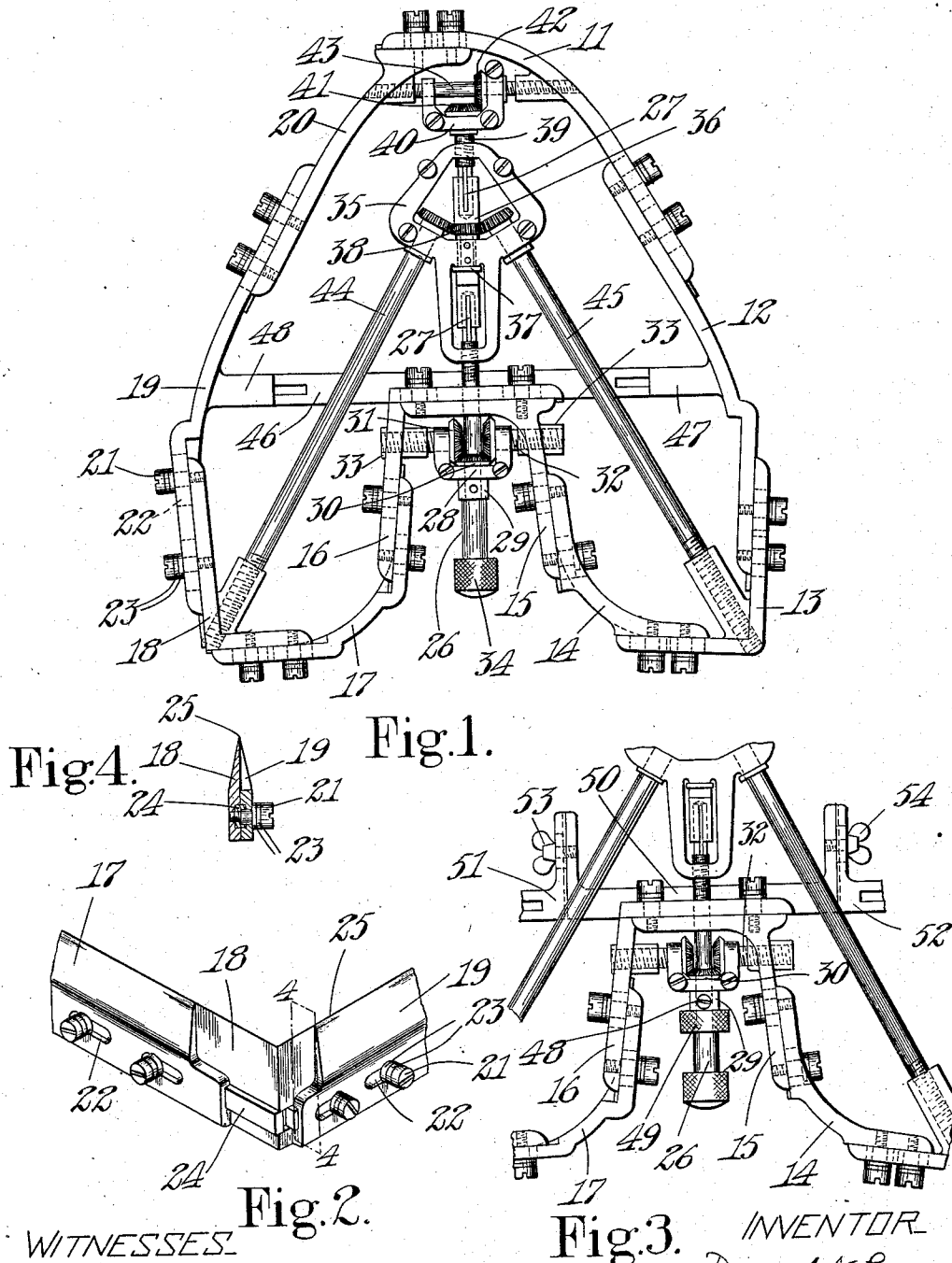


D. N. PRIME.
EXPANSIBLE DIE.
APPLICATION FILED JULY 22, 1910.

1,049,599.

Patented Jan. 7, 1913.



WITNESSES:

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Fig. 3.

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EXPANSIBLE DIE.

