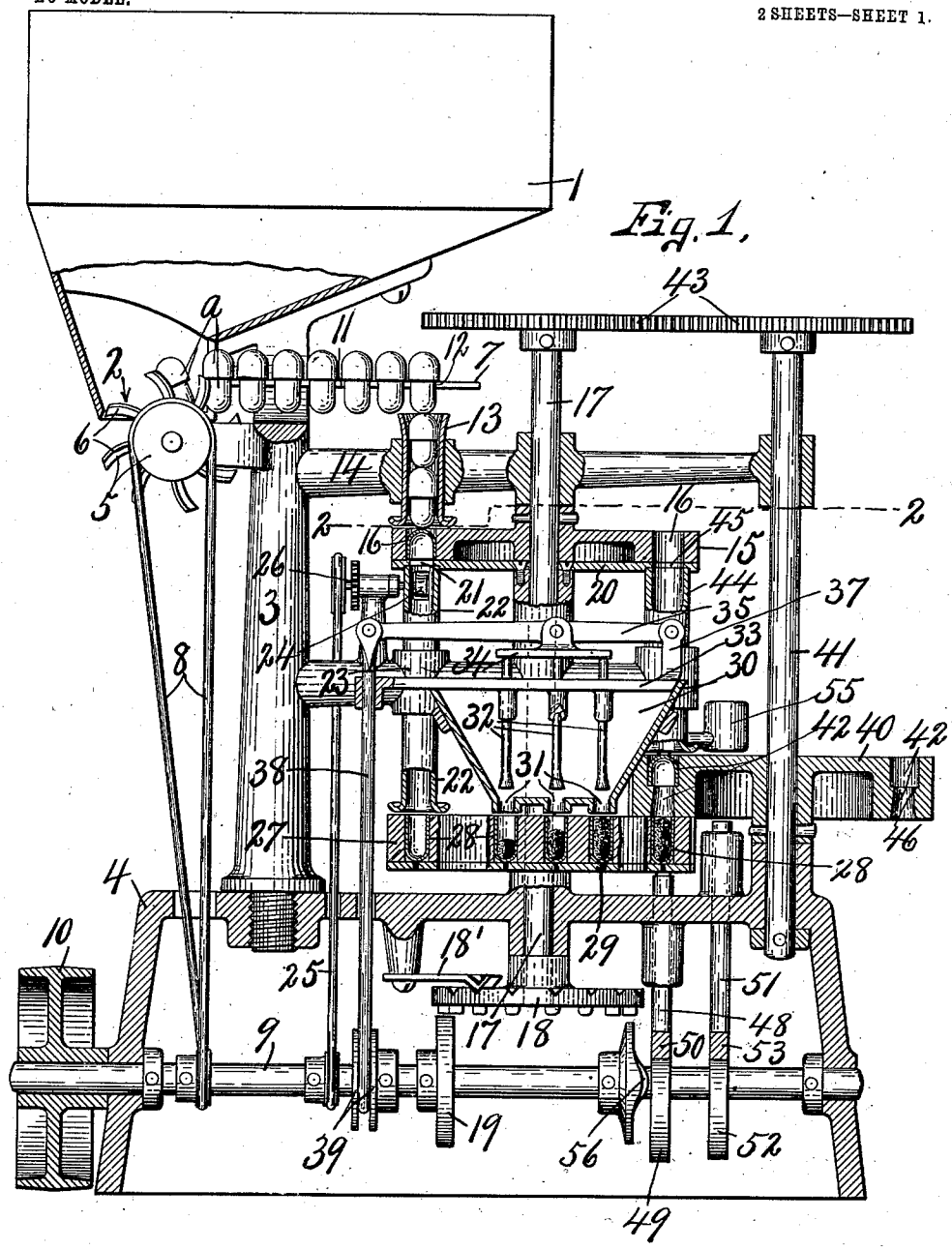
A. K. CARTER.

MACHINE FOR DECAPPING, FILLING, AND RECAPPING CAPSULES.

APPLICATION FILED OCT. 16, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses,
B. B. Robinson,
H. B. Chase

Inventor,
Alvin K. Carter

By,
Howard P. Denison
Attorney.

No. 774,378. PATENTED NOV. 8, 1904.

