Jan. 5, 1954 L. W. ANDREWS 2,664,996

ADJUSTABLE DIE

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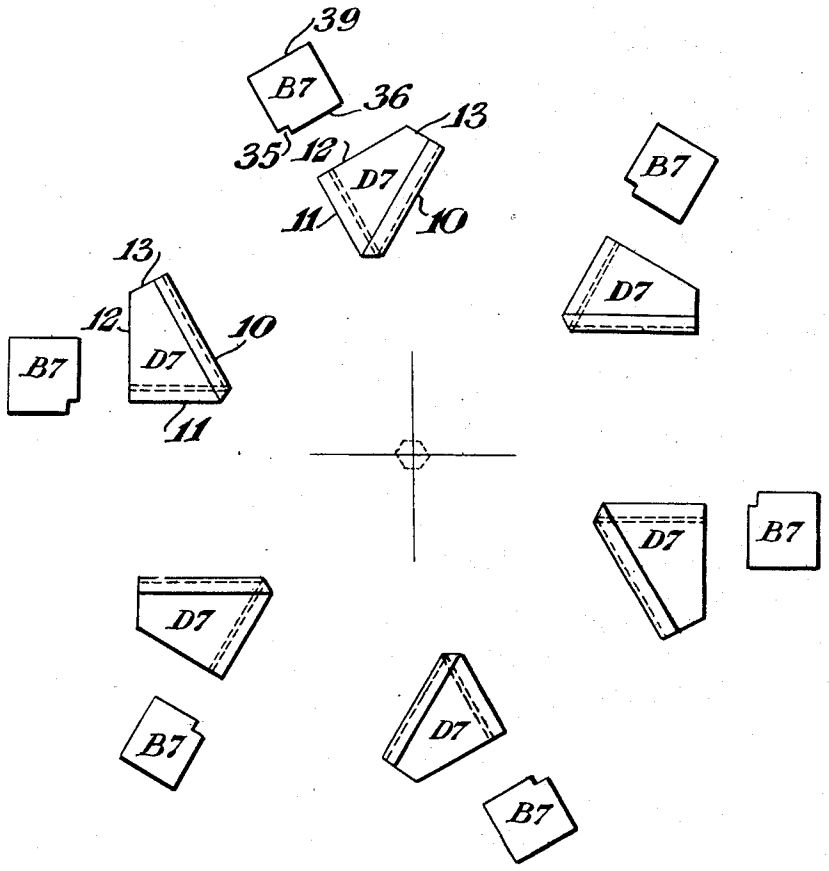


Fig. 1.

Inventor:
Leonard Wilfred Andrews;
By his attorneys,
Baldwin & Wight

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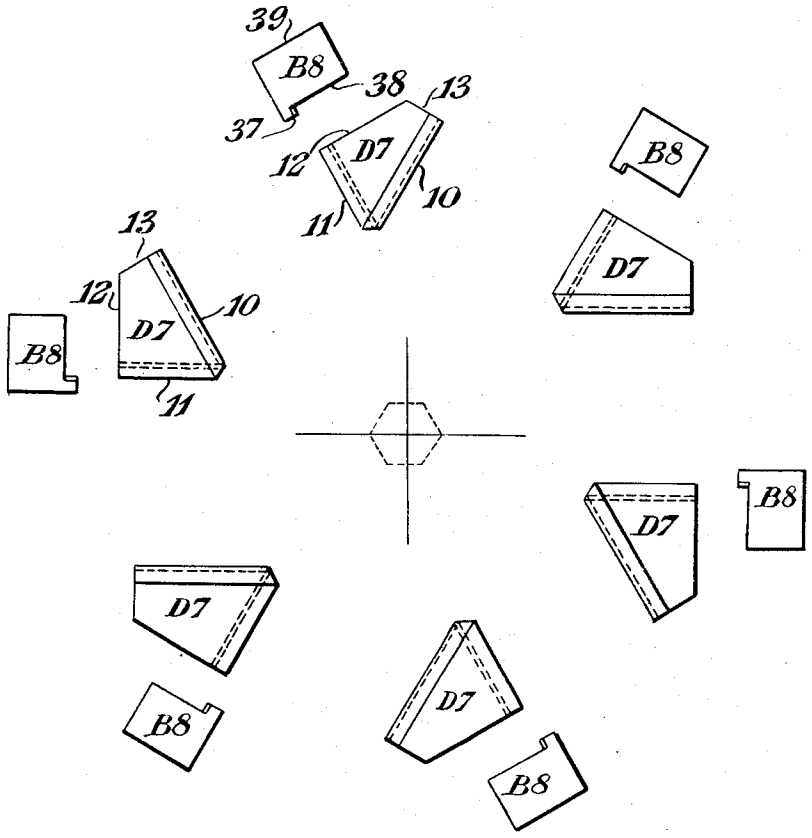


