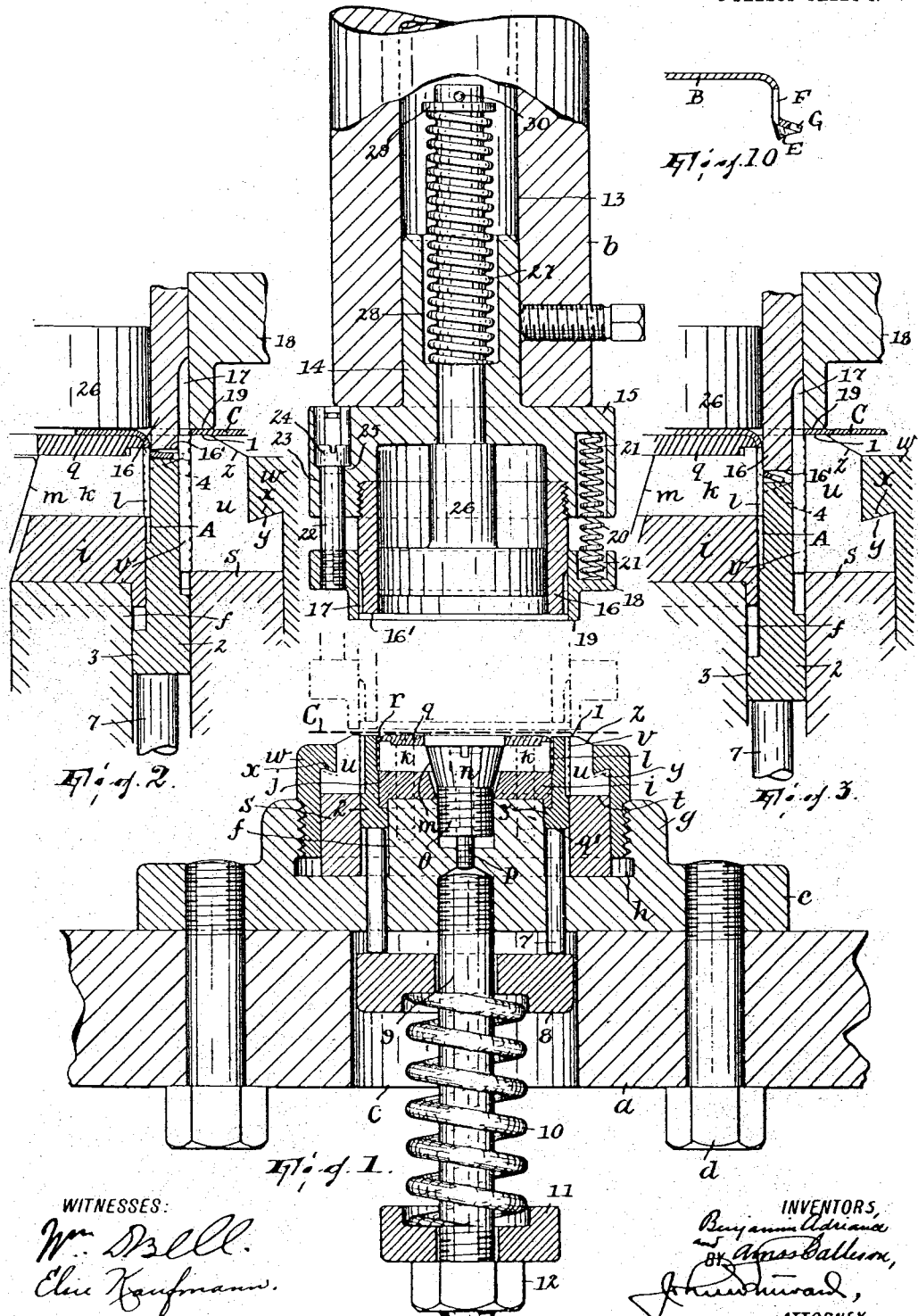


DIE STRUCTURE.

Patented June 11, 1912.

2 SHEETS--SHEET 1.



B. ADRIANCE & A. CALLESON.

DIE STRUCTURE.

APPLICATION FILED MAY 19, 1910.

1,029,333.

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2 SHEETS-SHEET 2.