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APPLICATION FILED OCT. 16, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

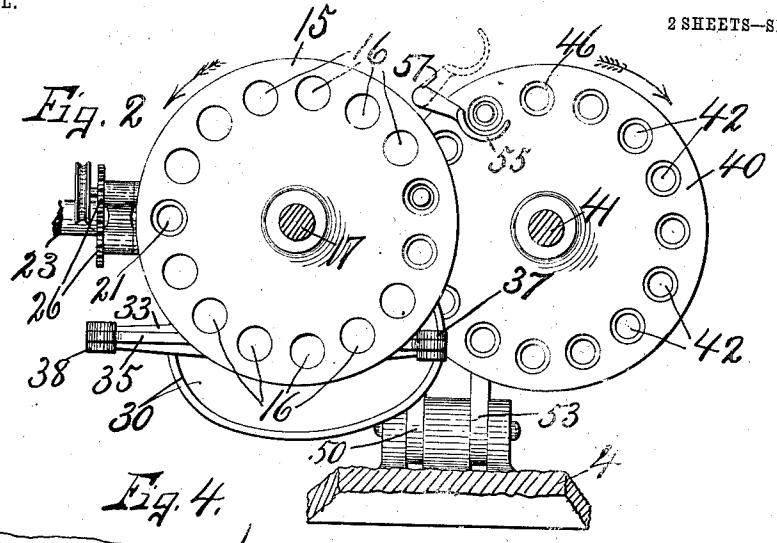


Fig. 4.

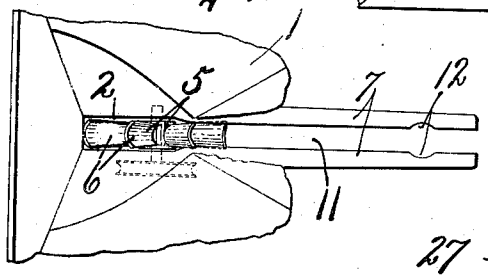


Fig. 3.

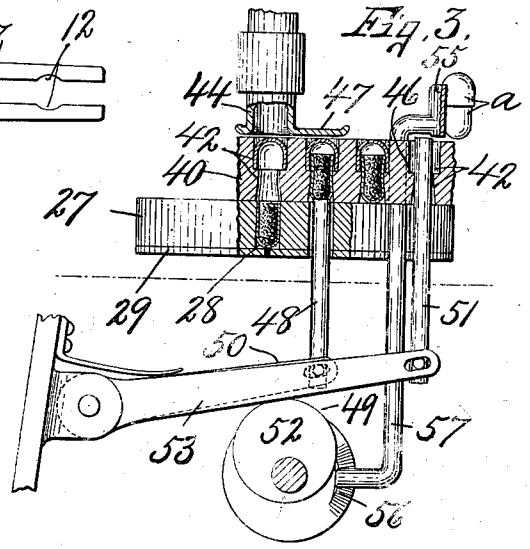


Fig. 5.

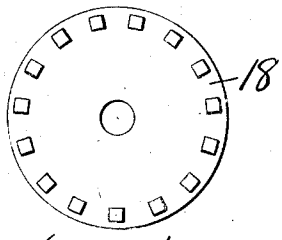


Fig. 6.

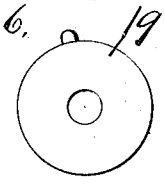


Fig. 8.

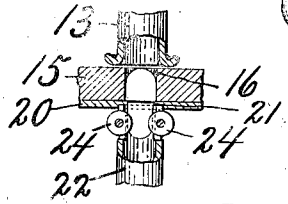
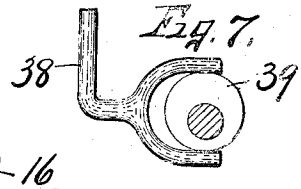


Fig. 7.



Witnesses,
B. B. Robinson
H. E. Chase

Inventor,
Alvin K. Carter

By,
Howard P. Gridley
Attorney.

No. 774,378. Patented November 8, 1904.

UNITED STATES PATENT OFFICE.

ALVIN K. CARTER, OF SYRACUSE, NEW YORK.

MACHINE FOR DECAPPING, FILLING, AND RECAPPING CAPSULES.

SPECIFICATION forming part of Letters Patent No. 774,378, dated November 8, 1904.

Application filed October 16, 1903. Serial No. 177,280. (No model.)

