No. 666,672. Patented Jan. 29, 1901.

E. HOFFMAN.

MACHINE FOR ROLLING LOCKING LUGS ON BOTTLE CAPS.

(Application filed Nov. 21, 1899.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.

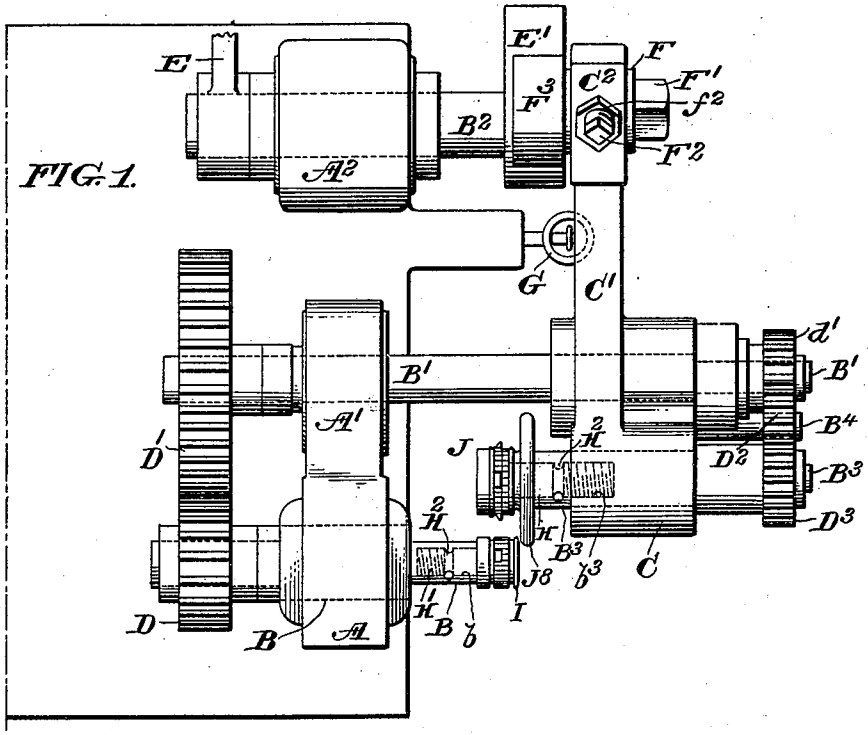
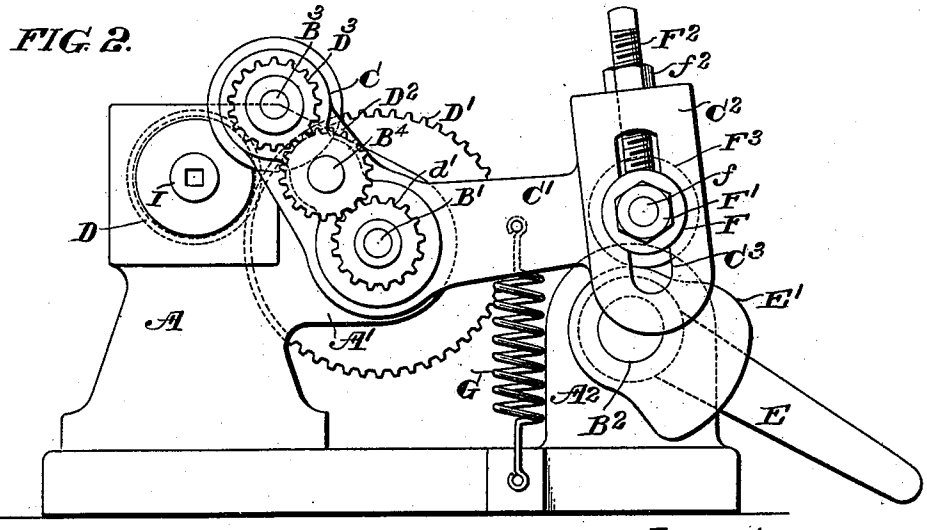


FIG. 2.



