Oct. 9, 1923. 1,470,349

R. G. CLARK

BOTTLE CAPPING MACHINE

Filed April 14, 1920 4 Sheets-Sheet 1

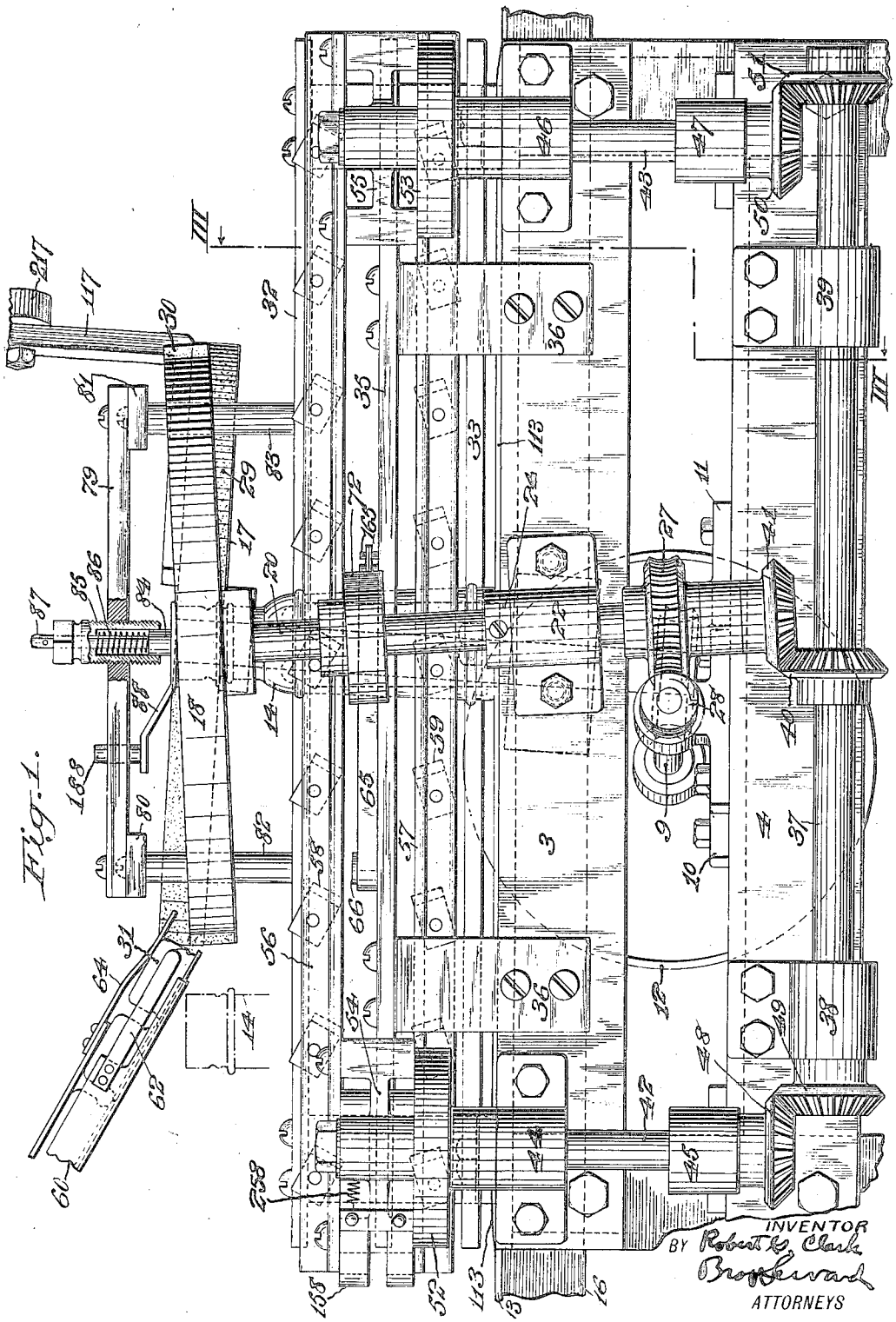


Fig. 1.