To all whom it may concern:

Be it known that I, ALVIN K. CARTER, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Machines for Decapping, Filling, and Recapping Capsules, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in machines for decapping, filling, and recapping capsules in which the empty capsules are placed promiscuously in a suitable hopper and are then automatically fed one by one to a separating device where the bodies of the capsules are successively withdrawn from their caps and are automatically filled with powder or other material and afterward reinserted into their respective caps ready for the market.

The object is to render the operation of decapping, filling, and recapping continuous and automatic and as simple, expeditious, and reliable as possible.

In the drawings, Figure 1 is an elevation, partly in section, of a machine for carrying out the objects of my invention. Fig. 2 is a horizontal sectional view taken on line 2 2, Fig. 1. Fig. 3 is a detail sectional view of portions of the two lower disks, showing the recapping and discharging plungers and their operating devices. Fig. 4 is a top plan of a portion of the hopper and the guide for the capsules. Figs. 5 and 6 are detail views of the main driving-gears for the disks. Fig. 7 is a detail view of the cam and yoke for operating the filler-plungers. Fig. 8 is a detail sectional view of the decapping mechanism.

Similar reference characters indicate corresponding parts in all the views.

The empty capsules, as *a*, are dumped promiscuously into a hopper 1, having its sides and bottom inclining downwardly toward an outlet-opening 2 in its base, so that the capsules will gravitate into the opening, which is somewhat elongated in one direction and slightly greater in width than the diameter of the capsule to cause the capsules to automatically right themselves lengthwise of the opening. This hopper may be supported in any desired manner, but is shown as mounted upon the upper end of a standard 3, which rises from a supporting-base 4. At the bottom of the discharge-opening is located a continuously-revolving agitator and feeding device 5, having a series of radial arms 6, which engage and feed the capsules one by one upon and along a suitable guide or race 7, the front faces of the arms being concave in cross-section, so as to facilitate the righting of the capsules as they are fed to the race. This agitator and feed device is also mounted upon the standard 3 and is driven by a belt 8 from a continuously-revolving main driving-shaft 9, which is journaled in the base 4 and is provided with a driving-pulley 10, to be connected to any source of power. (Not shown.)

The guide or race 7 consists of a table or bed which inclines upwardly and laterally from the base of the discharge-opening of the hopper and is formed with a lengthwise slot 11 of substantially the same width as the diameter of the lower or smaller section of the capsule, but of less width than the diameter of the upper section or cap, and the capsules are then fed one by one into the race with the lower edge of the cap riding on the upper faces of the walls of the slot 11, and the lower sections are thereby suspended and ride in the slot. At or near the outer end of the raceway the slot 11 is enlarged sufficient to permit the capsule-caps to pass therethrough—*i. e.*, the ways upon which the lower edge of the cap rides are cut away; but the distance between this enlargement 12 and the feed device is sufficient to receive and hold the number of the capsules while being fed to the enlargement or discharge-opening of the raceway.

An upright tubular guide 13 is held in vertical alinement with and beneath the enlargement 12 by an arm 14 of the standard 3 and receives the capsules as they successively gravitate from the race through said enlargement. The interior diameter of this tube is slightly greater than the diameter of the cap of the capsule, so that the capsules gravitate readily through the tube, which is sufficiently long vertically to retain a definite number of the capsules in an upright position one upon the other. The upper end of the tube lies in a plane substantially coincident with the plane

of the lower ends of the capsules when in the raceway, so that they may ride freely over the tube, and when the tube is filled with capsules the upper end of the upper capsule in the tube is in substantially the same plane and supports the capsule, which may be in the enlargement of the race.

The outer end of the slot 11 beyond the enlargement is open, so that when the tube 13 is filled the capsules may still continue to be fed along the race and beyond the enlargement, so that the end ones are simply forced through the open end of the slot and may be returned by hand or otherwise to the hopper.

The slot 11, feeding device 5, and raceway 7 constitute means for feeding and righting the capsules right side up with their caps uppermost, in which position they gravitate successively into the guide 13. Any capsules which may be fed forwardly bottom side up by the device 5 are merely forced out through the slot 11 and fall beneath the raceway 7.

The sloping sides and bottom which terminate in an elongated opening on the base of the hopper cause the capsules to fall lengthwise upon the radial wings of the rotary feeding device 5, in which position they are fed by the wings into the slot 11 of the race 7.