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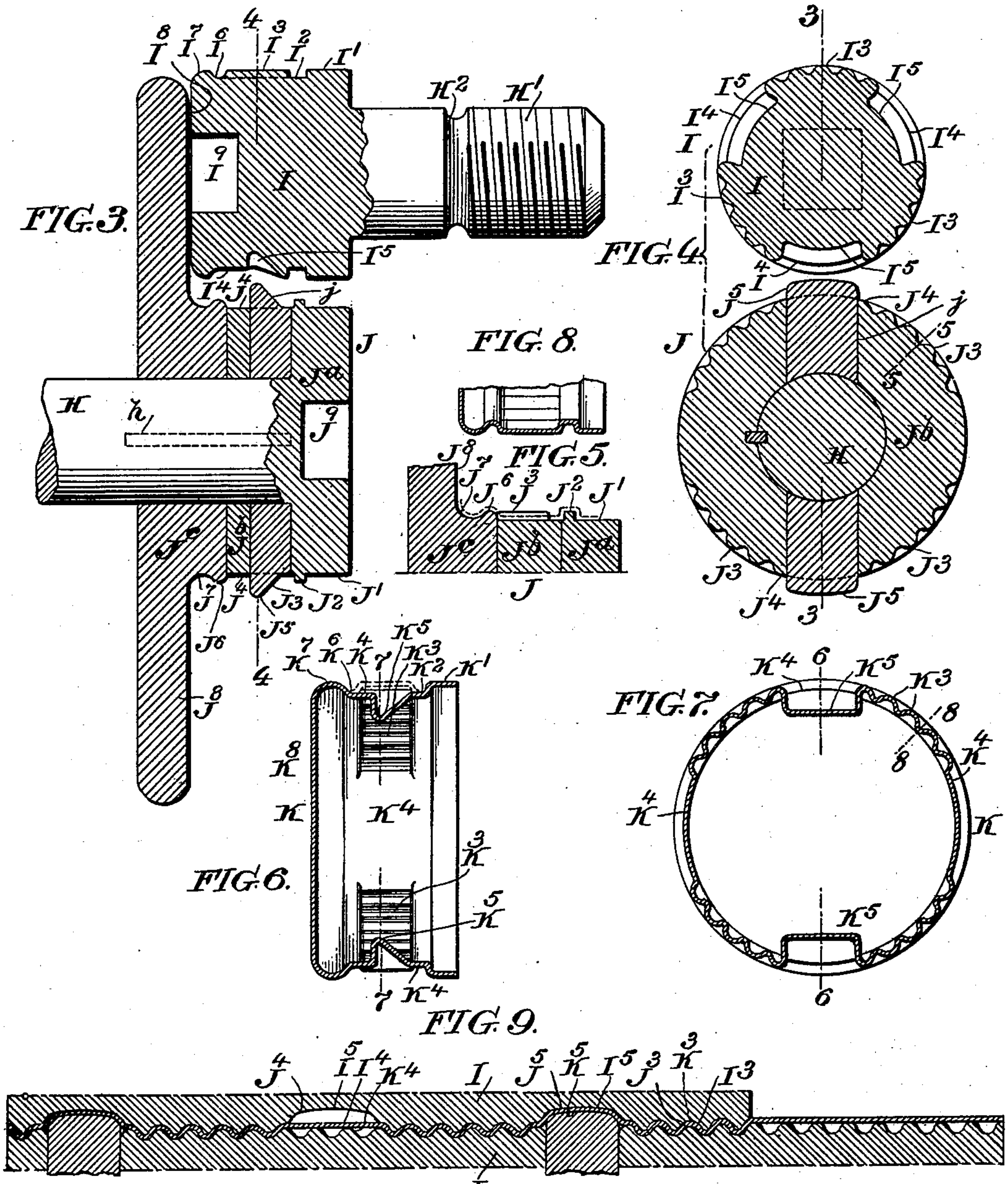
(No Model.) 4 Sheets—Sheet 2.



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(No Model.) (Application filed Nov. 21, 1899.)

4 Sheets—Sheet 3.

FIG. 10.

