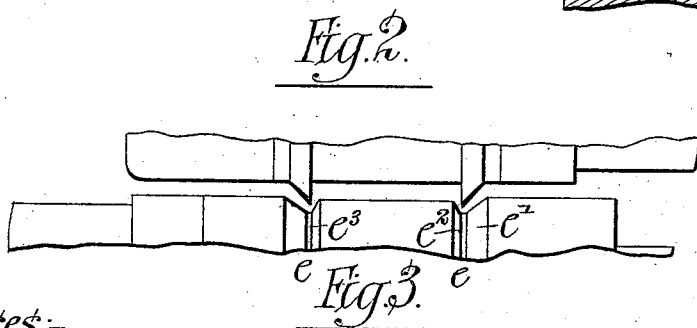
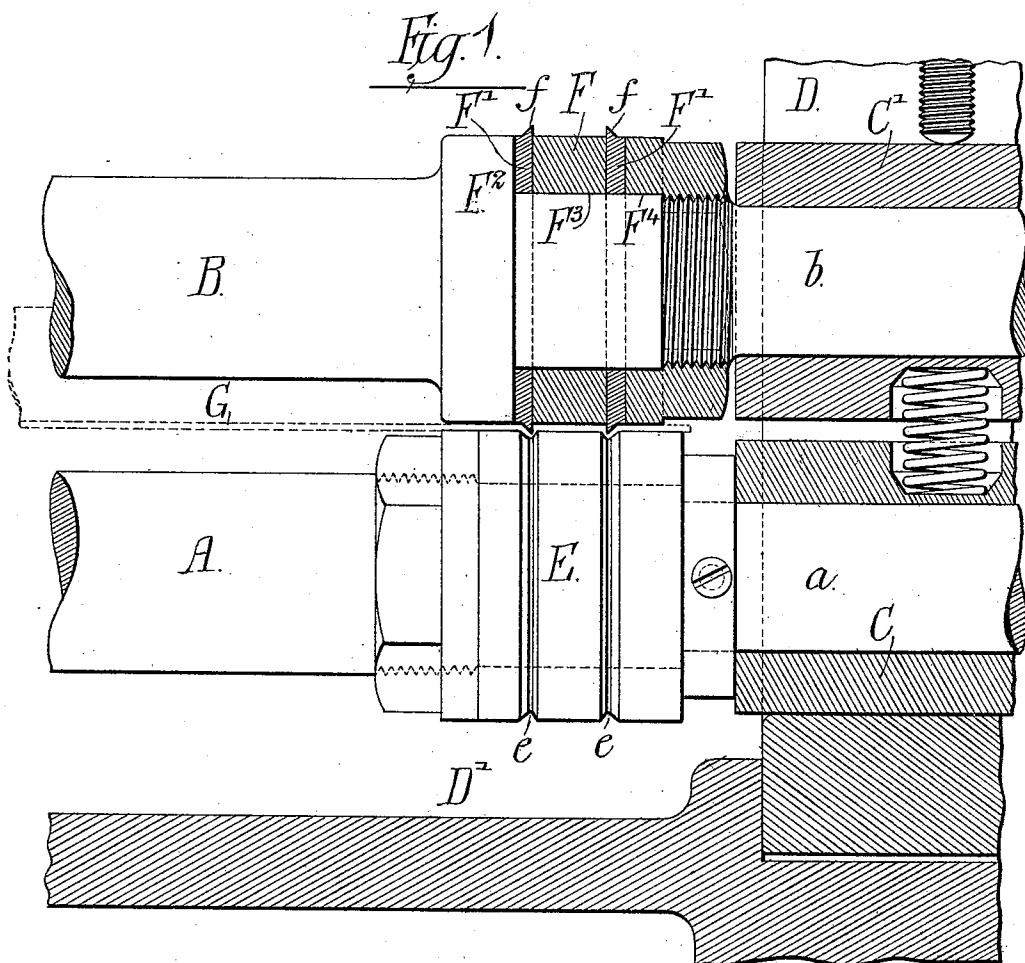


(No Model.)

