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ADJUSTABLE DRAWING DIE

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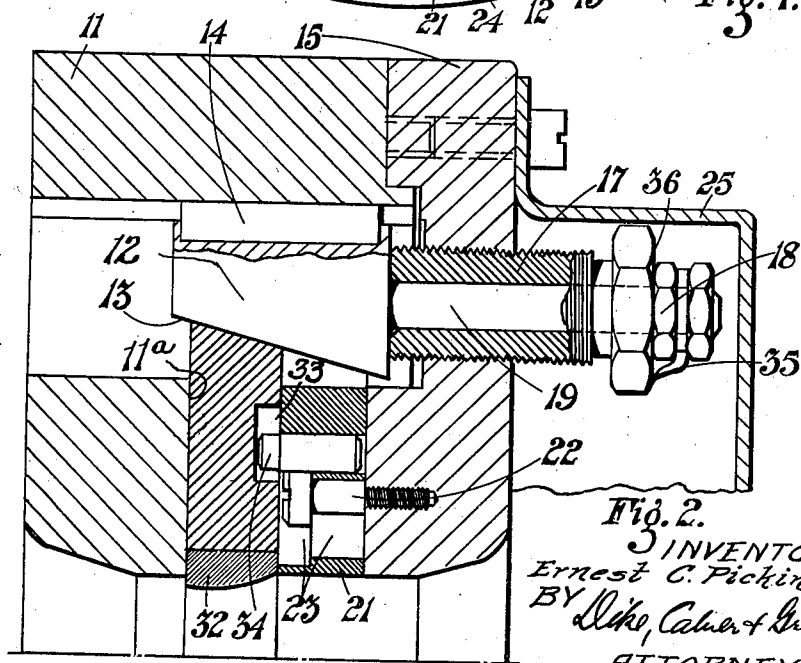
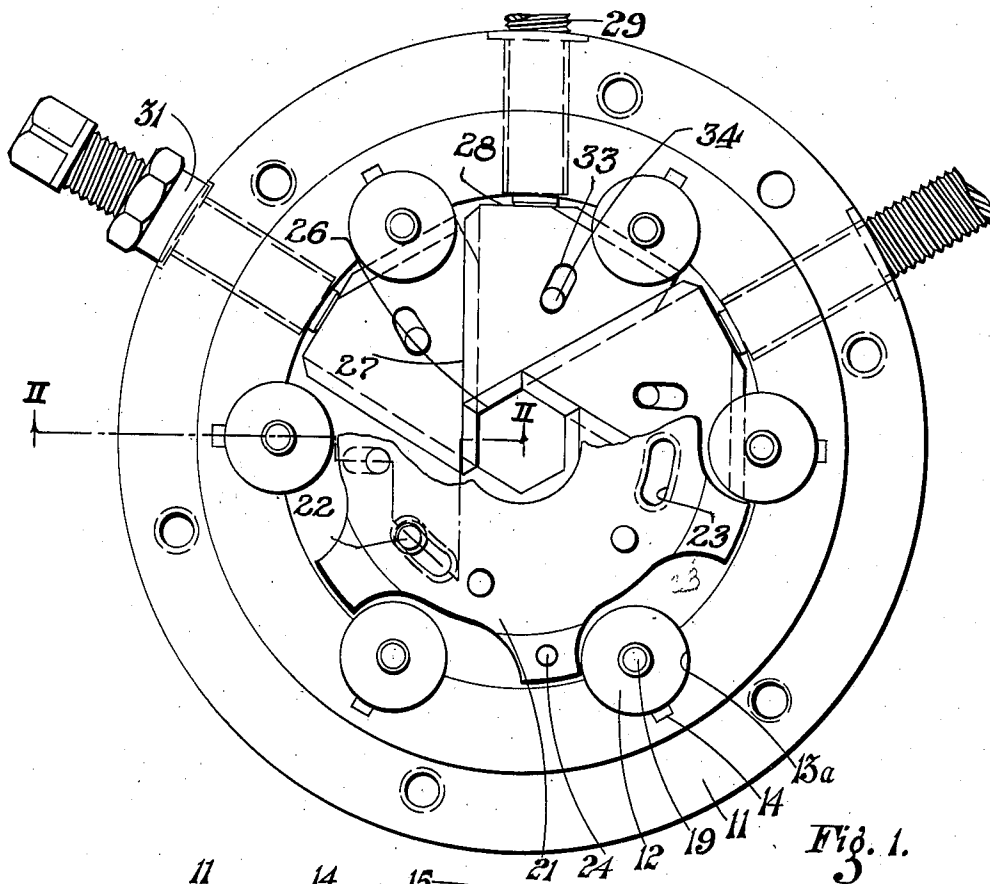