Fig. 2.

Inventor:
Leonard Wilfred Andrews;
By his attorneys,
Baldwin & Wight

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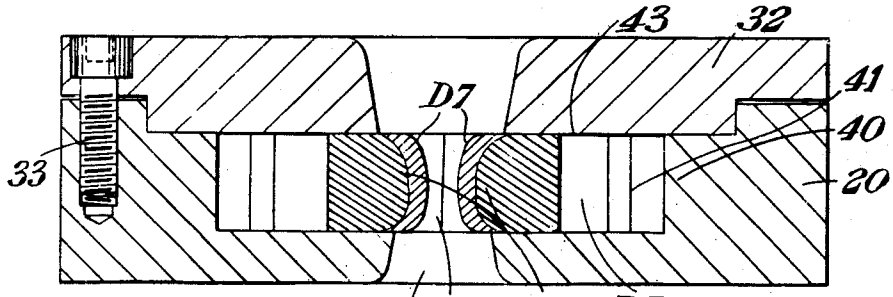


Fig. 4.

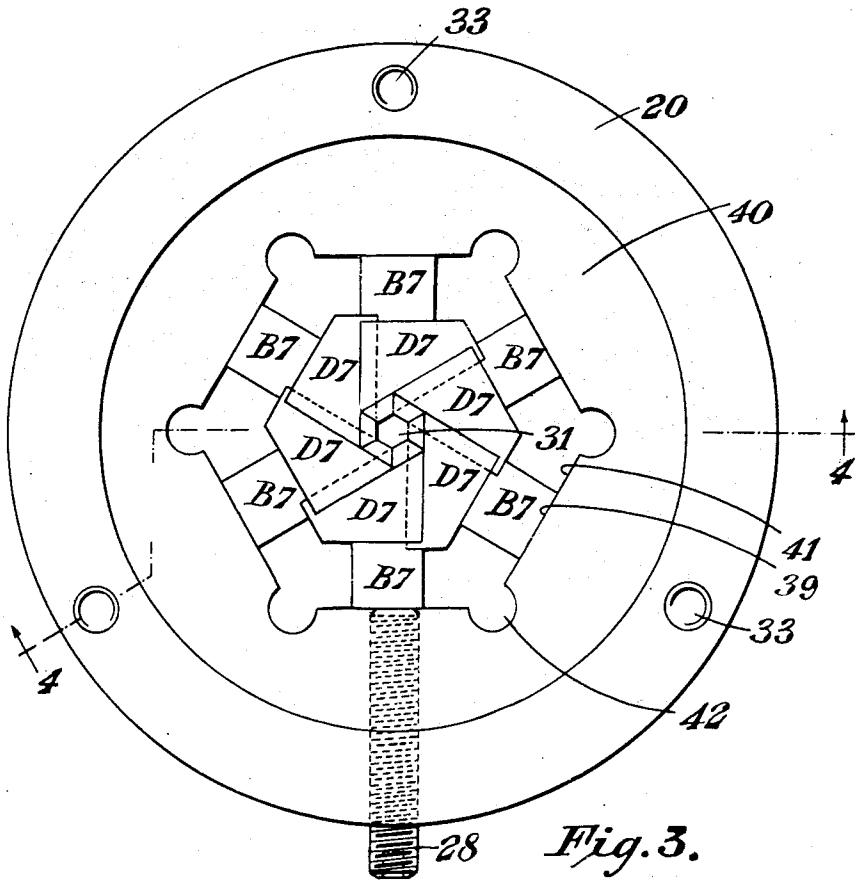


Fig. 3.