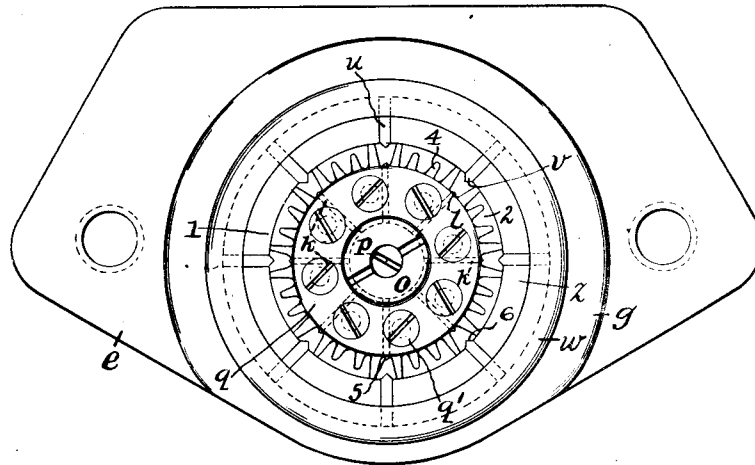


Fig. 4.

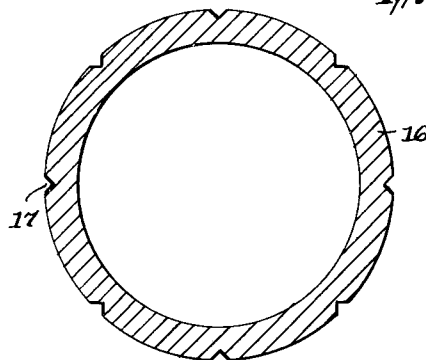


Fig. 5.

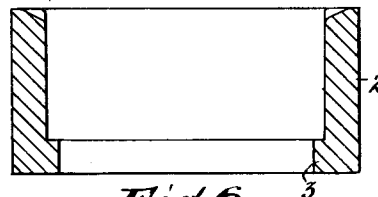


Fig. 6.

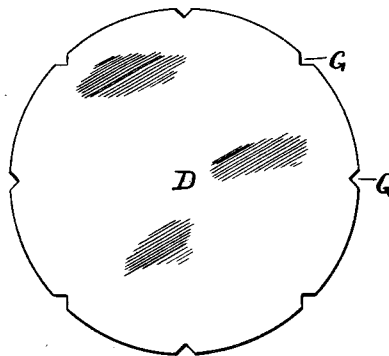


Fig. 7.

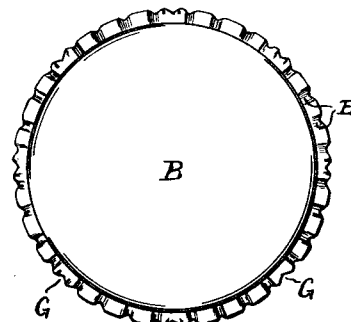


Fig. 8.

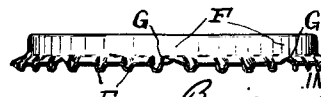


Fig. 9.

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UNITED STATES PATENT OFFICE.

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DIE STRUCTURE.

1,029,333.

Specification of Letters Patent.

Patented June 11, 1912.

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To all whom it may concern:

Be it known that we, BENJAMIN ADRIANCE and AMOS CALLESON, citizens of the United States, residing in Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Improvement in Die Structures; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to metal punching and drawing apparatus and particularly to die structures for such apparatus.

The objects of our invention may probably be best set forth by reference to an article of manufacture—to wit, a certain closure for bottles, jars and the like—which our improved die-structure, in one form thereof, is designed to produce. This closure resembles in general form the conventional sheet-metal crown, or cap having a flaring corrugated or fluted flange; it differs from the crown ordinarily used in that at suitable intervals, depending on the size of the crown and other conditions, two series of cuts are formed in the flange, one series being in the edge of the flange and the other in set-back relation to said edge yet in the flange, and the first series being preferably V-shaped and the second straight, preferably narrow and substantially vertical and respectively coinciding with the V-shaped cuts. The purpose of forming the closure as thus described is to make possible its removal from a bottle or the like without the use of a special implement, it being possible to disrupt the flange so as to break its grip on the bottle shoulder by inserting any suitable pointed implement under its flange edge and prying the same until the metal of the flange is broken down at one or more of the points where the cuts come. The form of the cuts and their relation to each other are such that, while the closures are uniformly adapted to respond to the action of the means for applying them to the bottle- or jar-heads without disruption or overweakening resulting at the weakened points in their flanges at that time, the closures will readily yield to the disrupting influence of

the implement employed in removing them from the bottle or jar-heads.

