

Oct. 30, 1945.

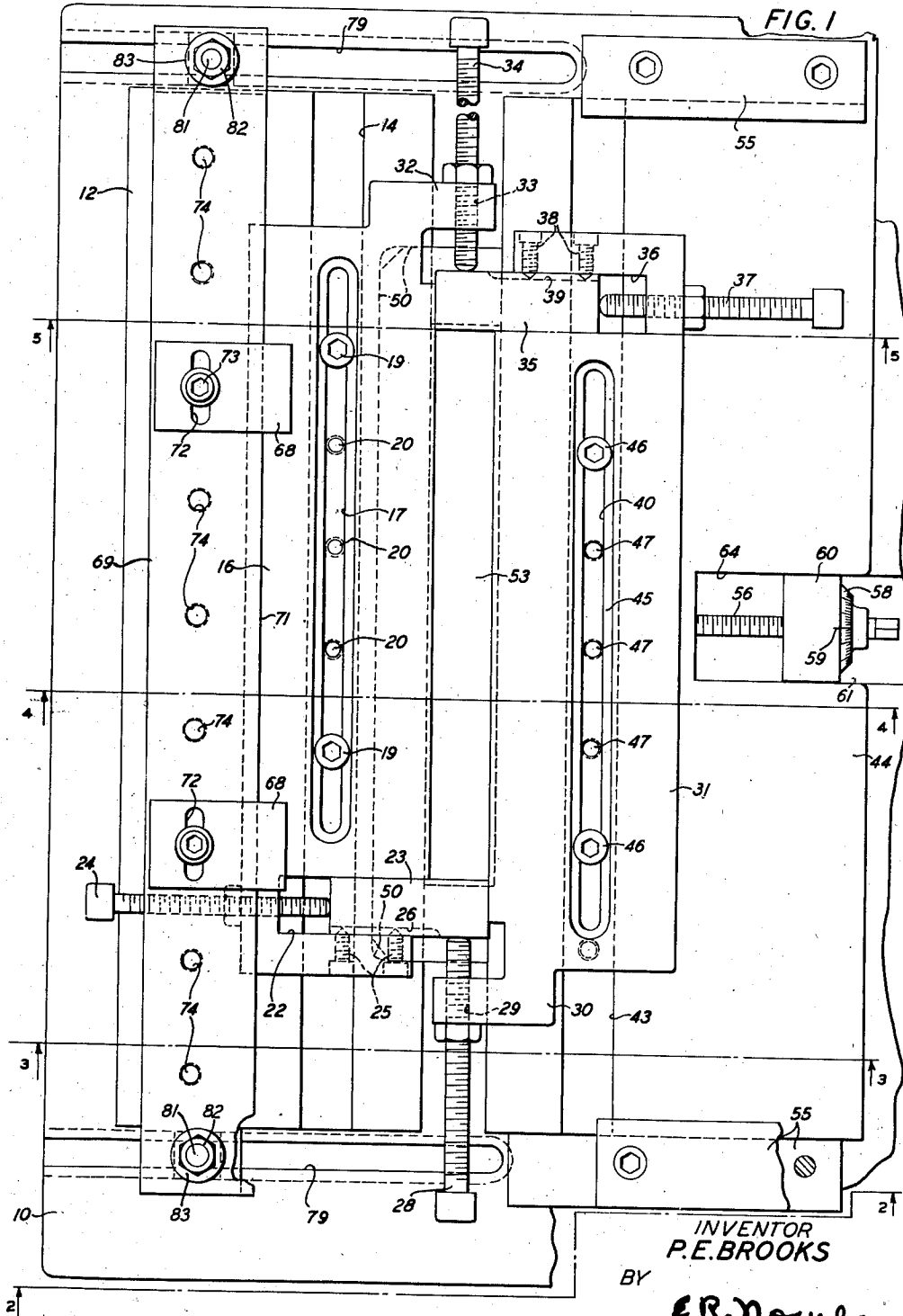
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2,388,115