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To all whom it may concern:

Be it known that I, DANIEL N. PRIME, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain Improvements in Expansible Dies, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to dies for cutting or dying out blanks from sheet material, such as leather, fiber board, cloth or the like, and more particularly to dies of the type used with the clicking press for cutting blanks from upper leather for boots and shoes.

It has been customary heretofore, among manufacturers to use a separate, rigid die for each different size or shape of blank which it was desired to die out, a full set of these dies consisting of one for each piece that goes to make up a shoe. As many sets of these dies were required as there were sizes or styles of shoes to be made. Such sets of dies are expensive, take up considerable room for storage and much time is wasted by the cutters in obtaining the right dies in changing from one size to another or one style to another.

It is an object of the present invention to provide a die of such character that it may be used for cutting blanks of a plurality of sizes or shapes, or both, whereby the number of dies and the initial cost of the collection of dies necessary to produce the different shapes and sizes of blanks for the uppers manufactured in a single factory may be substantially reduced. In carrying my invention into effect, I preferably construct dies which are expansible or adjustable as to size, thus doing away with the necessity of different sets of dies for the different sizes of blanks which it is desired to produce. By providing for a sufficiently large range of adjustment it is possible to die out a number of different sizes by the use of a single die.

In a preferred embodiment of my invention the cutting blade of the die consists of a plurality of sections which are so connected together as to be capable of sliding adjustment with respect to each other.

Suitable means is provided for effecting this adjustment in such a manner as to enlarge or reduce the size of the die at will.

This result may be accomplished through manipulation of a single actuating means by the provision of adjusting screws properly positioned to effect the desired adjustments of the various sections of the cutting blade of the die, the said adjusting screws all being geared to a single operating spindle or shaft so that they may be simultaneously rotated to accomplish their respective functions of adjustment. In order to secure substantial continuity of the cutting edge of the die, adjacent sections thereof may be oppositely beveled. The sections are thus capable of sliding past each other to any desired degree, while the cutting edges of any two adjacent sections lie closely against each other and form a single continuous cutting edge.

In passing from one size to another in dying out the various blanks which enter into a shoe upper the amount by which the length of the blank must be increased is from two to four times as great as the amount by which the width is to be increased.

It is accordingly a further object of the invention to provide a die capable of being expanded or contracted through wider limits longitudinally than transversely. One way in which this result may be effected consists in so proportioning the pitch of the threads of the adjusting screws and the gearing between said screws and the operating spindle or shaft previously referred to that in expanding the die the increase in length will be suitably greater than the increase in width.

A further advantage realized in the use of such a die becomes apparent when dealing with leather of different qualities. When a fine grained non-stretching leather is being worked it is often desirable to cut a blank slightly larger than when the leather is soft or yielding. With a die embodying my invention the manufacturer can save stock by cutting blanks slightly undersize from a leather which is likely to stretch, the nature of the material allowing the difference to be made up in the lasting operation by the stretching of the leather. In effecting a saving of stock in this manner it is

very important that the die be capable of adjustment to exactly the desired size and through any desired range.

It is often desirable in dying out blanks to produce patterns which differ somewhat at one part of their outline while the remainder thereof practically conforms to a predetermined standard. This is exemplified, for instance, in blanks for vamps in which it may sometimes be desired to have a deep, and at other times a shallow, throat.

A further object of my invention accordingly comprises the provision in a die of the type hereinbefore described of means whereby one portion of the contour of the cutting edge may be varied while the contour of the remainder of the edge remains fixed. One way in which this result may be accomplished is by constructing the parts constituting a portion of the cutting blade of the die in such a way as to be capable of adjustment with respect to the remainder of the blade and providing separate means for holding these parts in their adjusted position whereby the simultaneous adjustment of the various remaining sections of the blade above referred to may be effected without affecting the adjustment above described.

The advantages incident to the invention will be best understood and appreciated from a consideration of the following description and the accompanying drawings forming a part thereof, in which drawings—

Figure 1 is a plan view of an expansible die constructed in accordance with my invention; Fig. 2 is a detail in perspective showing the adjustable connection between adjacent sections of the cutting blade; Fig. 3 is a fragmentary plan illustrating a construction in which one portion of the contour of the die may be varied without affecting other parts thereof; and Fig. 4 is a sectional view on the plane 4—4, of Fig. 2.