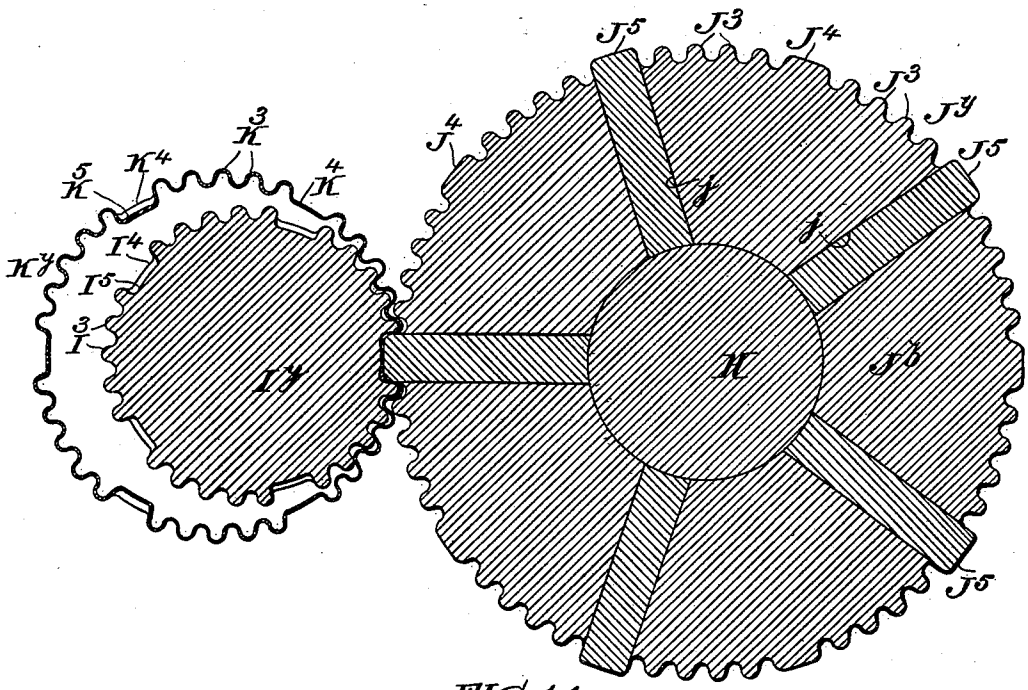
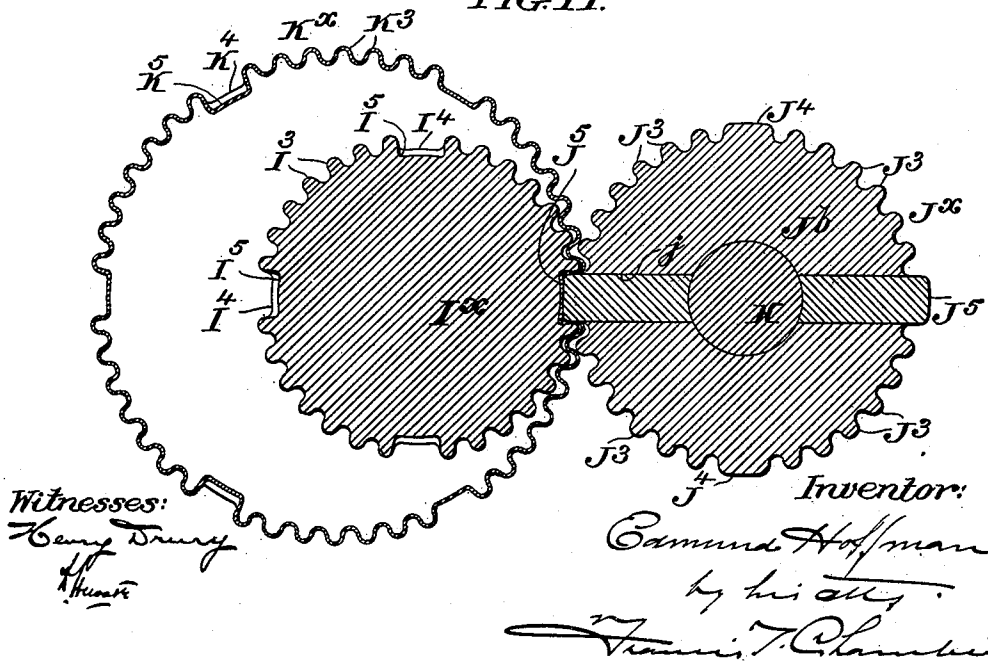


FIG. 11.