DIE

Filed March 10, 1944

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FIG. 2

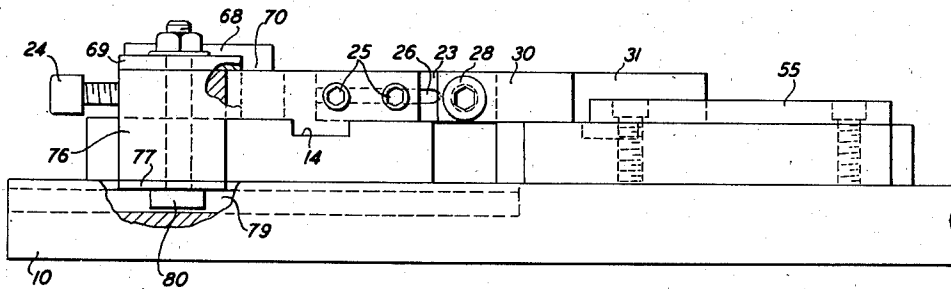


FIG. 3

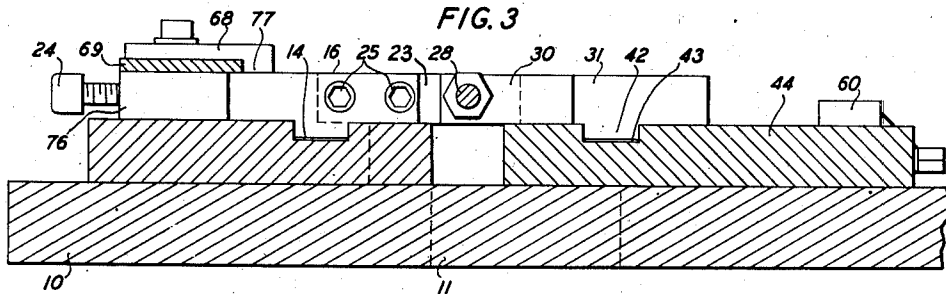


FIG. 4

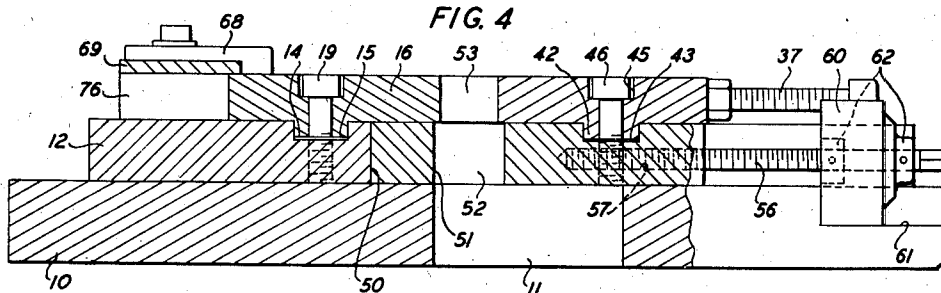
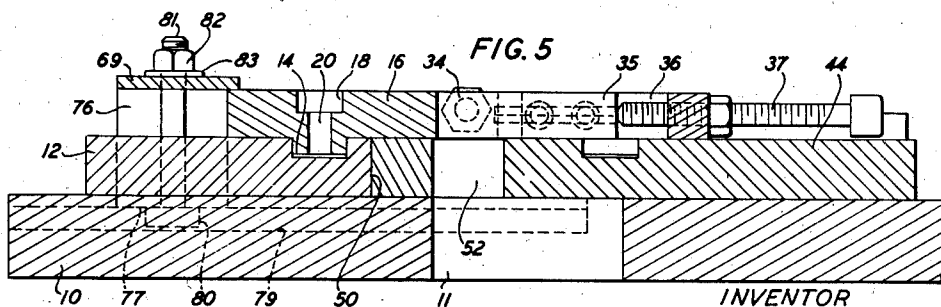