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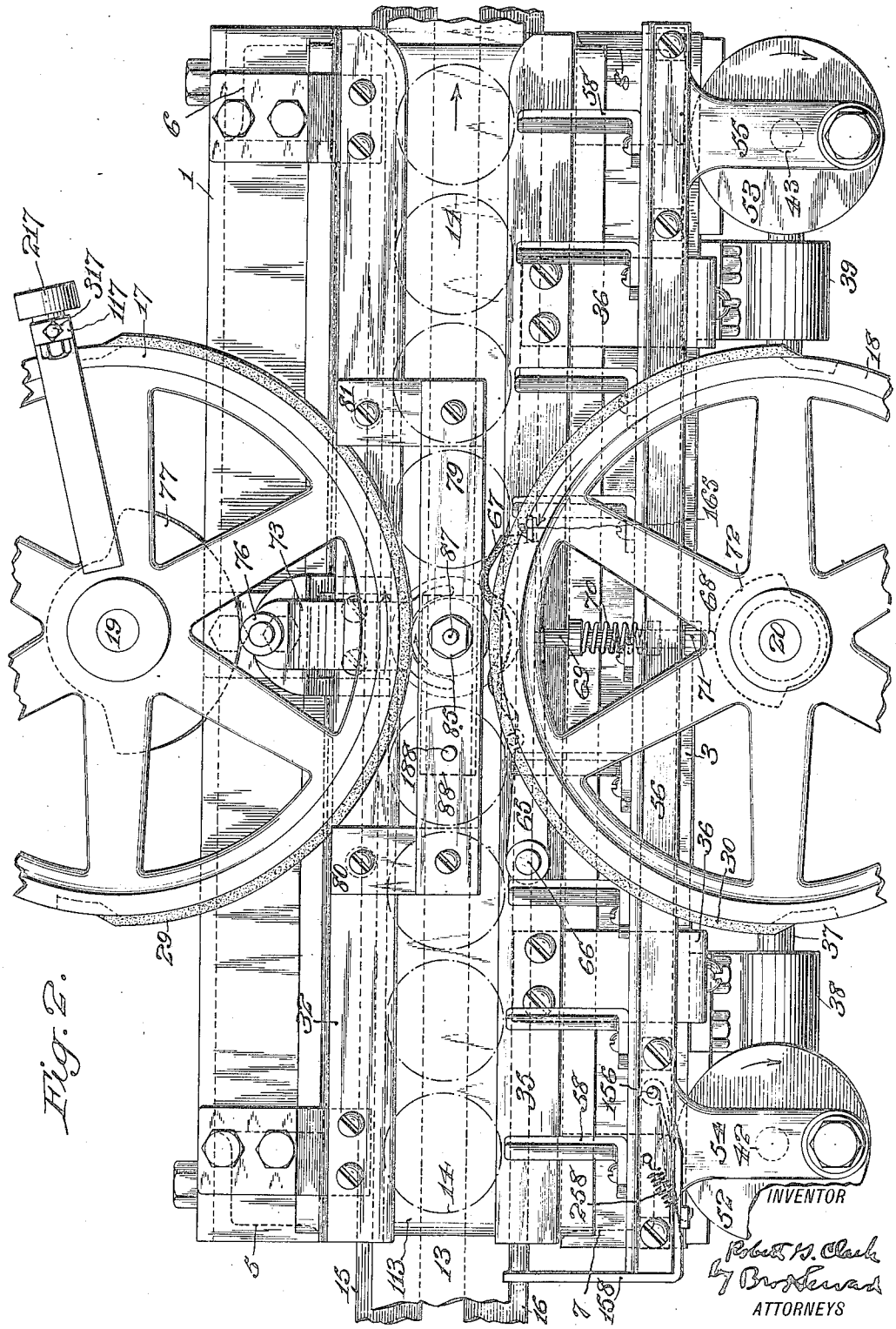


Fig. 2.