Referring first to Fig. 1, the die comprises a sectional blade 10 having an endless cutting edge and consisting of a plurality of consecutive sections 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20. The said sections overlap each other in pairs and are slidably connected together by means of screw and slot connections, each consisting of a screw 21 threaded into one section, as 18, the shoulder of the screw passing through a slot 22 in the adjacent overlapping section, as 19. Under the head of each screw are washers 23 for the purpose of effecting a better sliding connection between the screw and blade section.

In order that the edge of the die may be rigidly maintained in a single plane and the sections of the blade may be accurately guided in their sliding movements with relation to each other a slidable connection of the form shown in Fig. 2 is preferably employed. In one blade section a guiding slot

or groove is formed which receives a tongue 24 projecting from the engaging surface of the adjacent section of the blade. Positive means are thus provided for guiding the movement of the various sections of the blade in straight lines and preserving the rigidity of the frame of the die.

In order to maintain the continuity of the cutting edge of the blade under various conditions of adjustment of the size of the die, the adjacent sections of the knife are oppositely beveled to a common cutting edge, as clearly illustrated in Figs. 2 and 4, wherein the engaging surfaces of the sections 18 and 19 are shown as plane and lying closely against each other. The faces of the blades opposite their engaging surfaces are beveled toward said engaging surfaces so that the cutting edges of any two adjacent sections lie closely against each other and form practically a single continuous cutting edge 25.

In order to effect the enlargement or contraction of the die in all directions in such manner as may be desired to preserve a correct form while changing its size, the following mechanism is provided:—A main central shaft 26 consists of a plurality of sections splined together, as shown at 27, so that the sections are capable of longitudinal movement with respect to each other but all rotate together. The outer section of the shaft 26 is journaled in a yoke 28 upon one side of which a collar 29 is pinned to the shaft and upon the other side of which a bevel gear 30 is rigidly mounted upon the shaft. Meshing with the gear 30 are two bevel gears 31 mounted on the inner ends of screws 32 rotatably mounted in the yoke 28 and having their outer ends threaded into bosses 33 formed integral with the blade sections 15 and 16. Thus by rotating the shaft 26 by means of the thumb nut 34, the screws 32 will be rotated in opposite directions and adjustment of the blade sections 15 and 16 with respect to each other will be effected. The outer section of the shaft 26 is threaded into a floating frame 35 which will also be moved along the major axis of the die when the said shaft is rotated. The central shaft section 36 is threaded into the frame 35 and held from longitudinal movement in a frame 40. Upon the end of the shaft section 39 is mounted a bevel gear 41 which meshes with a bevel gear 42 mounted upon the shaft 43 which lies transversely of the die and is oppositely threaded at its opposite ends so that rotation of the said shaft 43 will effect relative transverse movement between the blade sections 11 and 20. Rods 44, 45 each have one end journaled in the floating frame 35 and provided with a bevel gear meshing with the gear 38 upon the central shaft section 36. The said rods 44, 45 extend toward the extreme corners of

the die and are provided with threaded ends which engage in correspondingly threaded bosses projecting inwardly from the corner blade sections 13 and 18. The rods 44 and 45 are located in such an angular relation to the central longitudinal axis of the die that the longitudinal component of the motion of the blade sections effected thereby is considerably greater than the transverse component. This results in enlarging the die more in the direction of its length than in the direction of its width. The same result is also contributed to by so proportioning the screw threads upon the transverse shafts 32 and 43 with respect to the threads upon the longitudinal shaft 26, and the gearing connecting said shafts, that the increase or decrease in the longitudinal dimension of the die will be greater than that in its transverse dimension.

In order to insure that the side sections 12 and 19 of the cutting blade shall preserve their proper angular relation while being adjusted toward and from each other a transverse guide bar 46 is attached to the blade section 16 and serves, by means of tongue and groove connections, between lugs 47 and 48, projecting inwardly from the blade sections 12 and 19 respectively, and said bar 46 to guide the said blade sections in their to-and-fro movement.