FIG. 5



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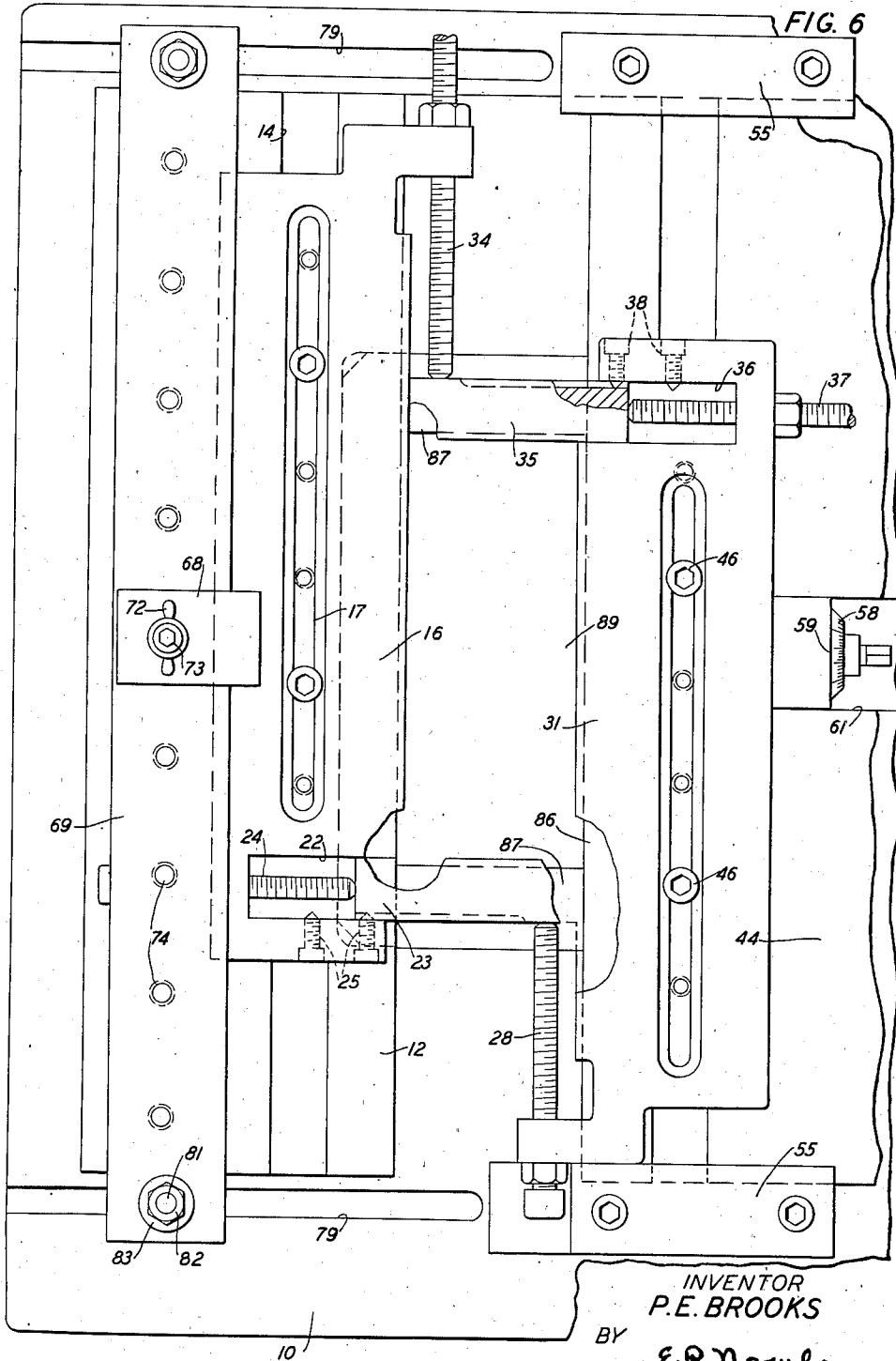
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## UNITED STATES PATENT OFFICE

2,388,115

DIE

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Application March 10, 1944, Serial No. 525,882

14 Claims. (Cl. 164—31)

This invention relates to dies, and more particularly to adjustable dies for forming articles.

An object of the invention is to provide a die which is simple in structure, highly efficient, and accurately variable for forming articles.

With this and other objects in view, the invention comprises a plurality of die elements supported for adjustment relative to each other for use in forming articles of various contours.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a fragmentary top plan view of the die with the die elements thereof and their associated structures shown in given relative positions for forming one type of article;

Fig. 2 is a side elevational view of the die taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a lateral sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a lateral sectional view taken along the line 4—4 of Fig. 1;

Fig. 5 is a lateral sectional view taken along the line 5—5 of Fig. 1, and

Fig. 6 is a top plan view of the die showing the die elements and their associated structures in other relative positions to form another type of article.