INVENTOR

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BOTTLE CAPPING MACHINE

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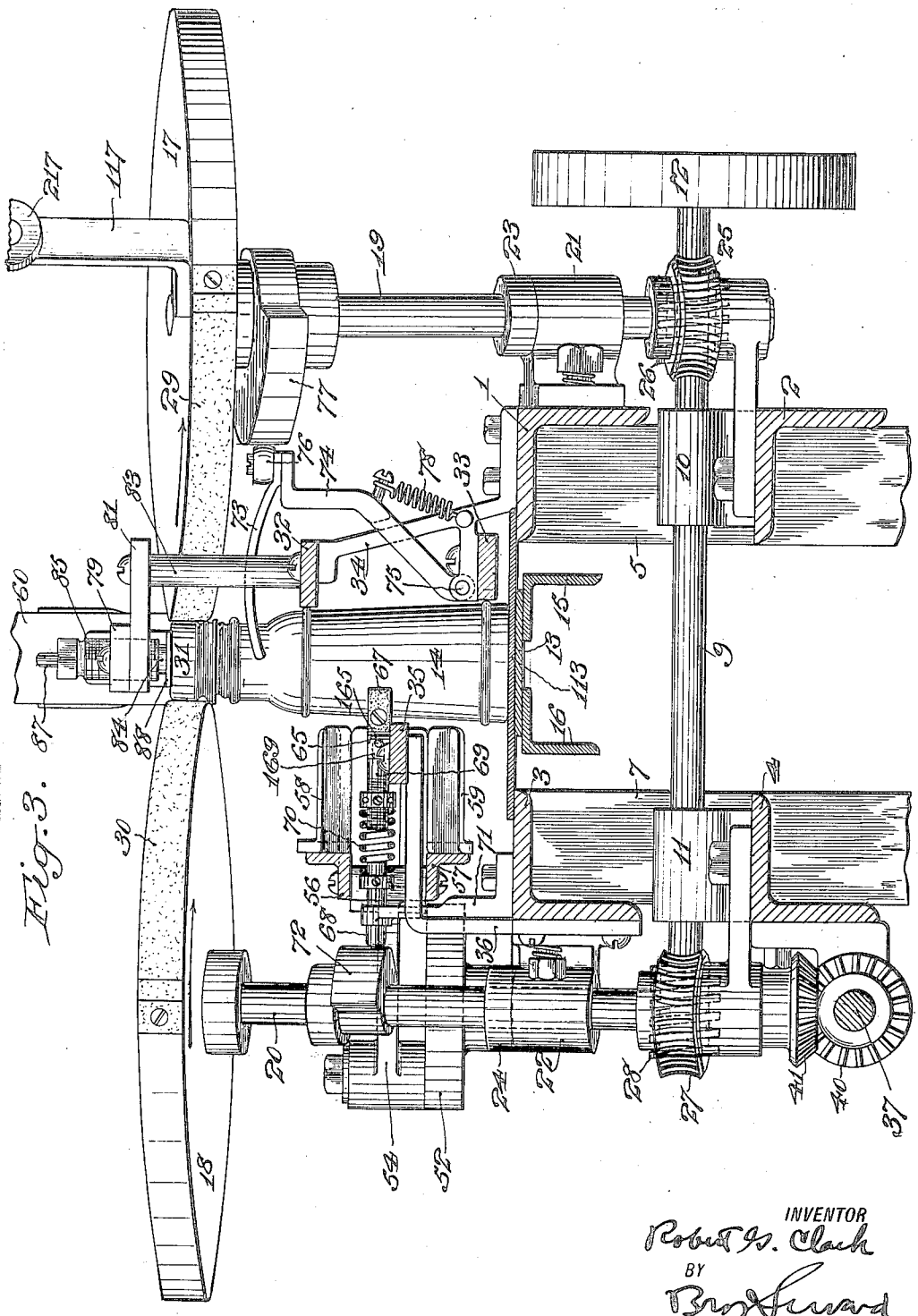


Fig. 3.

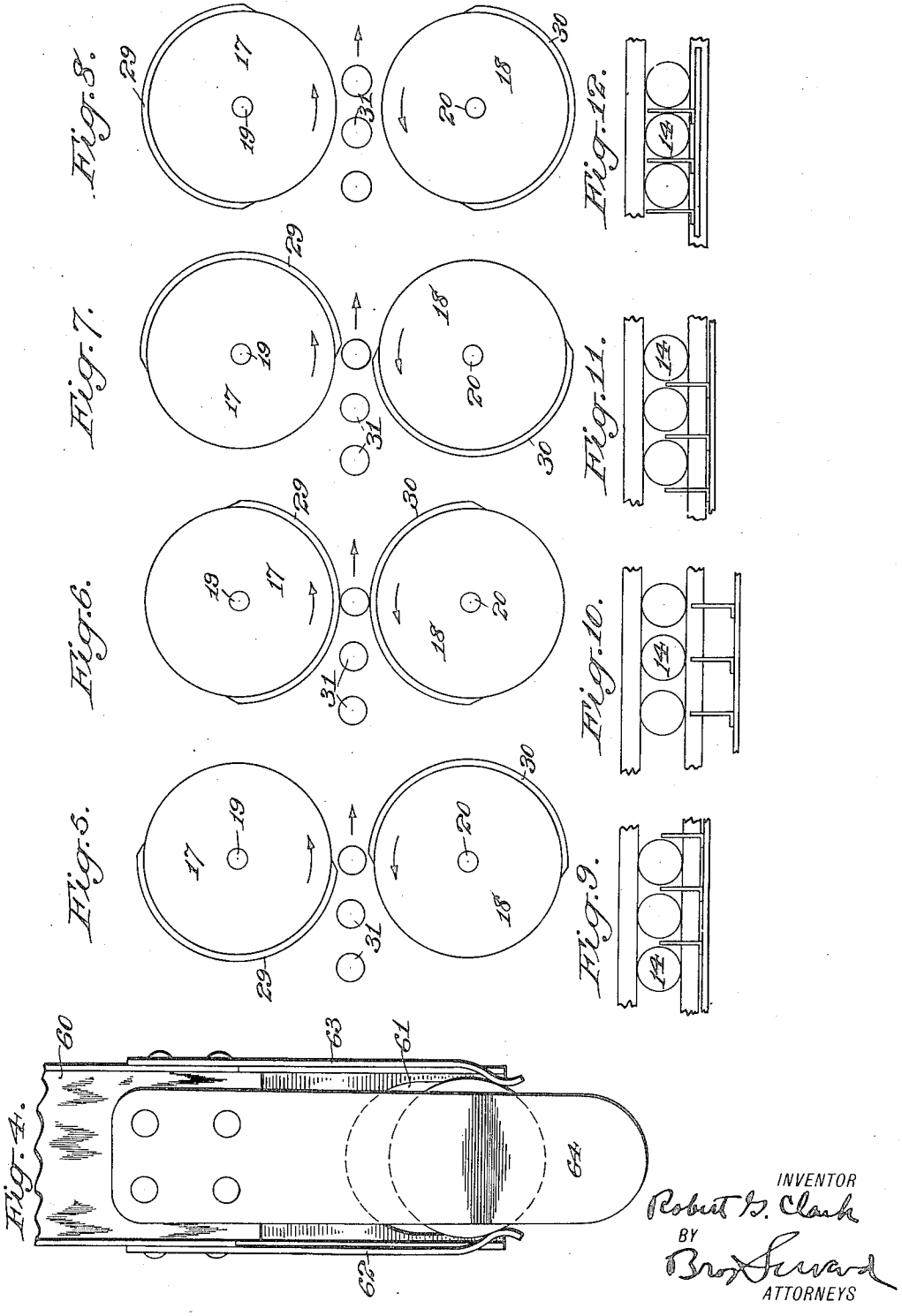
INVENTOR
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Oct. 9, 1923. 1,470,349