When it is desired to expand or contract the die to adapt it for cutting various sizes of blanks, the operator is able to effect the desired adjustments of the blade in all directions by the rotation of the single shaft 26. Lateral expansion of the die is effected by the screws 32 and the screw threaded shaft 43 which cause the blade sections 15 and 16 to move away from each other and the sections 11 and 20 to do the same. Rotation of the rods 44, 45 also forces the corner blade sections 13 and 18 outwardly in directions oblique to the main axis of the die effecting outward movements of the said corner sections in directions, each of which may be resolved into two components, one lateral and the other longitudinal with respect to the die. The lateral motion of the sections 13 and 18 together with the lateral motion of the sections 11 and 20 effects outward movement of the blade sections 12 and 19, as will be readily understood. The die as a whole is thus enlarged transversely. The longitudinal component of the movement of the corner blade sections has added to it the longitudinal movement of the floating frame 35 resulting from the rotation of the screw threads upon the shaft 26, and the sections 12 and 13, as well as the sections 18 and 19, are thus caused to slide with respect to each other in the direction of the length of the die. The rotation of the screw threaded portion of the shaft section 39 in the floating frame 35 also effects longitudi-

nal movement of the blade sections 11 and 20 with respect to the remaining sections of the knife. The die as a whole is therefore lengthened at the same time that the lateral expansion takes place and, by properly proportioning the gears and screw threads, enlargement and contraction of the die may be effected through the rotation of the single actuating shaft while the form of the die is correctly maintained.

It is frequently desirable to die out blanks, the main portion of the periphery of which follows a certain predetermined standard shape while a certain portion, such as a recessed portion of the edge of the blank, may be varied in shape or depth. One construction by which this result may be accomplished is shown in Fig. 3 as exemplified in a die for dying out vamps. By the use of my invention, the operator is enabled to change the depth of the throat cut in a vamp without otherwise altering the size or shape of the blank and after having adjusted the throat to the desired depth, further adjustment of the size of the die may be made without interfering with the throat adjustment. For this purpose the collar 29 is secured to the shaft 26 by a set screw 48 and the bevel gear 30 is rigidly connected to the collar 29 but may freely rotate upon the shaft 26 when the set screw 48 is loosened. A thumb nut 49 is provided for rotating the sleeve 29 and the gear 30 independently of the shaft. The cross bar 46 consists of a central section 50 and two side sections 51 and 52. Each of the sections of the bar is angular in form and the section 50 is slidably connected to sections 51 and 52 in such a manner that the said central section 50 may be moved longitudinally of the die without moving the sections 51 and 52. The parts are secured in their adjusted relation by means of wing nuts 53 and 54.

When it is desired to adjust the depth of the throat to be cut by the die, the set screw 48 and the wing nuts 53 and 54 are loosened. The section 50 of the cross bar together with the blade sections 15 and 16, which form a reëntrant loop-shaped blade, may now be moved inwardly or outwardly upon the blade sections 14 and 17 and the bar sections 51 and 52 without in any way affecting the remainder of the frame or blade of the die. The thumb nut 49 may be used to rotate the bevel gear 30 in order to turn the screws 32 to admit of the converging or diverging movement of the blade sections 15 and 16 as they are moved longitudinally of the die. When the desired adjustment of the throat is secured the nuts 53, 54 and the set screw 48 are tightened and the entire die may be adjusted in size as before described without affecting the throat adjustment just made.

It should be understood that the invention

is not limited to a die for cutting or dying out vamps but is useful in various other forms, the particular embodiment here illustrated and described being selected for purposes of illustration only.

A great advantage secured by the present invention is apparent when the die is being used for dying out blanks from different grades of leather. Small adjustments in the size of the die and between any limits desired may be readily made in order to compensate for the stretching qualities of the particular stock being used. A range of sizes grading imperceptibly into each other is thus secured which would be absolutely unattainable with the ordinary rigid dies now in use and could be practically approximated only at enormous expense by the provision of a very large number of such rigid dies. In addition to the large range of sizes, a great variation in the shape of the blank can also be effected by the use of the improved die.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. A die having an endless cutting edge which conforms at all points to the outline of the blank to be cut, in combination with a single actuating means for expanding said die in a plurality of directions while maintaining the continuity of the cutting edge.

2. In a device of the class described, a sectional blade, comprising overlapping adjacent sections oppositely beveled to a common cutting edge.

3. A die comprising an endless blade having a plurality of relatively movable sections and a continuous cutting edge which conforms at all points to the outline of the blank to be cut and means for moving some of said sections to expand the die in a plurality of directions while maintaining the continuity of the cutting edge.