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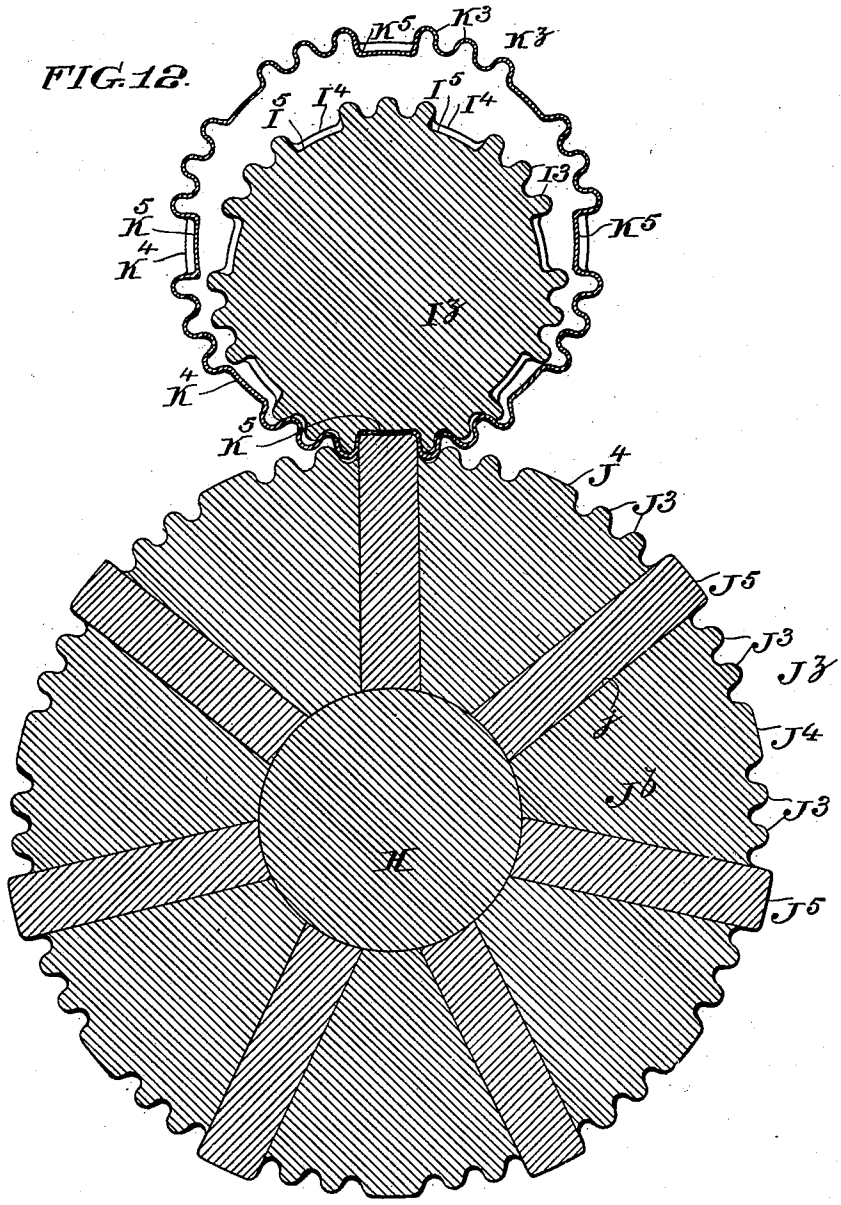
(No Model.) 4 Sheets—Sheet 4.

FIG. 12.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR ROLLING LOCKING-LUGS ON BOTTLE-CAPS.

SPECIFICATION forming part of Letters Patent No. 666,672, dated January 29, 1901.

Application filed November 21, 1899. Serial No. 737,734. (No model.)