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BOTTLE CAPPING MACHINE

Filed April 14, 1920 4 Sheets-Sheet 4



Patented Oct. 9, 1923. 1,470,349

UNITED STATES PATENT OFFICE.

ROBERT G. CLARK, OF BROOKLYN, NEW YORK, ASSIGNOR TO PARAGON CAN & CAP COMPANY, INC., OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

BOTTLE-CAPPING MACHINE.

Application filed April 14, 1920. Serial No. 373,922.

To all whom it may concern:

Be it known that I, ROBERT G. CLARK, a citizen of the United States, and resident of the borough of Brooklyn, in the city and State of New York, have invented a new and useful Improvement in Bottle-Capping Machines, of which the following is a specification.

This invention relates to bottle capping machines and has for an object to provide an apparatus of this character whereby screw caps may be applied to bottles or other receptacles with great rapidity and without injury to the cap or coating thereon.

Another object is to provide such an apparatus in which the entire operation is automatic, including the feeding of the bottles, feeding of the caps, screwing on of the caps, and ejection of the bottles.

Another object consists in providing such an apparatus in which the bottle is held against movement while the caps are being applied and in which the latter are seated and screwed very firmly onto the bottles.

Another object consists in providing certain improvements in the form, construction and arrangement of the several parts whereby the above named and other objects may be effectively attained.

A practical embodiment of my invention is represented in the accompanying drawings, in which

Fig. 1 represents a detail side elevation of my capping machine.

Fig. 2 represents a detail top plan view of the same.

Fig. 3 represents a detail transverse vertical section taken in the plane of the line III—III of Fig. 1, looking in the direction of the arrows.

Fig. 4 represents a detail top plan view of the cap feeder.

Figs. 5 to 8 inclusive represent diagrammatic plan views showing more particularly the different positions of the cap screwing means and caps during a cycle of operations.

Figs. 9 to 12 inclusive represent diagrammatic plan views showing more particularly the different positions of the positive intermittent feeder for the bottles or other receptacles during a cycle of its operations.

The machine includes a frame which comprises two opposite pairs of upper and lower longitudinal side bars, 1, 2 and 3, 4, which are rigidly connected by pairs of front and rear uprights 5, 6 and 7, 8.

The main drive shaft 9 is mounted in suitable bearings in brackets 10, 11 on the side bars 2, 4, and is arranged so as to extend diagonally across the machine. It is provided on one end with a pulley 12 adapted to receive a belt in order to impart motion to the shaft 9 from a suitable source of power (not shown).

A conveyor belt 13 adapted for feeding the bottles 14 leads longitudinally through the machine between the side bars 1 and 3 and rests on the tracks 15, 16. This conveyor belt may be driven at the desired speed from any suitable source of power (not shown) in order to feed the bottles into and eject them from the machine.