Directly beneath the lower open end of the tube 13 and in close proximity thereto is a horizontal rotary carrier 15, having a circular concentric row of openings 16, which are intermittently and successively brought into registration with the lower end of the tube 13 as the carrier is rotated. This carrier is secured to an intermittingly-rotating upright shaft 17, which is driven from the main shaft 9 through the medium of gears 18 and 19 of any desired construction to cause the disk or carrier 15 to rotate step by step to successively register the openings 16 with the discharge end of the tube 13.

As seen in Figs. 1, 5, and 6, the gear 18 on the upright shaft 17 is provided with a number of spurs or teeth corresponding to the number of openings 16 in the carrier, and the gear 19 on the main shaft 9 is provided with a single spur or tooth, whereby the disk 15 is rotated through an arc equal to the space between the radii drawn through the centers of adjacent openings 16 at each revolution of the main shaft, and these openings 16 are therefore successively centered with the tube and are temporarily held in this position during the remainder of the revolution of the main shaft by a spring-detent 18′, Fig. 1. These openings are of the same height or length as the caps of the capsules, and directly beneath the lower face of the carrier and in close proximity thereto is a fixed plate 20, having an opening 21 alined with the discharge end of the tube 13 and just large enough to easily receive the lower section of the capsule, but of less diameter than the cap, so that as the capsules are discharged from the tube into the alined opening 16 the lower edge of the cap rests on the top face of the plate 20, while the lower section of the capsule protrudes through the opening 21. A second upright tube 22 is fixedly supported in an arm 23 of the standard 3 and is registered with the opening 21 in the plate 20, so that the lower section of the capsule in the opening 21 also projects into the upper end of the tube 22. At this point the capsules are decapped by a pair of continuously-rotating gripper-rollers 24, which are driven from the main shaft 9 by a belt 25 and gears 26, said gripper-rollers being suitably supported and protrude slightly through openings in the opposite sides of the upper end of the tube 22 to engage and draw the lower section of the capsule out of the cap and force the same down through the tube 22. A second carrier 27 is secured to the upright shaft 17 some distance beneath the carrier 15 and is provided with a circular concentric row of openings 28 in vertical alinement with and corresponding in number to the openings 16. These openings 28 are successively registered with the lower end of the tube 22 and are of just sufficient size to easily receive the lower sections of one of the capsules as it is discharged from the tube 22, a fixed plate 29 being supported directly beneath the openings 28 to form a stop and support for the lower capsule-sections. It is now evident that this decapping operation is performed while the disks 15 and 27 are at rest and that the caps are retained in the disk 15, while the lower sections are deposited into the disk 27. Now when the disks 15 and 27 are rotated one step, as previously described, another set of openings 16 and 28 are brought into registration with the tubes 13 and 22 and the operation just stated is repeated, while at the same time the caps and lower sections in the carriers are carried forwardly one space or step and rest upon the plates 20 and 29. These capsule-sections are thus carried forwardly step by step, and the lower sections, with their open ends uppermost, are brought into registration with the discharge-nozzles of a suitable filler which contains the powder to be deposited in the capsules. This filler comprises a hopper 30, having one or more (in this instance three) discharge-nozzles 31, in which are vertically-movable plungers 32, the hopper being fixedly supported by a bracket 33, and the nozzles are spaced so that three of the lower sections of the capsules are registered therewith at the same time when the machine is in full operation.

The plungers are mounted on a yoke 34 and guided in openings in the bracket 33 and are actuated downwardly into the nozzles when the disks or carriers are at rest. Any means may be employed to actuate these plungers; but the yoke is preferably pivoted to the intermediate portion of a lever 35, which is fulcrumed at one end to a fixed support 37, and

its other end is connected by a link 38 to a cam or eccentric 39 on the main shaft 9, the throw of the cam following soon after the shift of the carrier by the gear 19 and is sufficient to force the plungers through the nozzles, but not into the capsule-section. A limited quantity of the powder is fed by the first plunger nearest to the tube 22 to partially fill the capsule alined therewith, and at the next shift of the carrier more powder is added to the same capsule by the second plunger, while at the next shift the powder fed by the third plunger is sufficient to fill the capsule. This filling of the capsules by degrees is found to be more practicable than filling with a single stroke of a single plunger; but it is evident that the latter may be employed, if desired.