Fig. 2.
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ADJUSTABLE DRAWING DIE

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12 Claims. (Cl. 205—26)

This invention relates to adjustable dies for drawing to a section of the shape of a hexagon or other polygon, particularly one having more sides than four, our main object being to provide an inexpensive construction of adjustable drawing die which can be easily manipulated and will be very reliable in operation.

A drawing die, according to the invention, includes a body providing abutment surfaces spaced from and inclined to one another according to the polygonal section to be drawn, die sections coacting with one another and with the abutment surfaces, a plate or other member rotatable about the axis of the drawing die and having pin-and-slot connections with the sections such that these can be adjusted, to vary the size of the die opening, in sliding contact with one another and relatively to the abutment surfaces, and locking bolts or other means for locking the sections in an adjusted position.

In some cases a die section may wear more than another, and to allow of effecting adjustments in such cases the invention further consists in forming the abutment surfaces as inclined surface members which are accurately received in the body and are adjustable parallel to the axis of the drawing die, the die sections having corresponding inclined surfaces whereby the adjustment of an appropriate abutment member will effect individual adjustment of the associated die section.

In the accompanying drawing:

Figure 1 is a plan view mainly of the body of one form of drawing die according to the invention, part of the size-adjusting member being broken away to disclose the die sections only three of which are actually shown; and

Figure 2 is a cross-section, to a larger scale of the drawing die taken mainly on the line II—II of Figure 1.

In the construction illustrated, the body 11 is of cylindrical outline and cup-like form and the abutment members 12 are of mainly cylindrical form but provided with flat abutment surfaces 13 inclined to the axes of the abutment members. They are received in part-cylindrical recesses 13a in the circular wall of the body and slidingly keyed therewith at their sides remote from the abutment surfaces, as shown at 14, their axes being parallel to that of the drawing die. A detachable plate 15, which can be bolted to the body and by which the parts can be enclosed, carries a plurality of adjustable externally-screw-threaded sleeves 17. These are engaged with the abutment members at one end and the

heads 18 of studs 19 carried by the members at the other end, the heads being formed by two nuts locked together. In practice these screws are initially set so that in the case of a regular hexagonal drawing die the abutment surfaces will form part of the sides of a regular truncated prism of hexagonal cross-section. If one die section wears more than another, or is re-ground, it can be adjusted by axial movement of the associated abutment member. Otherwise the abutment members are not normally moved after the initial setting, except as hereinafter mentioned.

The inner face of the plate 15 rotatably supports the size-adjusting member 21—for example, by means of three symmetrically-spaced, headed pins 22 engaged with arcuate slots 23. This member 21 is provided with diametrically-opposite holes 24 which can be engaged by detachable handles inserted through arcuate slots (not shown) in the plate 15 from the outside thereof when the detachable cover 25 has been removed.

When the plate 15 is bolted firmly down it serves for preventing displacement of the die sections in a direction parallel to the axis of the drawing die, the die sections resting against the base 11a of the body. The die sections are essentially of quadrilateral shape in plan view. One side 23 providing the operative drawing surface is inclined, in the case of a hexagonal drawing die, at sixty degrees to an adjacent side 27 which contacts with the operative drawing surface of the next die section. The side 28 opposite the operative drawing surface of a section, when the sections have been adjusted for size of opening, can be engaged by a bolt 29 extending through the die body at right-angles to this side and having a lock nut 31 thereon whereby it can be locked in position. The bolt lies substantially along a radius of the drawing die.