As the means provided for screwing the cap onto the bottle, after it has been preliminarily seated thereon, forms a very important part of my invention, I will describe it at this juncture before setting forth the means for feeding the bottles and seating the caps thereon. This cap screwing mechanism includes two oppositely inclined rotary elements, as for instance, discs or wheels 17, 18. These discs are preferably of relatively large diameter, as compared with the diameter of the caps to be applied, and are carried at the upper ends of oppositely inclined upright shafts 19, 20, mounted in bearings contained in brackets 21, 22, that are secured to the outer faces of the side bars 1 and 3 of the machine frame. Collars 23, 24 are pinned on the shafts 19, 20 to hold the same against downward longitudinal movement in their bearings. The shafts 19, 20 are driven from the main shaft 9 through the worm wheels and worms 25, 26 and 27, 28, respectively.

The discs 17 and 18 are provided on about one-half of their peripheries with friction facings 29, 30, which may be composed of leather, rubber or the like. These facings serve to suitably enlarge the radial dimensions of the discs 17, 18, throughout their extent, and are arranged to have a rolling frictional contact with opposite sides of the bottle cap 31 when the latter is in position, loosely applied on the mouth of the bottle, for screwing the cap home. It will be observed that, although the discs 17, 18 are driven in the same rotary direction, their surfaces adjacent the cap move in op-

posite directions so as to effect a rotary motion of the cap in order to screw it onto the bottle.

Along one side of the path followed by the bottles in passing through the machine, there are provided upper and lower longitudinally disposed guide rails 32, 33, which are located above the track 15 and are supported from the side bar 1 of the frame by brackets 34. Along the other side of the said path, there is arranged a longitudinally disposed guide rail 35, which is located above the track 16 and supported by brackets 36 mounted on the side bar 3. These guide rails serve to determine the course of the bottles in passing through the machine.

The apparatus also includes means for supporting and feeding the bottles step by step through the machine, which means includes a horizontal shaft 37 that is longitudinally disposed at one side of the machine and mounted in bearings contained in brackets 38, 39, bolted to the side bar 4. This shaft 37 is driven from the upright inclined shaft 20 through the beveled gears 40, 41. Vertical shafts 42, 43, are located at each end of the machine on the same side thereof as the shaft 37, and are mounted in bearings in pairs of brackets 44, 45, and 46, 47, respectively, which are secured to the upper and lower side bars 3, 4. These shafts 42, 43, are actuated by the shaft 37 through the bevel gears 48, 49 and 50, 51, respectively. The upper ends of the shafts 42, 43 carry crank discs 52, 53 which are fixed to said shafts and to which are pivoted the outer ends of arms 54, 55, the other ends of which are rigidly secured to upper and lower longitudinally disposed finger bars 56, 57, which latter carry sets of fingers 58, 59, that are designed to separate and feed the bottles, which will be hereinafter described. As will be readily seen, these finger bars are given a substantially rotary movement by virtue of their connection with the shafts 42, 43, so that the fingers 58, 59 will be first inserted between the bottles moving inwadly on the conveyor belt 13, will then advance the bottles a predetermined distance, will then be withdrawn out of the path of the bottles and will then be returned to their original positions; this cycle of operations being continuously repeated to effect an intermittent or step by step feed of the bottles through the machine. In order to prevent the bottles from being crushed or injured at the time of their first engagement by the finger bars, a yielding finger 158 is pivoted to the bar 56, as indicated at 156, and normally held in alinement with the other fingers by means of a retractile coil spring 258. As a result of this arrangement, if an incoming bottle should be engaged exactly centrally by the finger 158, the latter, instead of crushing the bottle, would yield slightly and urge the bottle into its proper position with respect to the finger bars 56, 57. After the bottle has once been positioned by the yielding finger 158, it will retain its proper relationship with respect to the other fingers throughout its travel.

While the bottles are passing through the machine, under the influence of the finger bars 56, 57, they rest and move upon a stationary plate 113, which is secured to the side bars 1, 3, of the machine frame and lies in a plane immediately above the conveyor belt 13. The ends of the plate 113 are beveled off, and the action of the finger bars 56, 57, serves to slide the bottles from the conveyor belt 13 onto the plate 113 as the bottles are moving into the machine and to return the bottles to the conveyor belt as they leave the machine.