The operations of and mechanisms for decapping and filling the capsules have now been described, and the next operation is to reinsert the filled capsule-sections into their respective caps. In carrying out this latter operation a third carrier or disk 40 is mounted upon a rotary shaft 41 just above the lower carrier 29 and is provided with a circular row of openings 42, which are successively brought into vertical alinement with the openings 28, or, rather, these openings 28 and 42 are successively brought into registration with each other by each step-by-step movement of the carriers 15 and 27. The radii of the several carriers from their axes to the center of the openings are substantially equal and each carrier is provided with the same number of openings 16, 28, and 42, while the intermittent movement of the carrier 40 is the same as for the other carriers and is effected through the medium of the intermeshing gears 43 on the shafts 17 and 41. The carriers 27 and 40 are arranged so that two adjacent openings of one carrier are brought into registration with two adjacent openings of the other carrier, as seen in Fig. 3. A third upright tube or guide 44 is interposed between the carriers 15 and 40 almost diametrically opposite to the tube 22 to conduct the caps from the carrier 15 to the carrier 40. The upper end of the tube 44 is registered with an opening 45 in the plate 20, while its lower end is registered with one of the openings 42, which extend through the carrier 40, said openings and tube being sufficiently large in diameter to permit the caps to readily and easily gravitate from the carrier 15 to the carrier 40. The openings 42 are of substantially the same depth as the length of the complete capsule, but are each formed with an annular shoulder 46, about midway upon which the cap rests when received from the tube 44. The lower part of each of the openings 42 tapers upwardly, so that the diameter of the annulus 46 is slightly less than the inner diameter of the cap which is in its upper part, the object of this being to slightly compress the upper end of the filled section of the capsule to permit it to enter the cap easily when forced upwardly, as presently described. After the cap has thus been deposited in the opening of the carrier 40 all of the carriers are moved one step, which brings two of the openings of the carriers 29 and 40 in alinement at one side of the tube 44 and under a fixed abutment or stop 47, which in this instance projects laterally from the base of the tube 44. It is now understood that one of these alined openings 42 contains a cap, while the lower opening registered therewith contains a filled lower section of the capsule, and that the head of the cap is directly under the abutment 47. Now while the carriers are at rest in this position the filled capsule-section is forced upwardly through the opening 42 and into the cap alined therewith by means of a plunger 48, which is actuated by a cam 49 on the main shaft through the medium of a lever 50, as seen in Fig. 3. The filled capsule has now been recapped, but remains in the carrier 40, and after two or more successive movements of the carriers, or as soon as the recapped capsule is carried out of the way of the carrier 27, an additional plunger 51 is operated to force the filled and recapped capsule out of the opening in the carrier 40. This plunger 51 is actuated by a cam 52 on the main shaft 9 through the medium of a lever 53, and as soon as the recapped capsule is expelled from the carrier 40 it is removed by a sweep 55, which is also actuated by a cam 56 on the main shaft through the medium of a rock-shaft 57, to which the sweep is secured.

It has now been shown how a capsule is decapped, filled, and recapped successively as it passes through the machine, and it is evident that as each opening of the carrier is presented to the tube 22 it receives a capsule-section and carries it to the filler and that the filler-plungers as well as the recapping and expelling plungers operate during each period of rest.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for decapping, filling and recapping capsules, a hopper and an upright guide at one side of the hopper, in combination with a race for the capsules leading from the hopper to the guide, and a feeding device in the base of the hopper for feeding the capsules from said hopper and forcing them along the race.

2. In a machine for decapping, filling and recapping capsules, a righting and feeding mechanism comprising a hopper having a discharge-opening for the capsules, a raceway extending laterally from the discharge-opening and having a slot of less width than the diameter of the cap of the capsule and rotary means movable in the opening of the hopper for feeding the capsules one by one into the slot with their caps riding on the walls of said slot.

3. In a machine for decapping, filling and recapping capsules, an upright guide, a raceway having a discharge-opening alined with the upper end of the guide, a hopper for the capsules and a rotary feeding device in the base of the hopper for feeding the capsules one by one into the raceway.

4. In a machine for decapping, filling and recapping capsules, mechanism for separating the capsule-sections including a pair of rotatable rollers engaging and drawing one part of the capsule from the other.

5. In a machine for decapping, filling and recapping capsules, a holder for the cap and rotary grippers to engage and draw the body from the cap.

6. In a machine of the class described, a holder for the capsule, mechanism to feed the capsules one by one to the holder, and decapping mechanism including a pair of rotary rollers engaging the body of the capsule and drawing the same from the cap.