To all whom it may concern:

Be it known that I, EDMUND HOFFMAN, a citizen of the United States of America, residing in the city of Bridgeton, in the county of Cumberland, in the State of New Jersey, have invented certain new and useful Improvements in Machines for Rolling Locking-Lugs on Bottle-Caps, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to machinery for rolling locking-lugs, and preferably also corrugations, on cap-closures for bottles and similar receptacles, my object being to provide an efficient and simple machine in which the caps can be readily placed and from which they can be readily withdrawn. Particularly my object is to roll the caps and form the locking-lugs and corrugations by means of an inside roller of considerably less diameter than the cap formed upon it and a coacting external roller; and my invention consists, essentially, in the arrangement and combination of the coacting die members in the internal and external rolls, which will be hereinafter described in connection with the drawings and especially pointed out in the claims.

Reference being now had to the drawings in which my invention is illustrated, Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a side elevation of the machine. Fig. 3 is a section through the rolls, taken as on the section-line 3 3 in Fig. 4, the scale of the drawing being larger than in Fig. 1. Fig. 4 is a section through the rolls, taken as on the section-line 4 4 of Fig. 3. Fig. 5 is a section through one edge of the outer roller, taken as on the section-line 5 5 of Fig. 4. Fig. 6 is a side elevation of a bottle-closure cap such as is made by the rolls shown in Figs. 3 and 4, the section being on the line 6 6 of Fig. 7. Fig. 7 is a section through the cap, taken on the line 7 7 of Fig. 6. Fig. 8 is a section through the cap, taken as on the section-line 8 8 of Fig. 7. Fig. 9 is a protraction of a portion of the faces of the inner and outer rolls, showing the mode in which they act upon the metal of the cap. Fig. 10 is a sectional view of a modified pair of rolls and the cap impressed thereby; Fig. 11, a similar view showing another modification; and Fig. 12, again, a similar view showing still another modification, all the modifications involving my invention to the same extent.

A indicates a standard forming a supporting-frame for the rollers and including a laterally-extending arm or bracket, (indicated at A'.) A^2 indicates another standard forming a bearing and support for the mechanism by which the rolls are brought into and out of operative position.

B is a shaft journaled in the standard A and formed with a socket in its end, as indicated at *b*.

B' is a shaft supported in a bearing in the bracket A'.

D and D' are gear-wheels secured on the ends of the shafts B and B' and engaged together.

C C' are two arms of a bell-crank lever pivoted and journaled on the shaft B', the arm C having at its end a bearing in which is supported a shaft B^3. Between the bearing for the shaft B^3 and its pivotal connection with shaft B' the arm C also supports a stud-shaft, (indicated at B^4.) On the end of the other arm C' is formed a slotted head C^2, C^3 indicating the slot.

d' is a gear-wheel secured on the end of the shaft B'.

D^2 is a gear-wheel in mesh with the gear *d'* and journaled on the stud-shaft B^4, said gear-wheel being also in engagement with a third gear-wheel D^3, secured to the shaft B^3.

b^3 indicates a socket in the end of the shaft B^3 similar to that in the end of the shaft B.

E is a lever secured to the shaft B^2, and E' a cam also secured to the shaft B^2, said cam being arranged, as shown, so as to lie close to the head C^2 of the lever-arm C'.

F is a stud for supporting a cam-roller, (indicated at F^3.) This stud has a slide extension which passes through the slot C^3 of the head C^2 and is adjusted therein by means

of a set-screw F^2 and nut f^2, a threaded extension f serving to receive the binding-nut, (indicated at F'.) The cam-roller F^3 rests in contact with the cam E', as shown, being held against it by the action of a spring G tending to constantly draw the arm C' of the lever downward.

I is the roller upon which the cap is placed, and J the coacting roller working against the outer face of the cap.

I^x I^y I^z are inner rollers of modified construction, and J^x J^y J^z outer rollers of modified construction. As shown and as I prefer to construct it, the roller I is formed with an annular beading I', immediately above which occurs an annular depression or slot, (indicated at I^2.) Above this slot or depression the roller is formed with a series of symmetrically-disposed segments I^3, formed with corrugations adapted to serve as a die member in corrugating the cap in connection with inversely-shaped grooves on the exterior roller. Between the corrugated segments I^3 are symmetrically-disposed plane faces I^4, in which plane faces are formed die members I^5 to coact with inversely-shaped die members on the exterior roll to form locking-lugs on the cap. Above the corrugations the roll is formed with an annular groove or depression I^6, above which in turn is a rounded annular beading I^7, I^8 indicating the head of the roll, and I^9 an angularly-shaped cavity in the head for convenience in inserting and removing rollers in the machine.