Referring now to the drawings, attention is first directed to Figs. 1 to 5 inclusive. The die structure includes a base 10 which may be disposed upon and secured to a mounting plate of a suitable press (not shown). In such presses there are included reciprocable rams for supporting companion dies or punches. The salient feature of this invention is the adjustability of the die elements to readily condition the structure to form articles of various sizes and contours. It would, therefore, be necessary to have companion punches or die elements similarly variable or interchangeable to complete the forming of the articles of various sizes and contours. Such a structure is disclosed in applicant's copending application Serial No. 525,881 filed March 10, 1944.

A clearance hole or aperture 11 is formed in the base 10 of a size sufficient for the largest article to be formed. A supporting member 12 is disposed upon the base 10 and fixed thereto by any suitable means (not shown). A longitudinal groove 14, of the contour illustrated, extends the full length of the support 12 and is adapted to receive and form interfitting connection with a tongue portion 15 of a die element 16. An elongate aperture 17 is formed in the die element 16 in general alignment with the tongue portion 15, extending therethrough, as illustrated in Figs. 4 and 5, and having a recessed portion 18 to receive the heads of retaining screws 19. A plurality of threaded apertures 20 is disposed in the support 12

at spaced positions longitudinally of the groove 14, to selectively receive the retaining screws 19 to secure the die element 16 in any desired position relative to the support 12.

One end of the die element 16 is grooved, as at 22, to receive a die element 23, this die element being adjustable in the groove 20 through the aid of an adjusting screw 24. This screw 24 is threadedly carried by the die element 16 and enters the groove 22, as illustrated in Fig. 1, to move the die element 23 to a desired position relative to its associated die element 16. The lateral movement of the die element 23 is controlled by retaining screws 25 threadedly disposed in apertures in the adjacent portion of the die element 16, their ends being receivable in a longitudinal groove 26 of the die element 23. The adjustment of the die element 23 is made after the screws 25 are loosened, they serving to retain the die element against displacement after the adjustment has been completed. The outer portion of the die element 23, that portion which projects beyond the die element 16, is backed up or supported by an adjustable screw 28 threadedly disposed in an aperture 29 of an arm 30 which is integral with another die element 31.

A similar structure is provided at the opposite end of the die element 16, where an integral arm 32 has a threaded aperture 33 to receive an adjustable backing screw 34 to support or back up a die element 35 which is identical in structure to the die element 23 and is supported in the same manner by the die element 31 that the die element 23 is supported by the die element 16. As illustrated, the die element 35 is disposed in a groove 36 of the die element 31 adjustable into varied positions relative thereto through the aid of a screw 37 threadedly supported by the die element 31 and assisted by retaining screws 38, the ends of which are receivable in a longitudinal groove 39 of the die element 35. It will, therefore, be apparent that the die element 16 with its associated die element 23 is substantially identical to the die element 31 with its die element 35. Similar means is provided for supporting the die element 31 through the aid of an elongate aperture 40 extending through a torque portion 42 which is receivable in a longitudinal groove 43 of an adjustable support 44. A recessed portion 45 is provided adjacent the aperture 40 to receive the heads of retaining screws 46, their threaded ends being selectively receivable in threaded apertures 47 of the support 44.

With the arrangement of the die elements 16, 23, 31 and 35 and their relative movements made possible through their relative movements made possible through their associated structures, die cavities of varied contours may be formed to form articles of various sizes and contours. It is important, depending upon the type of material

being used for the forming of the articles, to support the die elements adjacent their forming edges. For this reason provision is made to selectively receive backing members having clearance apertures or recesses of varying contours. This means includes a recess 50 in the support 12 to selectively receive backing members of the contours desired. Only one of such members is illustrated in Figs. 1 to 5 inclusive of the drawings and is identified by reference numeral 51. The central portion of this member fills the recess 50, integral leg portions 52 thereof extending laterally beneath the die elements 23 and 35 to partially surround the die cavity indicated at 53. Thus the backing member is held in place, as illustrated in Figs. 4 and 5, between the die element 16 with its associated elements 23 and 35 and the base 10, and also between the supports 12 and 14.