4. A die comprising an endless blade having a continuous cutting edge and consisting of a plurality of connected sections overlapping side to side, some movable longitudinally of the die and others movable laterally of the die, and means for simultaneously moving all of said sections relatively to each other while maintaining the continuity of the cutting edge.

5. A die for dying out at a single operation a vamp having a cut out throat, said die having a reëntrant loop-shaped cutting blade, and means for adjusting said loop-shaped cutting blade relatively to the remainder of the die, whereby the depth of the throat may be varied.

6. A die of the class described, comprising an endless, sectional cutting blade, adjacent sections of said blade engaging and guided by each other for relative movement,

and means for expanding the die in a plurality of directions.

7. A die comprising an endless sectional cutting blade, and means whereby the contour of said blade may be varied at one portion of its length by sliding some of the blade sections endwise while the contour of the remainder of the blade is preserved.

8. A die comprising a plurality of overlapping sections movable in endwise directions, a tongue and groove connection between each pair of sections, and retaining devices for maintaining each pair of sections in engagement laterally.

9. A die comprising a sectional blade, the sections of said blade being adjustable with respect to each other, the cutting edges of adjacent sections merging into each other without interruption and means for adjusting said sections unequally but proportionately in two directions substantially at right angles to each other.

10. A die having an endless, sectional cutting blade consisting of side, end, and corner sections, adjacent sections overlapping and being slidably supported by each other, and a transverse guide bar for preserving the angular relation between said side sections while permitting them to be adjusted toward and from each other.

11. In a die of the class described, an endless cutting blade comprising side sections, a guide bar guiding said side sections for movement transversely of the die, and end and corner sections mounted on said side sections and guided thereon for movement toward and from said guide bar.

12. In a die of the class described, an endless cutting blade comprising relatively movable side, end and corner sections, said end and corner sections being mounted upon and guided by said side sections, and means engaging said end and corner sections for moving them outwardly or inwardly to expand or contract the die.

13. In a die of the class described, a cutting blade presenting an endless contour and comprising relatively movable side, end and corner sections, and means engaging said corner sections of the cutting blade for moving all the sections of the blade while preserving the endless contour of the blade.

14. A die having a sectional cutting blade, a main shaft, and screw-threaded rods geared to said main shaft and each threaded into a different section of said blade, whereby rotation of said main shaft will effect relative movement of said blade sections.

15. An expansible die comprising an endless blade having a continuous cutting edge, and means for expanding or contracting said die unequally in a plurality of directions.

16. An elongated die comprising an endless sectional blade having a continuous cut-

ting edge, and means for expanding or contracting said die through wider limits longitudinally than transversely thereof while maintaining continuity of the cutting edge.

5 17. A die comprising end and side sections and means for moving the end sections toward each other and simultaneously moving the side sections toward each other, said means including a telescopic shaft extending in the direction of movement of one pair of sections and arranged to be shortened when said sections move toward each other.

15 18. A die comprising a blade having an endless cutting edge, and a single actuating means for moving certain portions of the blade in directions oblique to each other while maintaining the continuity of the cutting edge.

20 19. A die comprising an endless blade having a plurality of relatively movable overlapping sections and a continuous cutting edge and means for moving some of said sections to expand the die in a plurality of directions.

25 20. A die for dying out at a single operation a vamp having a cut-out throat, said die having a reëntrant loop-shaped cutting

blade comprising relatively adjustable overlapping sections, and means for adjusting the loop-shaped cutting blade relatively to the remainder of the die, whereby the depth of the throat may be varied. 30

21. A die for dying out at a single operation a vamp having a cut-out throat, said die having a reëntrant loop-shaped cutting blade adjustable relatively to the remainder of the die, whereby the depth of the throat may be varied, said reëntrant blade comprising relatively adjustable overlapping sections. 35 40

22. A die for dying-out at a single operation a vamp having a cut out throat, said die having a reëntrant loop-shaped cutting blade overlapping at its ends the ends of the main portion of the die blade, and removable fastening means at said overlapping ends detachably securing the loop-shaped blade to the main portion. 45

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 50

DANIEL N. PRIME.

Witnesses:

WILLARD A. SMITH,
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."