The principal objects of our invention, therefore, is to provide a die-structure whereby a closure of the kind above described may be cut from a metal sheet and formed complete in a single thrust of the movable member of such structure, the resultant product being so formed as to be best adapted in every way for the purposes for which it is designed.

While we herein describe and show our invention with reference to its use in the forming of closures for bottles, jars and the like we do not wish to be correspondingly limited; as hereinafter pointed out in the claims, we reserve to ourselves certain combinations of elements without reference to other elements, as the former may be useful in the manufacture of other articles than closures or the like.

In the accompanying drawings, Figure 1 is a vertical sectional view, showing certain parts in side elevation, of the improved mechanism; Fig. 2 is a similar, but fragmentary view, showing the position of certain parts after the blank has been cut from the sheet and while it is being manipulated into its ultimate form; the view being on a slightly larger scale than Fig. 1; Fig. 3 is a view similar to Fig. 2, but showing the position of said parts when the closure being formed has reached the last stage in its manipulation; Fig. 4 is a plan view of the lower or (in the present adaptation) stationary member of the mechanism; Fig. 5 is a horizontal sectional view of the female die; Fig. 6 is a vertical sectional view of a yielding part which coacts with the female die; Fig. 7 is a plan view of the blank cut from the metal sheet as the first step in the operation; Figs. 8 and 9 are a plan and side view of the finished closure; and Fig. 10 is a vertical sectional view of a fragment of the cap, enlarged, the plane of the section being coincident with cuts formed therein.

a and *b* designate suitable parts (the former being the bed and the latter the plunger, in the present adaptation, of a machine including the improved die-structure) supporting the elements of the male and female dies, respectively, and the parts which are associated therewith for the forming of the article of manufacture already referred

to and shown in Figs. 8, 9 and 10 of the drawings. The bed *a* has an opening *c* therein and over this opening is secured by the cap-screws *d* a plate *e* having on its upper face a boss *f* and, surrounding said boss and spaced therefrom, the annular, integral and internally threaded wall *g*, forming with the boss an annular socket *h*.

The top of the boss is planed off smooth and on it rests an annular knife or cutter support *i* recessed in its under side so as to fit snugly over the boss. In its upper portion said support *i* is provided with radial saw-cuts or slits *j* and in these are fitted the knives or cutters *k*; the outer extremities of these knives or cutters form their cutting edges (*l*), being double-beveled in plan (Fig. 4) and straight and vertical in side elevation (Fig. 1). Their inner edges incline inwardly and downwardly, as at *m*, and abut against the tapered portion *n* of an adjusting screw *o* which is tapped into the boss and penetrates the support *i*; to secure this screw precisely as adjusted, we employ a lock-screw *p* passing vertically through it and also tapped into the boss. By adjusting the screw *o* up or down the knives or cutters can be set so that their cutting edges will project more or less from the perimeter of the support *i*. A circular plate *q* surmounts the support *i*, acting to secure the cutters or knives in place and affording the advance face of the male die, its upper outer edge being rounded off, as at *r*, and, in its proper working relation with respect to the edges *l* of the cutters or knives, defining a circle of somewhat less diameter than that occupied by said edges; this plate *q* is held in place by the screws *q'* tapped into the support *j*. In the annular socket *h* is seated another cutter or knife support *s*, annular in form and having its upper portion formed with the radial saw-cuts or slits *t* in which are seated the knives or cutters *u*; these have the vertical, straight, double-beveled cutting edges *v* projecting within the circle represented by the inner perimeter of the support *s*. Support *s* is held in socket *h*, and the knives or cutters *u* are held in the support, by the retaining ring *w*, which is screwed into the threaded wall *g* and has an interior shoulder *x* which overhangs and bears upon the exterior shoulder *y* formed on the knife support *s* and knives *u*. At *z* the top surface formed by the knife support and knives is beveled off, leaving a narrow seat 1.

In the annular space which is formed between the male die (which in the present instance may be said to comprise parts *i*, *k*, *o* and *q*) and the structure comprising parts *s* and *u* is vertically movable a ring 2 having an internal shoulder 3 adapted to bear against the under side of the perimeter-portion of the support *i*. Said ring has in its upper face a series of radial notches 4; in

its inner surface it has a series of V-shaped recesses 5 adapted to receive and fit the edges *l* of the knives *k* and in its outer surface a series of V-shaped recesses 6 adapted to receive and fit the edges *v* of the knives *u*. This ring is supported by a series of pins 7 in turn resting on a disk 8 penetrated by the vertical stem 9 which is tapped into the plate *e*, said disk resting upon a spiral spring 10 surrounding the stem and supported by a step 11 seated against a nut 12 screwed onto the lower end of the stem 9.