Inventor:
Leonard Wilfred Andrews;
By his attorneys,
Baldwin & Wight

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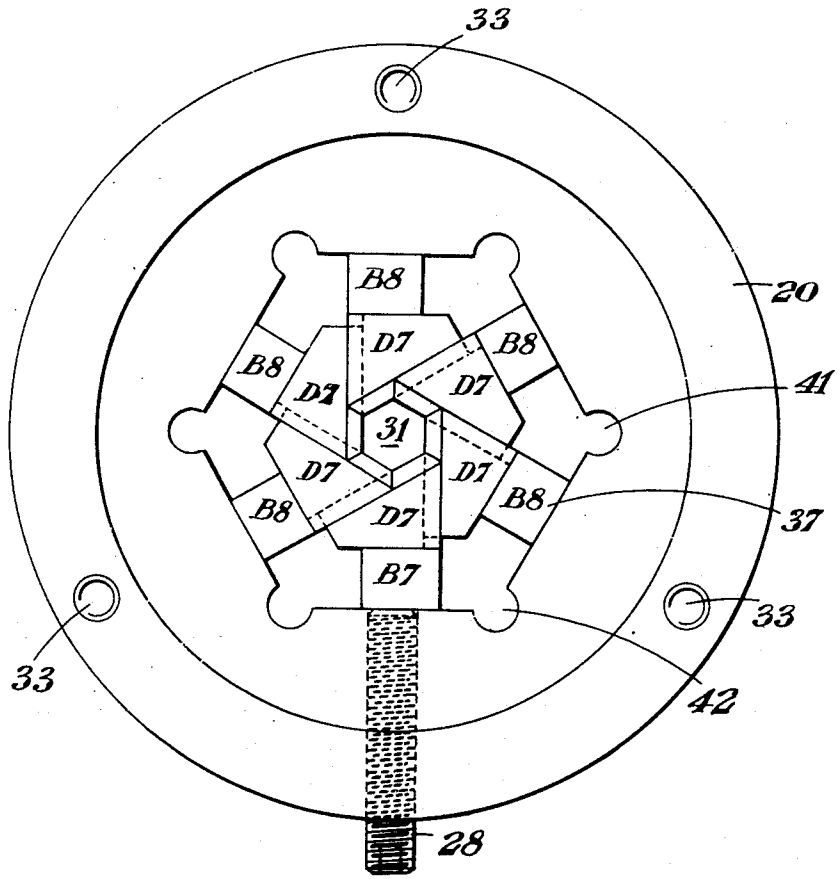


Fig. 5.

Inventor:
Leonard Wilfred Andrews
By his attorneys,
Baldwin & Wight

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UNITED STATES PATENT OFFICE

2,664,996

ADJUSTABLE DIE

Leonard Wilfred Andrews, London, England, assignor to Murex Limited, Rainham, England, a company of Great Britain

Application February 23, 1951, Serial No. 212,369

Claims priority, application Great Britain February 28, 1950

3 Claims. (Cl. 205—26)

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This invention relates to an improved adjustable die suitable, for example, for drawing, forming or extruding bars of square, rectangular, hexagonal or other sections.

It is known that sets of accurately ground and shaped blocks faced with hard metal cemented tungsten carbide, when assembled and clamped together, can be used for the purpose of drawing bars of polygonal sections. Clamping screws, together with adjusting screws, are used to position the blocks in their proper assembly and, by adjustment, to determine the shape and size of the die-hole thus produced at the centre of the assembly. The nature of the components of the sets and the method of assembly and adjustment have been such, however, that setting to a predetermined size of hole is complicated and that the drawing range of any single complete assembly or die is limited. Furthermore, any single die assembly is relatively cumbersome and easily damaged by mis-handling or by bad setting, and, owing to the many screws employed, tends to lack rigidity.