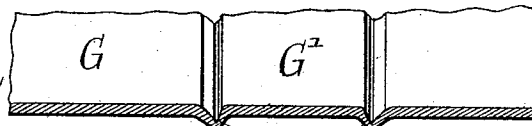
J. ZIMMERMAN & J. K. UNDERDOWN.
ROLLER DIE FOR FORMING WEAKENED LINES IN SHEET METAL.
 No. 515,270. Patented Feb. 20, 1894.



Witnesses:

Louis M. Whitehead.

John W. Adams.



Inventors.

John Zimmerman.

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UNITED STATES PATENT OFFICE.

JOHN ZIMMERMAN AND JOHN K. UNDERDOWN, OF CHICAGO, ILLINOIS,
ASSIGNORS TO THE NATIONAL KEY-OPENING CAN COMPANY, OF
SAME PLACE.

ROLLER-DIE FOR FORMING WEAKENED LINES IN SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 515,270, dated February 20, 1894.

Application filed December 16, 1892. Serial No. 455,356. (No model.)

To all whom it may concern:

Be it known that we, JOHN ZIMMERMAN and JOHN K. UNDERDOWN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Roller-Dies for Forming Weakened Lines in Sheet Metal; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention has reference to roller dies for forming weakened lines in sheet metal key-opening cans, and more especially to the formation of the weakened line or lines of the key-opening cans illustrated in Letters Patent Nos. 486,522 and 486,523, granted November 22, 1892, to John Zimmerman, one of the present inventors. As especially set forth in the former of said patents the weakened line or each of two such lines is formed by thinning the sheet metal of the can body by compression and without rupture of the tin or other coating, and, in the preferred form of construction, such weakened lines are along the apices of the ribs formed in the sheet metal by ribbed and grooved roller dies. As further indicated, especially in the latter of said prior patents, the sheet metal between the grooves, when two grooves are formed, is in the same plane or curved surface with the remainder of the blank or formed can body.

This invention has for its object to provide a particular conformation of the ribs and grooves in the dies whereby the metal is at once shaped and thinned in what we believe to be the most effective manner for giving the desired weakened lines along the apices of the ribs in the blank sheet or in the finished can body.

In the accompanying drawings, Figure 1 represents the ribbing and grooving roller dies, the former being shown in axial section, mounted in the usual form of frame of which a portion is also shown in vertical section through the vertically arranged bearings of the roller shafts. Fig. 2 is an enlarged view of proximating portions of the roller dies, in

side elevation, the enlargement being for the purpose of more distinctly illustrating the relative forms of the ribs and grooves of said dies. Fig. 3 illustrates a section of a ribbed and grooved blank after having passed between the rollers of Fig. 2.

A and B represent two shafts of familiar construction mounted to carry and operate roller dies, *a* and *b* being the journals at one end of said shafts running in boxes or bearings C C' which in turn are supported in the upright slotted frame member D in the usual manner, D' being a bed or cross-plate of the frame.

E represents the grooved roller die and F the ribbed roller die. The grooved die E is provided with one or more V-shaped grooves *e* each having its opposite walls or faces *e'* and *e''* inclined unequally with respect to a plane at right angles to the die axis, as shown, and separated by the cylindric or slightly concaved bottom surface *e'''*, as more distinctly shown in Fig. 2. The die F has ribs *f f* arranged to enter the grooves *e e* and formed to present a more acute angle than that formed by the sides of the several grooves and so as to exhibit, on being viewed against a light, tapering or wedge-shaped spaces between their several side faces and those of the grooves, as also more plainly indicated in Fig. 2. The ribs *f* project from the cylindric part of the die F a distance greater than the depth of the grooves so that when the opposing rollers bear upon the opposite surfaces of an interposed sheet, the metal will be thinned by compression at the bottom of the groove. Preferably the side faces of the ribs *f f* which are adjacent to the less inclined walls *e''* of the grooves are substantially in planes at right angles to the axis of the roller, and the apices of the ribs are as sharp as practicable consistent with smoothness and solidity. They will be made, for example, by first cutting the opposite faces to an edge and then dulling the edge only sufficiently to give it truth and solidity. The smooth thin edges of the ribs *f* are arranged nearly or quite opposite those sides of the narrow bottoms *e'''* of the grooves which are adjacent to the more