Obviously the die sections may, if desired, have their operative surfaces tipped for a suitable distance, as shown at 32, in a manner known per se.

The fourth side of a die section is the inclined one which coacts with the associated inclined abutment surface. At right-angles to this fourth side the appropriate surface of the section has a straight groove 33 therein which is engaged with a stud 34 carried by the size-adjusting member 21. The stud 34 has clearance in the groove 33, which clearance may be of any suitable dimension, one thirty-second of an inch being one of the preferred sizes.

The operation by which the sections can be adjusted for size of opening is as follows.

After the cover 25 has been removed, in order to free the parts some of the abutment members 12 are first released—for example, each alternate one. The heads 18 of each alternate stud 19 carry pointers 35 which coact with markings on the adjacent faces 36 of the associated screws 17, so that the latter can be unscrewed definite amounts. If the die opening is to be made smaller (the die is shown substantially at its maximum opening), the handles (not shown) are inserted in the holes 24 of the size-adjusting plate and the latter then adjusted as necessary in a clockwise direction (Figure 1). If to be made larger, the bolts 29 must first be released and the plate then turned in an anti-clockwise direction. Then the screws 17 are turned back to their original positions and the bolts 29 then adjusted and locked. The cover 25, on replacement, prevents unauthorized or inadvertent adjustment of the screws 17.

It will be understood that individual adjustments of die sections are necessary in cases where the operative face of some individual die section has worn and been reground. In practice, wear of parts other than die sections themselves is very slight and need not be considered in the present instance. Individual adjustments of die sections are applicable when a relatively small amount of material is removed from the operative face of a die section to provide for adjustment within very fine limits.

Assuming, however, that wear has occurred along the operative face of any particular die section, the die section must be removed and the whole of its operative face reground to be truly parallel to the original face. Under ordinary conditions taking off from two to three thousandths of an inch is sufficient. After regrounding, the face is polished and the die section inserted in its respective place. With all the abutment surfaces remaining in their original respective positions, the die sections would not then mate correctly, but would have between them clearances dependent upon the amount of material removed from the operative face of the reground die section. In order to prevent such a condition the reground die section must be adjusted by means of its associated wedge which in the embodiment shown herein will have to be screwed further into the body. During this movement of the respective wedge 12, the associated die section is not restricted by the engagement of the pin 34 in its slot 33 because of the perpendicular direction of said slot with respect to the slanted side of the respective wedge member. Thus the slot 33 and the pin 34 engaging the same provide merely general locating means for the individual die sections.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. An adjustable polygonal drawing die including a cup-like body, a detachable plate for closing the open edge of the body, the circular wall of the body having on its inside face a plurality of spaced, axially-extending, openings therein, abutment members slidably received in said openings for parallel movement, said abutment members having inclined surfaces which together form parts of the sides of a truncated prism having a cross-section similar to that of the section to be drawn, die sections co-acting with one another and resting on the base of the body, said die sections having inclined surfaces

for co-acting with those of the said abutment members, and means for adjusting an abutment member axially whereby to effect individual adjustment of the associated die section, said means including an axially-extending headed stud fast with an abutment member, and a sleeve engaging the head of the stud and the abutment member and having a screw-threaded engagement with said detachable plate.

2. An adjustable drawing die, according to claim 1, characterized hereby, that the head of one of said studs carries a pointer adapted to co-act with markings on the adjacent face of the associated sleeve.

3. An adjustable polygonal drawing die, according to claim 1, characterized hereby, that the head of each of said studs is formed by a pair of nuts, the head carrying a pointer secured between the pair of nuts and co-acting with markings on the adjacent face of the associated sleeve.

4. An adjustable die for drawing bars of polygonal cross sections, said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, pin-and-slot means moving said sections simultaneously for effecting adjustments of said opening, and a single wedge means for each of said sections adapted to move respective sections for individual adjustments independently of one another.

5. An adjustable die for drawing bars of polygonal cross sections said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, means moving said sections simultaneously for effecting adjustments of said opening, and screw actuated single wedge means for each of said sections adapted to move respective sections for individual adjustments independently of one another.