Into a bore 13 formed in the plunger *b* is fitted the stem 14 of a cup 15. Into this cup is screwed the cylindrical female die 16. The die 16 has a smooth interior annular surface, while its outer surface is formed with a series of V-shaped vertical recesses 17 designed to receive and fit the edges *v* of the knives *u* when the die 16 is coöperating with the male die and, pushing down the ring 3, enters the annular recess between the male die and the structure formed by support *s* and knives *u*; the lower face 16' of the die 16, which bears upon the upper and notched recessed face of the ring 2, is flat or smooth. The female die 16 is surrounded by a ring 18 which has the double function of coöperating with the seat 1 to clamp the sheet from which the blank is to be cut and of stripping the sheet from the female die in the receding stroke of the plunger. To this end, the ring 18 has a narrow acting face 19 conforming and adapted to coöperate with the seat 1 in gripping or holding the sheet; said ring is normally held with its lower face slightly below that of the female die by means of springs 20 seated in recesses 21 in the ring and socket 15, the downward movement of the ring under the pressure of the springs being limited by screws 22 which are carried by the ring and slide vertically in bores 23 in the cup and have their heads 24 engaging shoulders 25 in said bores.

26 is a vertically movable plunger arranged in cup 15 and normally held elevated by a spring 27 interposed between the bottom of a bore 28 formed in the stem 14 and a washer 29 abutting against a pin 30 in the upper end of said plunger; the plunger 26 is depressed during the receding movement of the plunger *b* by any suitable mechanism, (for instance, similar to that shown in Patent No. 947,273), and acts at that time to clear the article formed from the female die.

Before describing the operation it should be remarked that the knives *k* are adjusted so that their extreme outer edges occupy a circle almost exactly as large in diameter as that represented by the inner surface of the female die 16; further, that the annular space A (Figs. 2 and 3) which exists between the outer perimeter of the support *i*

and the female die 16 when the latter is depressed and operating to draw the blank into the ultimate form (the cap B, Figs. 8 and 9) is only sufficiently wider (by preference) than the thickness of the metal so that the latter might just be entered therein freely, though snugly. When, having placed the sheet C on the lower member of the die-structure, the upper member descends, the first effect is that the face 19 of ring 18 coacts with the seat 1 to produce an annular grip on the sheet. Next, the female die descending relatively to ring 18 and entering the annular space occupied by ring 2 (which recedes under it), coacts with support *s* and knives *u* (together forming, in effect a female die) to cut the blank D (Fig. 7) from the sheet, this being followed by the drawing of the blank (continuing to the end of the operation) into the form of the ultimate cap B (Figs. 7 and 8), the center part or body of the blank being supported on the plate *q* rigidly while its edge portion descends, gripped between the female die 16 and ring 3.

In the drawing operation, two results are accomplished: the corrugations in the edge-portion of the cap, brought about by the production of downward flutings E, are formed, and the slits F produced. These results are accomplished as follows. As already stated, the face 16' of die 16 is smooth, while the upper face of ring 2 is formed with the recesses 4. In the drawing operation, the edge-portion of the article shrinks in diameter, there occurring a slight inward slip thereof with reference to the parts 16 and 2 between which it is gripped. Such shrinkage cannot of course occur without an accompanying radial buckling of the metal in the edge-portion of the article, and as this buckling cannot form in an upward direction because the face die 16 is smooth, it forms downwardly at spaced intervals coinciding with the recesses 4 in ring 2. It has been found in practice that the buckling or intervalled displacement of parts of the edge-portion of the flange of the article occurs uniformly at the several recesses, so that the several flutings E are substantially regular in shape and form.