An adjustable die according to the invention comprises (1) a set of die blocks shaped to nest together complementarily with slidable adjustment in assembly to form a die-hole having the same number of sides as the number of die blocks in the set, the said slidable adjustment enabling the assembly to be arranged to give various dimensions of the die hole; (2) a holder having an apertured base for supporting the die blocks and comprising an inner retaining wall; (3) a set of backing blocks snugly interposed between the said retaining wall and the die blocks, the backing blocks being formed to match a particular arrangement of the assembly of die blocks; and (4) means operable to compress the backing blocks between the said retaining wall and the assembled die blocks, and thus to clamp the latter firmly in position.

A cover plate, surmounting the whole assembly of die blocks and backing blocks and detachably secured to the holder, may act as a further clamping means for holding the assembly together.

Each die block may be formed of or faced with hard metal cemented tungsten carbide or other material suitable for the purpose of the die. The other parts are made, for example, of steel. The die block is preferably ground and lapped so that the die face, that is the face which constitutes a wall surface of the die-hole, has a convex cylindrical surface, whereby the die-hole is formed with a throat. A second face of each die-hole, which is inclined at the required angle to the die face, is accordingly provided with a corresponding concave cylindrical surface to nest slidably on the

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convex die face of its adjacent die block. The outer surface, or third face, of each die block may be a plane surface, or two or more plane surfaces inclined to one another, according to the nature of the engagement thereon of the corresponding backing block which is interposed between the die block and the retaining wall of the holder. Different sets of die blocks may be provided for alternative use according to the form, as distinct from dimensions, of the die-hole section required.

It will be understood that one set of backing blocks corresponds to a particular setting of the assembly of a set of die blocks and therefore to a die-hole of predetermined dimensions produced with such assembly. Accordingly the adjustable die outfit will normally comprise a number of sets of backing blocks corresponding respectively to the different dimensions of die-holes required to be produced from one set of die blocks.

Advantages of the present invention are that a single set of die blocks may be used, with the appropriate sets of backing blocks, throughout substantially the full range of the adjustment of the assembly of die blocks to dimensions of die-hole; and that the assembly is relatively simple to handle, to adjust and to clamp to rigidity.

An embodiment of the invention is illustrated in the accompanying drawings of which:

Figure 1 is a plan view of a set of die blocks and a corresponding set of backing blocks, both sets of blocks being unassembled.

Figure 2 is a plan view showing a slight modification of the backing blocks of Figure 1, the die blocks being the same.

Figure 3 is a plan view of the blocks of Figure 1 assembled and mounted in a holder.

Figure 4 is a section on the line 4—4 of Figure 3 and including a cover plate.

Figure 5 is a plan view of the blocks of Figure 2 assembled and mounted in the same holder as that shown in Figure 3.

Figures 1 and 2 show identical sets of six die blocks, all marked D7, adapted for assembly to produce die-holes of hexagonal section. The backing blocks in Figure 1, all marked B7, are adapted to match an assembly of the die blocks when a relatively small die-hole of regular hexagonal section is formed. The backing blocks in Figure 2, all marked B8, are adapted to match an assembly of the die blocks when a relatively large die-hole of regular hexagonal section is formed. The essential difference between the blocks B7 and the blocks B8 is that the former have a front face with a recess which provides the face with two staggered parallel portions 35, 36, whilst the latter have a front face with a projection which provides it with two staggered

parallel portions 37, 38. In each case the backing blocks are of substantially rectangular form, the back faces 39 being parallel with the front faces.

The die blocks D7 used in the embodiment shown in Figures 1–3, have a convex side 10 for producing one wall of the die-hole and a matching concave side 11 for slidably fitting the convex side 10 of an adjacent die block, but the back faces 12, 13 are respectively at right angles to the sides 11, 10. This ensures that in assembly the back face 12 of one block will be in parallel relationship with the back face 13 of an adjacent block.