7. In a machine of the class described, rotary gripping-rollers and operating means therefor, mechanism to feed the capsules and register the bodies of the capsules with the rollers, whereby the rollers engage and draw the body from the cap, and holding means for the caps.

8. In a machine of the class described, a fixed vertical guide for the empty capsules, mechanism to feed the capsules into the guide with the caps uppermost, and decapping mechanism including a pair of rollers for engaging the body of the capsule to draw the same from the cap, and holding means for the cap.

9. In a machine of the class described, a carrier rotating step by step and operating means therefor, in combination with mechanism to feed the empty capsules one by one to the carrier at each movement, rotating rollers engaging and withdrawing the bodies of the capsules from their caps, and operating means for the rollers.

10. In a machine for automatically decapping, filling and recapping capsules, the combination with mechanism for feeding the empty capsules, decapping mechanism including rotating gripping-rollers and operating means therefor, mechanism for filling the body of the capsule, and additional mechanism for reuniting the capsule-sections.

11. In a machine for automatically decapping, filling and recapping capsules, a decapping mechanism including a pair of gripping-rollers for engaging and drawing the body of the capsule from the cap, a filler mechanism, means for conveying the body of the capsule from the decapper to the filler, and mechanism for reuniting the capsule-sections.

12. In a machine for automatically decapping, filling and recapping capsules, a decapping mechanism including a pair of gripping-rollers, mechanism to feed the empty capsules one by one to the decapping mechanism, a filler mechanism, a recapping mechanism, and means to convey the capsules consecutively from the decapper to the filler and then to the decapping mechanism.

13. In a machine for automatically decapping, filling and recapping capsules, the combination of two carriers rotating together step by step, operating means for the carriers, mechanism for feeding the empty capsules one by one to one carrier, mechanism separate from the carriers for separating the capsule-sections and conducting the body to the other carrier, means to hold the cap in the first-named carrier, mechanism for filling the body at a subsequent movement of the carriers, and additional mechanism for reuniting the filled capsule after a further movement of the carriers.

14. In a machine of the class described, the combination of an upright guide, means for feeding empty capsules into the guide, a rotary carrier movable step by step and provided with a series of openings which are successively registered with the lower end of the guide for receiving the capsules, a gripping device at the upper end of the guide for engaging and drawing the body of the capsule from the cap, means to hold the cap in the carrier, a second upright guide with which the openings of the carrier are successively registered, a second carrier rotatable step by step and having a series of openings registrable with the lower end of the second guide, means to actuate the carriers simultaneously, mechanism for filling the capsule-bodies as they are advanced to one position, and mechanism for reuniting the body to the cap when the carriers are advanced to another position.

15. In a machine for decapping, filling and recapping capsules, mechanism for separating the capsule-sections, mechanism for filling the capsules, and mechanism for reuniting the capsule-sections in combination with two carriers separate from the capsule-separating mechanism and movable step by step for carrying the capsule successively to the separator, filler mechanism and reuniting mechanism.

16. In a machine for decapping, filling and recapping capsules, two rotary carriers one above the other and having a common axis, each carrier being provided with a corresponding number of openings, means to rotate the carriers step by step, means for feeding the empty capsules into the openings of the upper carrier, mechanism for withdrawing the bodies of the capsules from their caps while in the upper carrier, a fixed guide for conducting the bodies from the withdrawing mechanism to the openings in the lower carrier, a powder-containing hopper between the carriers and having an outlet with which the openings in the lower carrier are successively registered to permit the powder to enter the body of the capsule, and mechanism for reuniting the capsule-sections after the filling operation.

17. In a machine for decapping, filling and

recapping capsules, two horizontal rotating carriers arranged one above the other and each having a corresponding number of openings, mechanism for feeding the empty capsules into the openings of the upper carriers, mechanism separate from the carriers for drawing the body of the capsule from the cap while in the upper carrier, a fixed guide for conducting the bodies of the capsules to the openings in the lower carrier, mechanism for filling the body of the capsules while in the lower carrier, a third carrier having openings movable into registration with those in the upper and lower carriers, a guide for conducting the caps from the upper carrier to the openings of the third carrier, and mechanism for reuniting the bodies of the capsules to their caps while in the third carrier.

In witness whereof I have hereunto set my hand this 7th day of October, 1903.

ALVIN K. CARTER.

Witnesses:

H. E. CHASE,

MILDRED M. NOTT.