O. Newton,

Sheet-Metal Die.

No. 28,397. Patented May 22, 1860.

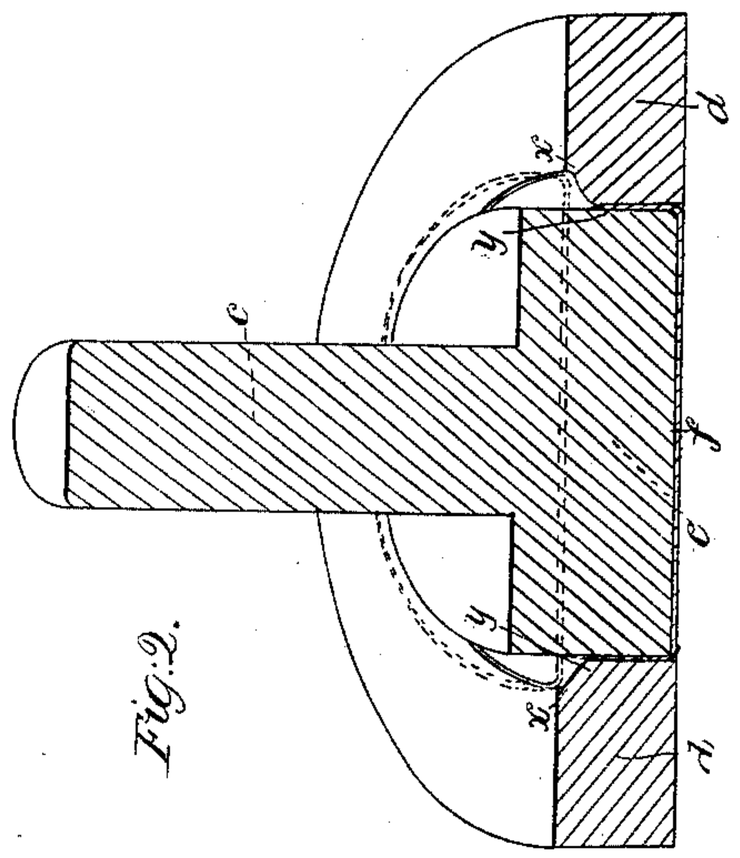

Fig. 2.

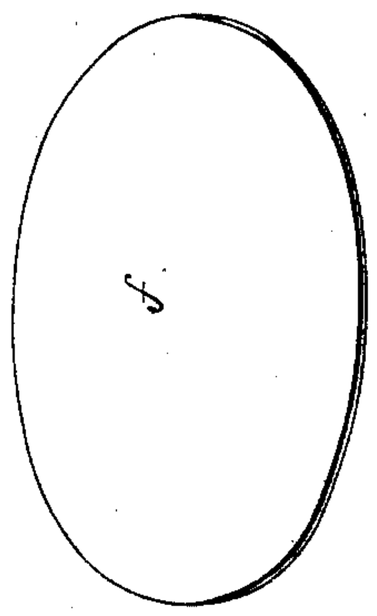

Fig. 4.

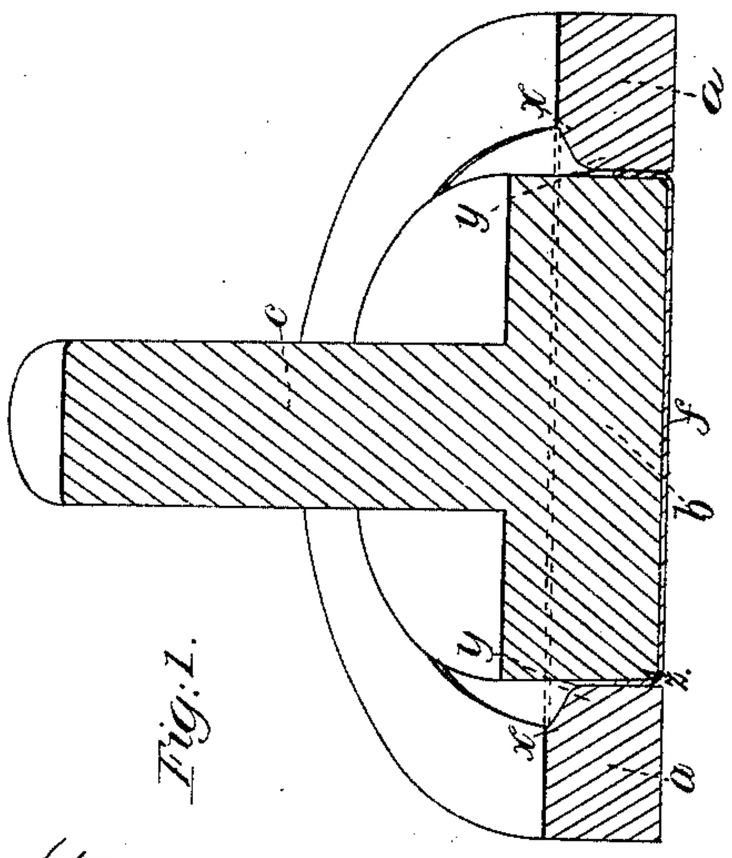

Fig. 1.