6. An adjustable die for drawing bars of polygonal cross sections, said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, a rotatable annular member arranged substantially coaxial with said sections, a pin-and-slot means drivingly connecting said sections to said member for moving said sections simultaneously for effecting general adjustments of said opening, and a single wedge means for each of said sections adapted to move respective sections in a direction parallel to the respective slots of said pin-and-slot means for effecting individual adjustments of the separate die sections without affecting the general adjustment of the remaining sections.

7. An adjustable die for drawing bars of polygonal cross sections, said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, a rotatable annular member arranged substantially coaxial with said sections, a pin-and-slot means drivingly connecting said sections to said member for moving said sections simultaneously for effecting general adjustments of said opening, and a plurality of screw

actuated wedges, one for each of said sections, said wedges being separately movable substantially along the axis of the die to move respective die sections in a direction parallel to the respective slots of said pin-and-slot means for effecting individual adjustments of the separate die sections.

8. An adjustable die for drawing bars of polygonal cross sections, said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, a rotatable annular member arranged substantially coaxial with said sections, a pin-and-slot means drivingly connecting said sections to said member for moving said sections simultaneously for effecting general adjustments for said opening, and wedge means for each of said sections adapted to be moved in the direction of the longitudinal axis of the die and to move respective sections in a direction parallel to the respective slots of said pin-and-slot means for effecting individual adjustments of the separate die sections without affecting the general adjustment of the remaining sections, said wedge means being adapted to engage said sections by direct contact.

9. An adjustable die for drawing bars of polygonal cross sections, said die comprising a body, a plurality of die sections received in said body and adapted to coact with one another to form a die opening, said sections being movable relatively to one another to adjust the size of said opening, a rotatable annular member arranged substantially coaxial with said sections, a pin-and-slot means drivingly connecting said sections to said member for moving said sections simultaneously for effecting general adjustments of said opening, and a plurality of screw actuated wedges, one for each of said sections, said wedges being separately movable substantially along the axis of the die to move respective die sections in a direction parallel to the respective slots of said pin-and-slot means for effecting individual adjustments of the separate die sections, said wedges being received within the confines of the die body and having wedge surfaces directly engaging said die sections.

10. An adjustable drawing die comprising a cup-like body, a plurality of die sections arranged within said body and adapted to coact with one another to form a die opening of polygonal outline, said sections being movable relatively to one another to adjust the size of said opening, a corresponding plurality of abutment

members slidable axially of the die in nests provided in the body thereof and having slanted sides engaging correspondingly slanted sides of said die sections, threaded means adapted to actuate said abutment members separately for effecting individual adjustments of said sections and means for moving all of said die sections simultaneously for effecting general adjustment of said die opening, said means including a lost motion device operating in the direction of movement of said die sections caused by said abutment members.

11. An adjustable drawing die comprising a cup-like body, a plurality of die sections arranged within said body and adapted to coact with one another to form a die opening of polygonal outline, said sections being movable relatively to one another to adjust the size of said opening, a corresponding plurality of abutment members slidable axially of the die in nests provided in the body thereof and having slanted sides engaging correspondingly slanted sides of said die sections, a detachable plate closing the open end of said body and covering said die sections and said abutment members, a plurality of threaded members operatively arranged in said plate and adapted to actuate said abutment members separately for effecting individual adjustments of said sections, and means for moving all of said die sections simultaneously for effecting general adjustment of said die opening, said means including a lost motion device operating in the direction of movement of said die sections caused by said abutment members.

12. An adjustable drawing die comprising a cup-like body, a plurality of die sections arranged within said body and adapted to coact with one another to form a die opening of polygonal outline, said sections being movable relatively to one another to adjust the size of said opening, a corresponding plurality of abutment members slidable axially of the die in nests provided in the body thereof and having slanted sides engaging correspondingly slanted sides of said die sections, threaded means adapted to actuate said abutment members separately for effecting individual adjustments of said sections, and means for moving all of said die sections simultaneously for effecting general adjustment of said die opening, said means including a lost motion device operating in the direction of movement of said die sections caused by said abutment members, and indicating means on said threaded members.

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