In the drawing operation, the upper outer corners of the knives *k* when the inner edge of the face 16' of die 16 approaches into substantial contact with them are caused to puncture the metal of the article; this occurs at points coinciding with, but set in relatively to, the apices of the V-shaped incisions G which are formed in the edge of the article when it is cut as blank D from the sheet. As the drawing operation continues and the already described inward slip of the edge-portion of the flange of the article with respect to parts 16 and 2 occurs, the part of such edge-portion

which escapes inwardly from between parts 16 and 2 takes the form of a cylinder fitting the space A except where the edges of the knives *k* come which, being more and more covered by the inner cylindrical face of die 16 as the latter descends, coöperate with the die to produce in each instance a running squeeze of the metal; since the knives are sharp and almost perfectly fit within the die 16 the squeezed portions of the metal assume the form of the vertical slits F. The edges of the slits thus do not project beyond the inner or outer surfaces of the vertical wall of the cap, forming undesirable ragged projections. In the present form, as already described, slits (*i. e.*, openings through the wall of the cap) are formed; as it is the purpose to weaken the said wall, whether that is accomplished by actually penetrating the same or merely reducing the thickness thereof, it will be understood that merely the latter may be accomplished if desired by adjusting the knives *k* so that the circle represented by their cutting edges will not so nearly coincide with that represented by the interior of die 16 as has hereinbefore been assumed.

It will be observed that the cylindrical or vertical wall of the finished cap is perfectly smooth; this is preferred in order to impart a finish to the container provided with the closure and it is the result of the lower face 16' and the inner cylindrical face of the die 16 meeting to form a plain circular edge.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In combination, with one member of a die mechanism, a cutting member having a cutting edge arranged opposite to and coactive with a working face of said die member, and means for moving one of said members relatively to the other in substantially the same direction as said face extends, said cutting edge extending in substantially the direction of thrust of the movable member substantially as described.

2. In combination, with one member of a die mechanism, said member having a working face extending substantially in the same direction as the thrust line of the die mechanism, a cutting member having a cutting edge arranged opposite to and coactive with said face, one of said members being movable relatively to the other in substantially the same direction as said thrust-line extends, and said cutting edge extending in substantially the direction of thrust of the movable member substantially as described.

3. In combination, with the male and female die members of a die mechanism, one of said members having a working face extending substantially in the same direction as the thrust-line of the die mechanism,

a cutter having a cutting edge arranged opposite to said face and arranged in the other member, one of said members being movable in the same direction as the thrust line extends, and said cutting edge extending in substantially the direction of thrust of the movable member substantially as described.

4. In combination, with the male and female die members of a die mechanism, a cutting member having a cutting edge opposite to and coactive with a working face of one of said members adjacent the other die member, and means for effecting a relative movement between the cutting member and the die member having said face in substantially the same direction as said face extends, said cutting edge extending in substantially the direction of thrust of the movable member substantially as described.

5. In combination, with the male and female die members of a die mechanism, one of said members having a working face thereof adjacent the other extending in substantially the same direction as the thrust-line of the die mechanism, a cutting member having a cutting edge arranged opposite to and coactive with said face, and means for effecting a relative movement between the cutting member and the die member having said face in substantially the same direction as said thrust-line extends, said cutting edge extending in substantially the direction of thrust of the movable member substantially as described.

6. In combination, with means for drawing the material, means for progressively forming in the drawn part of the material during the drawing operation a squeeze attenuated in substantially the direction of the drawing, substantially as described.

7. In combination, with means for drawing the material comprising male and female die members, means, coactive with a working face of one die member, for forming in the drawn part of the material during the drawing operation a squeeze attenuated in substantially the direction of the drawing, substantially as described.

8. In combination, with means for drawing the material comprising a die member

having a working face presented sidewise relatively to the direction of thrust in the drawing operation, means, coacting with said face, for forming in the drawn part of the material during the drawing operation a squeeze attenuated in substantially the direction of the drawing, substantially as described.

9. In combination, with one member of a die mechanism, a squeeze-forming member having a squeeze-forming face coactive with a working face of said die member, and means for moving one of said members relatively to the other member in substantially the same direction as the working face of said die member extends, said squeeze-forming face of the squeeze-forming member being limited in width transversely of the line of movement of the movable member, substantially as described.

10. In combination, with means for holding a part of the material against movement, means, coactive with the first means, for moving the unheld part of the material out of the plane of the held part thereof, one of said means being movable through the plane of the held part of the material, and a squeeze-forming member projecting from one of said means laterally relatively to the thrust line of the movable means and toward and having a squeeze-forming face coactive with the other means, the squeeze-forming face of said member being limited in width transversely of said thrust line, substantially as described.

11. In combination, with means for drawing the material, means for forming in the drawn part of the material during the drawing operation a squeeze attenuated in the direction of the drawing, substantially as described.

In testimony, that we claim the foregoing, we have hereunto set our hands, this 17th day of May, 1910.

BENJAMIN ADRIANCE.
AMOS CALLESON.

Witnesses:

LOUIS F. STUMPF,
F. A. GEWEHR.