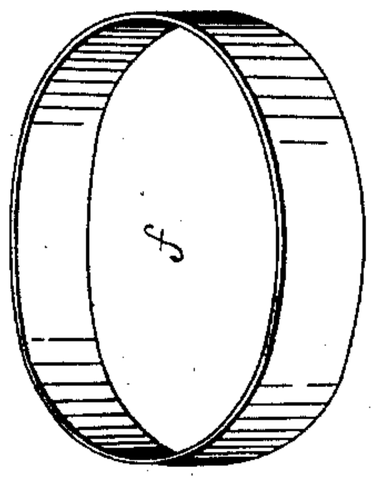

Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

ORRIN NEWTON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN MAKING SHEET-METAL CAPS, &c.

Specification forming part of Letters Patent No. **28,397**, dated May 22, 1860.

To all whom it may concern:

Be it known that I, ORRIN NEWTON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Seamless Metallic Caps and Boxes; and I do hereby declare the following to be a full, clear, and exact description thereof.

The special object of my improvement is to make caps (suitable for sealing the mouths of jars used for preserving fruits and vegetables) of sheet-tin or tinned iron in one piece, so as to have no joints, thus insuring their being perfectly air-tight, and at the same time to make the sides of the cap perfectly smooth and free from wrinkles, as otherwise they will not fit on the neck of the jar or can sufficiently close to form an air-tight joint.

My improvement is also applicable to the manufacture of boxes and caps of various kinds, as it produces an article of seamless boxes and caps, having a smoothness and finish which cannot be given by any other process with which I am acquainted.

I am aware that a rough article of tin caps has been made by turning up the edge of a disk of tin by means of a stamp; but by this process the edge formed is very shallow, and is full of currugations, which render it entirely unfit for the purpose named, or for any use where neatness of finish is desirable.

To enable others skilled in the art to make use of my improved mode of manufacturing metallic caps, I will proceed to describe it, referring to the annexed drawings, forming part of this specification, in which—

Figure 1 is a sectional perspective representation of the die and punch used for the first process of turning up the edge of the metallic disk, showing the disk between the punch and die after being operated upon, and by dotted lines the position of the disk before the descent of the punch. Fig. 2 is a sectional perspective representation of the die and punch employed for finishing the cap, showing the cap in place after the operation is finished and before it is discharged from the die, and by dotted lines the position of the partly-finished disk before the descent of the punch. Fig. 3 represents a finished cap. Fig. 4 represents a circular disk of tin from which the cap is to be made.

My improved method of making metallic caps consists of the use of a die or succession of dies, the cavity of each being of smaller diameter than the one previously used, and the mouth of each being of the diameter of the disk or blank, or of the unfinished cap to be passed through it, and rapidly diminishing for part of its depth, and thence to the bottom of the die, preserving the same diameter (if the cap is to have parallel sides) or tapering at the same angle to its axis that it is desired to give to the sides of the finished cap, and the use with such a die or dies of a punch or plunger of the same shape as the lower part of its die and of the same diameter less twice the thickness of the metallic disk or cap to be operated upon by it, so that when the disk is forced by the plunger into the lower part of the die the plunger and disk will occupy the entire diameter of the die.

In the drawings, Fig. 1, *a* is the die in which the first operation of turning the edge of the disk is to be performed. It is an annular piece of steel highly polished on its inner face. The diameter of the cavity of the die *a* at its mouth *x x*, Fig. 1, is equal to the diameter of the plane metallic circular disk, Fig. 4, which is to be operated upon in this die, the mouth of the die being so constructed that the disk will rest in it, perfectly level, in a little groove made for that purpose, as seen in Fig. 1. The diameter of the cavity of the die thence rapidly diminishes, as seen in Fig. 1, so that in about one-quarter of an inch in depth the diameter will be reduced a little more than half an inch, or over one quarter of an inch all round. This contraction of the die commences abruptly at the bottom of the shallow groove in which the disk is to rest; but as it approaches the point of greatest contraction at *y* the face of the die is curved so as not to present a sharp angle at *y*. From the point *y* to the bottom of the die the cavity is of uniform diameter throughout, and of a depth somewhat greater than the depth of side to be turned up around the disk by this die. The punch or plunger *b* is a cylindrical block of steel of uniform diameter, polished on its under side, which is a plain surface, and also all around. The under edge of this plunger is rounded off, as seen at *z*, Fig. 1, so that it will bend but not crease the disk at the point