The roller J is conveniently made in several pieces, as best shown in Fig. 3, one portion J^a forming the head of the roll and being secured to the spindle H and formed with an angular cavity J^9. Another portion J^b is formed with slots, as indicated at j, and a third portion J^c, like the intermediate portion J^b, is keyed to the spindle or shaft H. The composite roller has of course a face directly corresponding to the face of the roller I—that is, a depressed portion J' fitting on the annular beading I', the upwardly-extending beading J^2 fitting into the depressed portion I^2, a series of corrugated segments J^3 corresponding to and adapted to coact with grooves I^3, flattened segments J^4 corresponding in position with the flattened segments I^4 of the roller I, lug-forming die members I^5, which are conveniently formed on separate blocks of metal inserted in the cavity j, a bead J^6 corresponding to the grooved portion I^6, a curved depressed portion J^7 corresponding to the beading I^7, and finally the roll is formed with an outwardly-extending flange J^8, which fits over and against the head I^8 of the roller I.

The roller I is formed on the end of a spindle H', which fits into the socket b in the shaft B, while the roller J is partly formed on and partly secured to the spindle H, which fits in the cavity b^3 of the shaft B^3, each of the spindles being, as shown, formed with an annular slot H^2, through which passes a locking-pin, as shown in Fig. 1, to hold the roller-spindle in the socket, and of course it will be understood that the gearing by which the shafts are connected is so proportioned as to give the two rollers substantially the same peripheral speed, or rather such a speed as will result in the proper feeding of the bottle-cap between them.

In the arrangement of the lug-forming die members on roller I such die members must be symmetrically disposed around the circumference of the roller, and there must obviously be a distance between such die members equal to the distance between the lugs to be formed on the cap, said distance being also an even divisor of the circumference of the cap; but the die members distant in this degree from each other need not necessarily be adjacent to each other. The die members of the outer roll must also be symmetrically disposed, and for the best results the adjacent die members should be distant from each other to the same degree that the lugs to be formed are distant from each other on the cap.

In the operation of the rollers constructed as above indicated die members on the inner roll must frequently come into operative relationship with the face of the outer roll at points where there are no coacting die members, and as I prefer to form the lugs not in the grooves, but in the plane faces between the grooves on the cap, I prefer to form the outer roll with plane faces J^4 intermediate the similar plane faces in which the die members J^5 are formed and so that one of these plane faces, either provided with a die or unprovided with a die, will come in contact with each plane face on the inner roll. This, it will be understood, is not necessary, and my reason for preferring to so construct the outer roller is that it prevents the marking of the plane faces, which is apt to occur when the portion of the outer roll working in connection with the plane face on the inner roll is corrugated and not plane.

From the rule of construction which I have already stated—namely, that the die-faces on the inner roll must be so disposed that the distance between the not necessarily adjacent die members must be equal to the distance between the lugs to be formed on the cap—it will be evident that the size of the inner roll must always bear such relationship to the diameter of the cap as will permit of this disposal of the die-faces. Subject to this limitation the relative diameters of the cap and of the inner roller may vary considerably, though I prefer—and this is especially important with small sizes of caps—that the inner roll should be as nearly of the diameter of the inside of the cap as is practicable with avoidance of uniformity. Thus in the case of the roller I, (shown in Figs. 3 and 4,) which is intended for use in the manufacture of a cap K, Figs. 6 and 7, having two locking-lugs, (indicated at K^5 K^5,) I prefer to form the inner

roll of three-quarters the diameter of the cap and to provide it with three die members I^5, as shown. In this case the alternate die members are distant from each other by the same distance as the two locking-lugs K^5 to be formed in the cap. In the arrangement of rollers shown in Figs. 3 and 4 the outer roller is of the same diameter as the cap, and its two lug-forming die members J^5 are therefore situated diametrically opposite to each other, but between the die-forming members, and also on opposite sides of the roller, I form additional plane faces J^4, so that one such plane face, whether provided with a die or not, will correspond with and in operation coact with each of the plane faces I^4 in the inner roller.