abrupt or less inclined walls e^2 of the latter. When thus constructed and arranged and suitably adjusted and the blank (indicated by dotted lines at G in Fig. 1 and in full lines in Fig. 3) is passed between them, the edges of the ribs f produce a stretching action upon the metal embraced between the more abrupt faces of the ribs and grooves, which action is calculated to draw out or thin said metal on the sides of the resulting ribs, as indicated at gg , Fig. 3, as well as to thin the metal by compression at the apices of the ribs or bottoms of the grooves, as also shown in Fig. 3.

When two weakened lines are to be formed in the blank we have found it desirable to arrange the more abrupt sides of the ribs and grooves adjacent to each other, and, when but one such line is to be formed, to arrange said abrupt faces adjacent to the edge of the can body or blank, so that the thinned sides of the ribs formed in the sheet will belong to the detachable strip G' . An advantage of arranging the more abrupt sides of the ribs on opposite sides of the latter, as shown, when two are employed, is also attained by the opposition which one affords to the side pressure of the other.

As a desirable construction of the ribbed roller die F the ribs f are formed on separate parts from the cylindric portions of the die. This construction is clearly indicated in Fig. 1 wherein F' F' represent the disks having said ribs upon their margins, and F^2 F^3 and F^4 the cylindric members of the die. One of the cylindric parts F^2 is shown as a fixed collar on the shaft B. F^3 is an annular removable part applied to the shaft between the disks F' , and F^4 is a nut having a cylindric portion serving as a cylindric part of the die. Aside from the advantage of facility afforded by this multipart construction in forming the ribs, there is the further advantage that it permits the ribs to be removed and replaced when dulled or injured, without the construction of an entirely new die. There is also the further advantage of permitting accurate adjustment of the distance between the ribs to properly co-act with the grooves of the opposite die E.

It is of course not essential to the primary features of our invention hereinbefore set forth that the die F be thus made in parts,

and those of the following claims which do not in terms specify this particular compound construction are not limited thereto.

The metal sheet for a can body, described, having the weakened line or lines produced by the machine above set forth, is made the subject of another application for patent, to-wit: Serial No. 475,270, filed May 23, 1893.

We claim as our invention—

1. A pair of opposing roller dies for forming weakened lines in metal sheets, comprising a die having a V-shaped groove the walls of which are of unequal inclination to a plane at right angles to the axis of the roller, and a die having a rib the opposite faces of which form a less angle than the walls of the groove, substantially as described.

2. In combination with a roller die having a circumferential groove the side walls of which are unequally inclined to a plane at right angles to the axis of the roller and are separated by a cylindric or concaved surface at the bottom of the groove, an opposing roller die having a circumferential rib deeper than the groove of the first mentioned die and having an edge which is narrower than said bottom surface of the groove, said rib being arranged with its edge nearly or quite opposite that margin of said groove bottom which is contiguous to the more abrupt wall of the groove, and the face of the rib which is adjacent to said more abrupt wall of the groove being still more abrupt than said groove wall.

3. In combination with a double grooved roller die having grooves the walls of each of which are unequally inclined to a plane at right angles to the axis of the roller, of an opposing roller die having ribs, the faces of which form a more acute angle than that of the groove, the grooves and the ribs having their more abrupt sides or faces oppositely arranged whereby the lateral strains are opposed to each other.

In testimony that we claim the foregoing as our invention we affix our signatures in presence of two witnesses.

JOHN ZIMMERMAN.
JOHN K. UNDERDOWN.

Witnesses:

C. CLARENCE POOLE,
M. E. DAYTON.