where its edge is turned up. The plunger *b* is thicker than the depth of the die *a*, so that it will pass through the die far enough to deliver the disk without becoming itself unseated. Care must be taken to have the plunger of the right diameter, which is just the diameter of the lower or smallest part of the die, less twice the thickness of the metallic disk from which the caps are to be made, as will be seen by examining the drawings, Fig. 1. The plunger has a handle, *c*, exactly concentric with the axis of the plunger *b*, so that when the die is set in a suitable machine the plunger may be inserted into a socket of the machine and fastened immediately over and concentrically with the cavity of the die. The die is stationary, and is placed in a horizontal bed, and the plunger-socket having a vertical motion up and down, causes the plunger to enter the die with its axis in the exact center of the die, so that the sides of the plunger do not come in contact with the face of the die, but leave a space between them all round equal to the thickness of the metal used for making the caps. The stroke of the plunger must be exactly in the line of the axis of the die, and the length of the stroke such that the upstroke will raise the plunger out of the die and the downstroke will deliver the cap, but not cause the plunger to pass entirely below the under side of the die. The die-bed of the machine on which the die is set must have an opening at least as large as the smaller diameter of the die to allow the cap to pass through and away from the machine. If it is desired to turn down the disk to a considerable depth, as in making a box, a succession of dies and punches are used similarly constructed to those shown in Fig. 1, each die being smaller than the preceding one of the series, the diameter *x x* at the mouth of each intermediate die being equal to the diameter of the lower part of the die next preceding it in the series, and each succeeding die must have less difference in diameter between its mouth, and its lower part than the preceding one in the series had, because the more frequently the edge of the disk is subjected to the contracting power of the dies the less easy it becomes to contract it still further, and therefore it must be done by degrees; otherwise the metal may tear instead of drawing out smoothly and evenly; but in turning up an edge of less than half an inch in a disk of about two inches in diameter two operations only are necessary, and having been turned up with a rounding edge by the die and plunger shown in Fig. 1, the cap is placed in the finishing die shown in Fig. 2.

The finishing-die *d* and plunger *e*, Fig. 2, are constructed like those shown in Fig. 1, excepting in the following particulars: The diameter of the mouth of the die *x x*, Fig. 2, is, of course, less than the diameter of the mouth *x x* of the die, Fig. 1, the diameter of the mouth of the finishing-die *d* being equal to the smallest diameter of the cavity of the preceding die, *a*. The smaller diameter of the die *d* is equal to the diameter required to be given to the cap when finished, and the depth of the finishing-die in its narrowest part is equal to the entire depth of the sides of the finished cap. The difference between the diameter of the mouth of the finishing-die and its lower part or smallest diameter must be less than the difference between those diameters in the die previously used, for the reason before stated. The lower edge of the plunger *e* is not rounded like the plungers used with the first or intermediate dies, the lower face of the die and its sides meeting at right angles, so as to give a sharply-defined edge to the cap when finished. The diameter of the plunger *e*, like that of the plunger *b*, Fig. 1, is such as to fit closely in the lower part of the cavity of the die when the cap is forced into it.

I have described the dies and plungers having sides at right angles to the face of the plunger, which is the case when a cylindrical cap or box is to be made; but when the sides of the cap or box are designed to converge, the sides of the plunger and of the inner face of each die in the series have the same angle to their axis as the sides of the finished cap are to have to its axis.

The mode of making caps or boxes out of metallic disks by my process is as follows: A disk of metal, *f*, Fig. 4, of the diameter of the mouth of the first die, *a*, Fig. 1, is placed horizontally in the mouth of the die, (the plunger *b* being raised out of the die.) This disk rests in the groove *x x*, and cannot tilt on account of the rapid contraction of the cavity of the die below the points *x x*. The disk *f* is first lubricated by dipping it in soap-suds or oil. The piston or plunger *c* then descends and forces the disk down into the cavity of the die, drawing out the edges of the disk radially and contracting it circumferentially, until the entire disk is forced into the die, where it assumes the shape shown in Fig. 1. The plunger, still further descending, delivers the cap underneath, and then the plunger returns, ready to operate on another disk. The disk *f*, with its sides turned upward all round for a short distance within its circumference, is then (if it is desired to make the sides of any considerable depth) passed through a succession of dies, each of which reduces its diameter and elongates the sides, drawing them out at right angles (or other required angle) to the top of the cap. It is then placed in the finishing-die, the edge of the unfinished cap resting in the mouth *x x* of the die, as seen by dotted lines in Fig. 2, and on the descent of the plunger the sides of the disk are still farther drawn out, and the finished cap, shaped as in Fig. 3, is discharged through the die.

Having thus described my improved mode of making seamless caps or boxes out of metallic disks, what I claim as my invention, and desire to secure by Letters Patent, is—

The use of a die or succession of dies each having a smaller cavity than the preceding

one, the mouth of each die being of the diameter of the blank or unfinished cap to be operated upon, and the diameter of the cavity rapidly diminishing through part of its depth and thence to the bottom, having the same angle to the axis of the die as the sides of the finished cap are designed to present to its axis, with a plunger or plungers fitting into said die of the same shape as the lower part of the dies, and of such diameter as together with the metal of the disk or cap to fill up the entire diameter of the dies, for the purpose of drawing out radially and contracting circumferentially the edge of metallic disks, so as to form seamless caps or boxes, substantially in the manner described.

In testimony whereof I, the said ORRIN NEWTON, have hereunto set my hand.

ORRIN NEWTON.

Witnesses:

MARTIN G. CUSHING,

A. C. BAKEWELL.