The character of the cap formed in my machine is indicated in Figs. 6, 7, and 8. It will be understood that the cap is drawn to cup-shaped form before it is introduced into the machine and that in placing it in the machine the lever E and cam E′ are pushed down to the position shown in Fig. 2, with the result of lifting the lever-arm C and the roller J, secured thereto. The cup-shaped cap is then placed on the roller I, the lever E and cam E′ turned upward, pressing on the cam-roller F^3 and through it pressing the arm C′ upward and the arm C downward until the cap-blank is clamped between the rolls I and J, which then rotate through a sufficient distance to fully crimp and indent the cap—that is to say, in the plan shown the roller J must make one full revolution and in coaction with it the roller I must make one and a third complete revolution. No harm is done, however, by the continued revolution of the rolls, as the die members, both those which form the crimps and those which form the lugs, will simply act upon already-completed portions of the cap without changing their form. The lever E is then again thrust down to permit the cap to be taken from the machine and a new one inserted. The form given to the cup-shaped cap is fully shown in Figs. 6, 7, and 8, the cap having a beading K′ at its bottom, separated from the zone in which the beading and lugs are formed by an annular depressed portion K^2. The corrugated segments of the cap are indicated at K^3, and the plane segments at K^4, the locking-lugs formed in the plane segments at K^5. An annular groove (indicated at K^6) extends around above the corrugated portion, merging by a convex beading K^7 into the head K^8 of the cap.

In the construction of rolls shown in Fig. 10 a cap K^y is made having three locking-lugs K^5 and six corrugated sections K^3, separated by plane faces K^4. In this construction the inner roll is made with five lug-forming die members I^5, alternate ones being distant from each other by one-third of the circumference of the cap, by which distance also the lugs in the cap are separated from each other. The outer roll J^b is provided with five lug-forming die members J^5, each distant from the other by one-third of the circumference of the cap.

In the construction shown in Fig. 11 the cap indicated at K^x is also formed with three locking-lugs, and the roll I^x is of relatively less diameter than the roll I^y and provided with but four lug-forming die members. The outer roll J^x in this modification is of substantially the same diameter as the roll I^x and has but two lug-forming die members J^5.

In the remaining modified construction (illustrated in Fig. 12) the cap indicated at K^z is formed with four locking-lugs K^5 and the inner roll is formed with seven lug-forming die members I^5, the outer roll J^z in this case being provided with seven lug-forming die members J^5.

Many other examples could be given showing modifications of rolls, all, however, embodying to precisely the same extent the essential features of my invention. Those given will enable any one skilled in the art to thoroughly understand the essential requisites of construction in the manufacture of rolls for any desired style of cap.

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

1. In a machine for rolling locking-lugs on bottle-caps, a roller of materially less diameter than the cap having lug-forming die members symmetrically disposed around an intermediate section of its face and so that the distance between one member and another, not necessarily adjacent members, shall be equal to the distance between the lugs to be formed on the cap and an even divisor of the circumference of the cap in combination with a coacting roller having die members symmetrically disposed around its face and arranged to coact with the die members on the first roll to form the lugs on the cap, and means for revolving the said rolls at substantially the same peripheral speed.

2. In a machine for rolling locking-lugs on bottle-caps, a roller of materially less diameter than the cap having lug-forming die members symmetrically disposed around an intermediate section of its face and so that the distance between alternate members shall be equal to the distance between the lugs to be formed on the cap and an even divisor of the circumference of the cap in combination with a coacting roller having die members symmetrically disposed around its face and arranged to coact with the die members on the first roll to form the lugs on the cap and means for revolving said rolls at substantially the same peripheral speed.

3. In a machine for rolling locking-lugs on bottle-caps, a roller of materially less diameter than the cap having lug-forming die members symmetrically disposed around an intermediate section of its face and so that the distance between one member and another, not necessarily adjacent members, shall be equal to the distance between the lugs to be

formed on the cap and an even divisor of the circumference of the cap, said roller having corrugating die-sections formed between the lug die members, in combination with a co-acting roller having die members symmetrically disposed around its face and arranged to coact with the die members on the first roll to form the lugs on the cap and corrugating die-sections situated between said die members to coact with the corrugating-sections on the first roller, and means for revolving said rolls at substantially the same peripheral speed.

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