Referring now to Figure 3 in which the blocks of Figure 1 are shown assembled, the holder of the adjustable die comprises a body 20 with a central aperture 21 in its base. The body is formed integrally with a part 40, which provides an inner wall confining the space within which the die blocks and backing blocks are assembled to make a die-hole 31. It will be appreciated that the part 40 may be formed as a separate element fitted into a recess in the body 20 and keyed against rotation as in the previous embodiment. It will also be appreciated that the base of the body 20 may be recessed to accommodate an interchangeable supporting plate, with a relatively large or relatively small central aperture.

The inner wall 41 of the part 40 is of hexagonal form with slots 42 at its corners. The back faces 39 of the backing blocks B7 are in flush contact with the respective faces of the inner wall 41 whilst the front faces 35, 36 are respectively in flush contact with the back face 13 of one die block D7 and the back face 12 of an adjacent die block D7.

Penetrating radially through the body 20 and the part 40 thereof is a clamping screw 28 bearing on the back face of one backing block. When this is tightened the said backing block is pressed towards the die block assembly whereby the entire assemblies of die blocks and backing blocks are clamped in a state of compression. If desired, the clamping screw 28, instead of bearing directly on a backing block, may bear on a plate fitted into a recess in the wall 41.

Figure 4 shows, fitted on the body 20 of the holder, a cover plate 32 secured by bolts 33. It will be noted that the cover plate has a boss portion 43 fitting in a recess in the body 20 to bear on the die assembly.

The only difference between Figure 5 and Figure 3 is that Figure 5 shows assembled in the holder the die blocks D7 and backing blocks B8 of Figure 2, such assembly making a larger die-hole 31. In this case the back face 12 of a die block lies back nearer to the wall 41 than the back face 13 of the adjacent die block and therefore backing blocks B6 having projecting portions 37 are required.

I claim:

1. An adjustable die comprising a set of die blocks slidably assembled complementarily to form a die-hole of polygonal section, each die block providing one side of the polygonal section and having two back faces at an angle to one another such that in the assembly of die blocks each pair of adjacent die blocks presents back faces in staggered parallel relationship; a holder formed to provide a recess having an apertured base for supporting the die blocks and having a wall with faces forming substantially the same polygonal shape, on an enlarged scale, as the section of said die-hole; and a set of backing blocks in said recess having back faces in flush contact with the respective faces of said wall and having front faces formed with parallel portions staggered correspondingly to the staggering of the back faces of adjacent die blocks and engaging the said back faces.

2. An adjustable die comprising a set of die blocks shaped to nest together complementarily with slidable adjustment in assembly to form a die-hole having the same number of sides as the number of die blocks in the set, the said slidable adjustment enabling the assembly to be arranged to give various dimensions of the die hole, each die block having two back faces at an angle to one another such that in the assembly of die blocks each pair of adjustable die blocks presents back faces in staggered parallel relationship, a holder formed to provide a recess having an apertured base for supporting the die blocks in assembly and having a wall to surround the assembly, the said wall having faces forming substantially the same polygonal shape, on an enlarged scale, as the section of said die hole and at least one set of backing blocks adapted to be supported by said base and to be interposed in spaced relationship between the assembly of the die blocks and said wall, a front face of each backing block being formed with parallel portions staggered correspondingly to the said staggered parallel relationship of the back faces presented by a pair of adjacent die blocks.

3. An adjustable die comprising a set of die blocks shaped to nest together complementarily with slidable adjustment in assembly to form a die-hole having the same number of sides as the number of die blocks in the set, the said slidable adjustment enabling the assembly to be arranged to give various dimensions of the die hole, each die block having two back faces at an angle to one another such that in the assembly of die blocks each pair of adjustable die blocks presents back faces in staggered parallel relationship, a holder formed to provide a recess having an apertured base for supporting the die blocks in assembly and having a wall to surround the assembly, the said wall having faces forming substantially the same polygonal shape, on an enlarged scale, as the section of said die, and at least one set of backing blocks adapted to be supported by said base and to be interposed in spaced relationship between the assembly of the die blocks and said wall, a front face of each backing block being formed with parallel portions staggered correspondingly to the said staggered parallel relationship of the back faces presented by a pair of adjacent die blocks; and means for compressing the backing blocks between said wall and said assembly of die blocks.

LEONARD WILFRED ANDREWS.

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