The apparatus also contains mechanism for feeding the screw caps into position to be engaged by and seated upon the mouths of the bottles; and this mechanism includes a chute 60 which is suitably supported at an angular position, with its lower end about level with the discs 17, 18. The said chute has its lower portion extending in substantially the same vertical plane as the path of the bottles, and the bottom of its lower end is cut away, as shown at 61, in order to permit the entrance therein of the mouth of the incoming bottles. The sides and top of the chute at its discharge end are also cut away, and leaf springs 62, 63, 64, are arranged to engage the opposite sides and the top of the lowermost cap for yieldingly holding it in an inclined position in the path of the mouth of the immediately incoming bottle, so that the cap will be engaged by the mouth of the bottle and removed from the chute as the bottle passes from under the latter. It will be understood that the caps are fed to the chute right side up and that they pass downwardly to the discharge end under the influence of gravity. The top spring 64, is arranged to project a little farther than the side springs 62, 63, in order to insure the proper seating of the caps on the mouths of the bottles.

Means is provided for holding the bottles in proper position and against turning while the caps are being screwed thereon by the discs 17, 18, and this means includes a horizontal swinging arm 65 which is pivoted at 66 on top of the guide rail 35. This arm is cut away on its inner side, and this portion is preferably faced with a friction strip 67, such as leather or rubber; whereby the arm may partially embrace one side of the bottle with a frictional grip when the bottle is in position to be operated by the discs 17, 18. Suitable pressure is exerted on the arm 65 tending to swing it inwardly toward the bottle by a yielding pin composed of outer and inner rigid members 68, 69 and an interme-

diate expansion spring 70. The inner member 69 has its end reduced and let into the outer side of the arm 65 as indicated at 169, while the outer member 68 is slidably mounted in a bracket 71 bolted to the side bar 3. A face cam 72 is secured to the shaft 20 and abuts the outer end of the member 68 so as to intermittently increase the force of the inward pressure on the arm 65 to cause the latter to engage the bottles with sufficient force as they are fed intermittently into position to be acted upon by the discs 17, 18. A pin 165 is set into the guide rail 35 and serves to limit the inward movement of the arm 65.

Upon the opposite side of the path of the bottles there is mounted a yoke 73 which is carried by an arm 74 that is pivoted at 75 on the bracket 34 to swing in a vertical plane. This arm 74 carries a roller 76 that is adapted to abut a face cam 77 that is mounted on the upright shaft 19, a retractile coil spring 78 being provided for yieldingly holding the arm 74 in its upright position with the roller 76 against the cam 77. The action of the cam 77 is to move the arm 74 inwardly at predetermined intervals and thereby cause the yoke 73 to embrace the side of the bottle opposite from that which is partly embraced by the swinging arm 65. It will be understood that the arm 65 and yoke 73 work synchronistically so as to simultaneously embrace such bottle and firmly hold it against rotation during the operation of the screwing discs 17, 18.

In order to insure a firm seating of the caps on the bottles in proper alinement with the necks thereof, I provide mechanism for yieldingly pressing downwardly upon each cap during the operation of the screwing discs 17, 18. This mechanism includes a horizontally disposed bar 79 which lies parallel with the path of the bottles and slightly above the discs 17, 18. This bar is supported by arms 80, 81, which are screwed to uprights 82, 83, mounted on the guide rail 32. A plunger 84 is slidably mounted in a hollow screw 85 which is threaded in the bar 79 immediately above the position assumed by each bottle at the time it is being acted upon by the discs 17, 18. An expansion spring 86 surrounds the shank 87 of the plunger and abuts the head of the plunger and the interior of the screw 85, so as to normally urge the plunger 84 downwardly. The tension of this spring may be adjusted by turning the screw 85 in the bar 79. A cam plate 88 is fixed to the lower end of the plunger 84 and projects laterally upwardly toward the incoming bottles. The cam plate 88 is held against turning out of proper position with respect to the path of the incoming bottles by a stud 188 which is secured to the extremity thereof and fitted to slidably travel in a recess formed in the bar 79.

As an additional means for exerting downward pressure upon each cap as it is being screwed onto a bottle, I mount a lug 117 upon the top of the disc 17 and at the periphery thereof, which lug carries a roller 217 that is calculated to periodically engage the rounded upper end of the shank 87 of the plunger 84. The roller 217 is mounted at such a height as to drive the plunger 84 downwardly when it contacts therewith. The said roller may be adjusted in the lug 117 by the screw 317.