The support 44 rests upon the base 10 and is movable toward and away from the support 12 in a fixed path controlled by guides 55 which are mounted upon the base 10. The movement of the support 44 measured distances relative to the support 12 may be brought about through the aid of an adjusting screw 56 threadably receivable in an aperture 57 and controlled through the aid of an indicating dial 58 which is movable relative to a pointer 59. The adjusting screw 56 is supported in a block 60, fixedly mounted upon the base 10 in a cut-away portion 61, as illustrated in Fig. 4, and held against longitudinal movement therein through the aid of collars 62, which are fixed to the adjusting screw. A groove or cut-away portion 64 in the support 44 adapts the support to straddle the block 60 and be further guided in its adjustment relative to the fixed support 12.

Means is provided to locate material relative to the die cavity, this means including locating elements or stops 68, of the contour illustrated in Figs. 1 to 4 inclusive, adapted for mounting at selected positions upon a longitudinal support 69 and provided with downwardly projecting portions 70 to extend over a front edge 71 of the support and rest thereagainst. Elongate apertures 72 are provided in the elements 68 for receiving retaining screws 73 which are receivable in any of a number of threaded apertures 74 disposed at spaced positions longitudinally of the support 69. Through the aid of the threaded apertures 74, the elements 68 may be disposed at varied positions thereon relative to the die cavity 53, further adjustments being made possible through the aid of the elongate apertures 72. The support 69 has leg portions 76 secured to or formed integral with each end thereof and adapted to be fixed to the base 10. Integral projections 77 of the leg portions 76 are receivable in elongate recesses or grooves 79 of the base 10 for interengagement of the leg portions with the base to maintain the support 69 parallel with the forming edges of the elements 16 and 31 during adjustment of the support 69 with respect thereto. The grooves 79 are T-shaped in cross-section and adapted to receive square heads 80 of retaining screws 81, which project upwardly through apertures in the supporting legs 76 and the support 69 for securing this structure at any desired position relative to the die cavity through the aid of nuts 82 and washers 83.

The structure shown in Fig. 6 is identical in every detail to the structure shown in Figs. 1 to 5 inclusive except for a backing element or member 86. This member is of a contour identical

with that of the member 51 and is receivable in the recess 50 of the support 12, the difference being in the dimensions of the leg portions 87 as compared with the leg portions 52 of the member 51. Otherwise, the structure is the same, illustrating, however, the formation of a die cavity 89 differing in contour to the die cavity 53 through the relative adjustments of the die elements.

These adjustments may be readily brought about after the contour desired is determined. For example, in readjusting the structure from the relative positions of the die elements, as shown in Fig. 1, to form the arrangement illustrated in Fig. 6, the movable support 44, through the aid of the adjusting screw 56, is moved its extreme distance to the right, moving with it the die element 31 with its associated die element 35. While in this position the backing member 51 may be removed and the desired backing member 86 may be inserted in the retaining recess 50 of the support 12. It is necessary, however, that further adjustment of the die elements be made to complete the formation of the die cavity 89. Through the removal of the retaining screws 19 or the loosening thereof in their respective threaded apertures 20, the die element 16 with its associated die element 23 may be moved through the aid of its tongue portion 15 in the groove 14 until it is located at the desired position on its support 12. In a similar manner, the die element 31 may be adjusted relative to the movable support 44 and these die elements may be locked in their respective positions through the aid of their retaining screws 19 and 46. After this has been accomplished, the die elements 23 and 35 may be adjusted through the aid of their adjusting screws 24 and 37 to close the ends of the die cavity. The necessary adjustment of the retaining screws 25 and 28 are made during this interval of adjustment. The backing screws 28 and 34 are also adjusted against their respective die elements 23 and 35 to complete the support of these die elements. After this has been accomplished, the location of one or more locating elements 68 on the support 69 may be made and further adjustment of the support 69 may be made possible through movement of the leg portions 76 thereof longitudinally of their groove 79.

Although only two arrangements of the die elements and their respective supports and backing members have been illustrated, it is apparent that die cavities of other contours within the given limits may be formed for forming articles of various contours. The terms "form" or "forming" are intended to cover a wide field, as it is possible for the structure shown to be used for various purposes, namely for notching, blanking, shearing, piercing and bending materials into various forms for forming articles. Thus the article formed through the aid of the die elements and the cavity constructed thereby may be pierced or blanked or otherwise forced from material into the die cavity, or it may include side portions formed vertically while being moved into and through the die cavity.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined by the appended claims.

What is claimed is:

1. A variable die comprising opposing die elements, means to support the die elements for longitudinal movement thereof relative to each

other, die members cooperating with the die elements to singly form die cavities of varied contours, and means carried by one of the die elements to cause one of the die members to move therewith.

2. A variable die comprising opposing die elements, means to support the die elements for longitudinal movement thereof relative to each other, and die members mounted for movement relative to each other, and means to secure the die members to their respective die elements to cause the die members to cooperate with their die elements in singly forming die cavities of varied contours.

3. A variable die comprising opposing die elements having apertures therein adjacent opposing ends thereof, means to support the die elements for longitudinal movement thereof relative to each other, a die member disposed in the aperture of each die element, movable therewith and relative thereto to form singly die cavities of varied contours, and means carried by the die elements to secure their respective die members in their selected relative positions.

4. A variable die comprising opposing die elements formed adjacent their opposing end portions for connection with die members, means to support the die elements for longitudinal movement thereof relative to each other, a die member for each die element formed for connection with their respective formed portions and movable therewith and relative thereto to form singly die cavities of varied contours, means carried by the die elements adjacent the said portions thereof to secure their respective die members in their selected relative positions, and means to move the die members relative to their die elements in the said portions.

5. A variable die comprising opposing die elements, means to support the die elements for longitudinal movement thereof relative to each other, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours, and means carried by the die elements to move their respective die members relative thereto.

6. A variable die comprising opposing die elements, means to support one of the die elements for movement longitudinally and laterally relative to the other die element, and die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours.

7. A variable die comprising opposing die elements, a first die element and a second die element, means to support the first die element for movement relative to the second die element, a support for the second die element movable therewith in one direction relative to the first die element and formed for movement of the second die element thereon in another direction, and die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours.

8. A variable die comprising opposing die elements, a first die element and a second die element, means to support the first die element for movement relative to the second die element, a support for the second die element movable therewith in one direction relative to the first die element and formed for movement of the second die element thereon in another direction, means to move the support, and die members movable

relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours.

9. A variable die comprising a base having an aperture therein, opposing die elements, supports therefor disposed on the base and adapted for movement of their die elements thereon into varied positions relative to each other and the said aperture, and die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours adjacent the said aperture.

10. A variable die comprising a base having an aperture therein, opposing die elements, supports therefor disposed on the base and adapted for movement of their die elements thereon into varied positions relative to each other and the said aperture, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours adjacent the said aperture, and a backing member disposed on the base for assisting in supporting certain of the die elements and members adjacent the said aperture.

11. A variable die comprising a base having an aperture therein, opposing die elements, supports therefor disposed on the base and adapted for movement of their die elements thereon into varied positions relative to each other and the said aperture, one of the supports being recessed to receive a backing member, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours adjacent the said aperture, and a backing member disposed on the recess of the said support for partially covering the said aperture and assisting in supporting certain of the die elements and members.

12. A variable die comprising a base having an aperture therein, opposing die elements, supports therefor disposed on the base and adapted for movement of their die elements thereon into varied positions relative to each other and the said aperture, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours adjacent the said aperture, and means supported at varied positions relative to the die cavity to locate material relative thereto.

13. A variable die comprising opposing die elements, means to support the die elements for longitudinal movement thereof relative to each other, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours, a material locating member, and a support therefor adapted for positioning the member at any of a plurality of positions relative to the die cavity.

14. A variable die comprising a base having an aperture therein, opposing die elements, supports therefor disposed on the base and adapted for movement of their die elements thereon into varied positions relative to each other and the said aperture, die members movable relative to each other and the die elements to cooperate therewith in singly forming die cavities of varied contours adjacent the said aperture, a material locating member, and a support therefor adjustably mounted on the base relative to the said aperture to locate material singly relative to the die cavities.

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