In operation the bottles are placed successively upon the conveyor belt 13 in any well known and approved manner and are thence carried along by the belt until the leading bottle is engaged by the yielding finger 158 carried by the finger bar 56, and moved from the conveyor belt 13 onto the stationary plate 113. The movement of the finger bars 56, 57, then causes the fingers carried thereby to engage the bottle and move it along on the plate 113 step by step, each movement being equal to the throw of the crank discs 52, 53. As the bottle is moved along, it is held in a straight path by the guide rails 32, 33, 35, and its mouth finally enters the discharge end of the chute 60 and engages the lowermost cap 31. The continued movement of the bottle draws the cap from the chute and the spring 64 presses the cap into position loosely seated on the bottle. Further movement of the bottle causes the top of the cap to be engaged by the inclined portion of the cam plate 88 which tends to further press the cap down upon the bottle. After a little further movement the bottle arrives at a position in line with the axes of the discs 17, 18, and the cap is then finally driven downwardly by the plunger 84 under the influence of the spring 86 and the roller 217. As the bottle reaches this position, it is firmly gripped by the arm 65 and yoke 73 and held against turning. At this juncture the rotation of the discs 17, 18, brings the leading ends of the friction surfaces 29, 30, into contact with the sides of the cap and, as these surfaces at their points of contact with the cap are moving in opposite directions, they serve to screw the cap very rapidly and tightly upon the bottle. It will be noted that the discs 17 and 18 are of relatively large diameters so that it is only necessary for a part of their peripheries to engage the cap in order to screw it home and, as the parts of the said discs which are designed to operate upon the cap are of greater radius than the remainder of the discs, the operation of the parts may be so timed as to permit the free entrance of the bottle between the discs, while their portions of lesser radial size are adjacent the path of the bottle, and the immediately subsequent operation of the discs upon the cap, without the necessity of any

movement of the discs away from or toward the bottle. This is an important feature, among other reasons because it obviates the necessity of having the discs 17 and 18 under the influence of inward pressure which might tend to crush or injure the cap or bottle or both. Furthermore, the angular mounting of the discs 17 and 18 enables the portions of their peripheries engaging the cap to travel with the axial movement of the cap as it is screwed onto the bottle, without the necessity of any axial movement of the shafts upon which the discs are mounted. Preferably the angle of inclination of the discs 17 and 18 corresponds to the angle of the thread on the cap so that there will be practically no sliding or rubbing movement of the discs on the cap during the operation. While I have described the operation in connection with a single bottle and cap, it is of course clear that the bottles and caps may be put through the machine in unlimited numbers and in immediate succession.

It will be understood that the entire operation of screwing the cap home is performed so quickly that it takes place during a pause of the bottle in its step by step movement under the action of the finger bars.

After the cap has been screwed home the bottle is moved along by the finger bars and finally passed from the plate 113 onto the conveyor belt 13 in order to be carried to its destination.

While I have shown and described my invention as used for capping bottles, it is obvious that it may also be used as a machine for applying screw caps to receptacles of any character.

It will be understood that various changes may be resorted to in the form, construction and arrangement of the several parts without departing from the spirit and scope of my invention and hence I do not intend to be limited to the details herein shown and described except as they may be included in the claims.

What I claim is:

1. In a bottle capping machine, fixedly mounted means having a rolling contact with the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, and means for feeding the bottles to said screwing means.

2. In a bottle capping machine, a fixedly mounted rotary element having a surface for contacting with the side of the cap to impart to it a combined longitudinal and rotary movement for screwing it onto the bottle, said surface being of greater length than the circumference of the cap, and being adapted to contact with the side of the cap in substantial parallelism therewith when considered in the direction of the axis of the cap, and means for feeding the bottle to said screwing means.

3. In a bottle capping machine, means having a rolling contact with the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means including a fixedly mounted element fitted to rotate in a plane inclined to the axis of the cap, and means for feeding the bottles to said screwing means.

4. In a bottle capping machine, fixedly mounted means having a rolling contact with the opposite sides of the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, and means for feeding the bottles to said screwing means.

5. In a bottle capping machine, means having a rolling contact with the opposite sides of the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means including fixedly mounted elements fitted to rotate in planes oppositely inclined to the axis of the cap.

6. In a bottle capping machine, means for engaging the cap with a rolling contact to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means including a rotary shaft fixed against longitudinal and lateral movements, and an element fixed to said shaft, and means for feeding the bottles to said screwing means.

7. In a bottle capping machine, means for engaging the opposite sides of the cap with a rolling contact to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising rotary shafts fixed against longitudinal and lateral movements and screwing elements fixed to said shafts.

8. In a bottle capping machine, means for engaging the opposite sides of the cap with a rolling contact to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising oppositely inclined rotary shafts fixed against longitudinal and lateral movements and screwing elements fixed to said shafts.

9. In a bottle capping machine, means having a rolling contact with the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a fixedly mounted rotary element engaging the side of the cap, and means for feeding the bottles to said screwing means.

10. In a bottle capping machine, means having a rolling contact with the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a fixedly

mounted rotary element inclined to the axis of and engaging the side of the cap, and means for feeding the bottles to said screwing means.

11. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a rotary element inclined to the axis of the cap and having a segment of increased radius for engaging the side of the cap.

12. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a fixedly mounted rotary shaft inclined to the axis of the cap and an element carried thereby in position to engage the side of the cap, and means for feeding the bottles to said screwing means.

13. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a rotary shaft inclined to the axis of the cap and an element carried thereby having a segment of increased radius arranged to engage the side of the cap.

14. In a bottle capping machine, fixedly mounted rotary means for engaging the opposite sides of the cap with a rolling contact to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, and means for feeding the bottles to said screwing means.

15. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising fixedly mounted rotary elements inclined to the axis of and for engaging the opposite sides of the cap, and means for feeding the bottles to said screwing means.

16. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising fixedly mounted rotary elements oppositely inclined to the axis of and for engaging the opposite sides of the cap, and means for feeding the bottles to said screwing means.

17. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising rotary elements inclined to the axis of the cap and having segments of increased radius for engaging the opposite sides of the cap.

18. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising rotary elements oppositely inclined to the axis of the cap and having segments of increased radius for engaging the opposite sides of the cap.

19. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising fixedly mounted rotary shafts oppositely inclined to the axis of the cap and elements carried thereby for engaging the opposite sides of the cap.

20. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising rotary shafts oppositely inclined to the axis of the cap and elements carried thereby having segments of increased radii for engaging the opposite sides of the cap.

21. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising fixedly mounted rotary shafts oppositely inclined to the axis of the cap, rotary elements carried thereby for engaging the opposite sides of the cap, and a common drive shaft for said inclined shafts.

22. In a bottle capping machine, fixedly mounted means for engaging the cap with a rolling contact to impart to it a combined longitudinal rotary movement for screwing it on to the bottle, and means for holding the bottle against turning while the cap is being screwed on.

23. In a bottle capping machine, a rotary shaft, a rotary element carried thereby engaging the cap for imparting to it a combined longitudinal and rotary movement to screw the cap on to the bottle, and means controlled by said rotary shaft for holding the bottle against turning while the cap is being screwed on.

24. In a bottle capping machine, a rotary shaft inclined to the axis of the cap, a rotary element carried thereby engaging the cap for imparting to it a combined longitudinal and rotary movement to screw the cap on to the bottle, and means controlled by said rotary shaft for holding the bottle against turning while the cap is being screwed on.

25. In a bottle capping machine, rotary shafts, elements carried thereby engaging the opposite sides of the cap for imparting to it a combined longitudinal and rotary movement to screw it on to the bottle, and means controlled by said shafts for holding the bottle against turning while the cap is being screwed on.

26. In a bottle capping machine, rotary shafts oppositely inclined to the axis of the cap, elements carried thereby engaging the opposite sides of the cap for imparting to it a combined longitudinal and rotary movement to screw it on to the bottle, and means

controlled by said inclined shafts for holding the bottle against turning while the cap is being screwed on.

27. In a bottle capping machine, a pair of horizontally arranged rotary elements oppositely inclined to the axis of the cap, means for feeding the bottles with the caps thereon intermittently to a position between said rotary elements, said rotary elements having raised surfaces arranged to coact to impart a combined longitudinal and rotary movement to the cap to screw it on to the bottle.

28. In a bottle capping machine, means for feeding a bottle with a cap loosely positioned thereon, a rotary device for imparting to the cap a combined longitudinal and rotary movement for screwing it onto the bottle, said device having a part projecting toward the path of the bottle a sufficient distance to engage the cap and another part terminating a sufficient distance from the path of the bottle to permit the latter to pass freely thereby, and means for actuating said device so as to cause its said parts to move successively toward and away from the bottle.

29. In a bottle capping machine, means for feeding a bottle with a cap loosely positioned thereon, a plurality of rotary devices for imparting to the cap a combined longitudinal and rotary movement for screwing it onto the bottle, said devices being mounted on opposite sides of the path of the bottle and each having a part projecting toward the path of the bottle a sufficient distance to engage the cap and another part terminating a sufficient distance from the path of the bottle to permit the latter to pass freely thereby, and means for actuating the said devices so as to cause their said parts to move successively toward and away from the path of the bottle.

30. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it on to the bottle, said means comprising a rotary element having a segment of increased radius for engaging the side of the cap.

31. In a bottle capping machine, means for engaging the cap to impart to it a combined longitudinal and rotary movement for screwing it onto the bottle, said means comprising rotary elements having segments of increased radius for engaging the opposite sides of the cap.

In testimony, that I claim the foregoing as my invention, I have signed my name, this 16th day of March 1920.

ROBERT G. CLARK.