Dec. 19, 1944. L. H. SAUCIER 2,365,436

ADJUSTABLE ANGLE PLATE

Filed Feb. 4, 1942

FIG. 1.

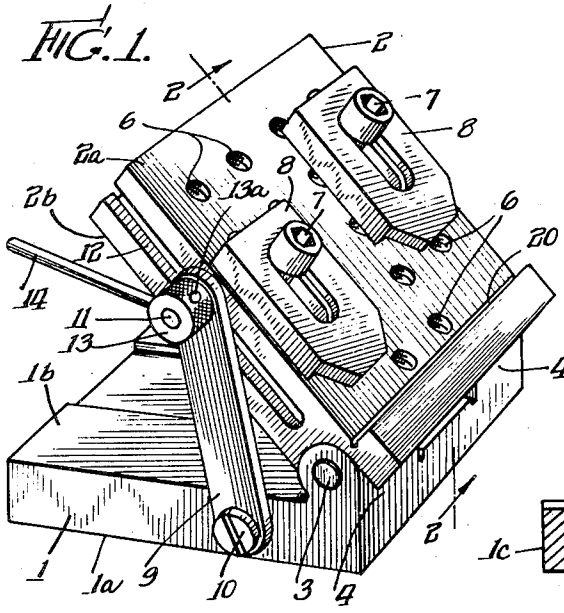

FIG. 2.

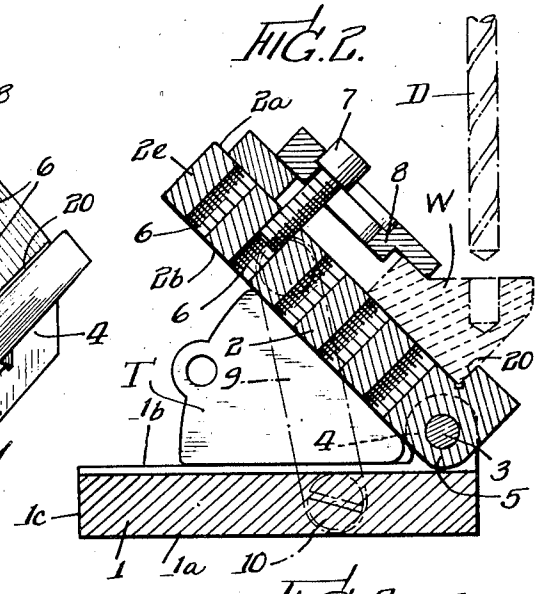

FIG. 3.

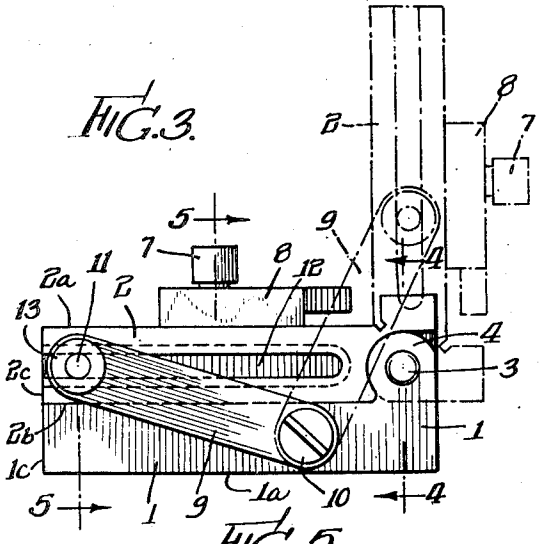

FIG. 4.

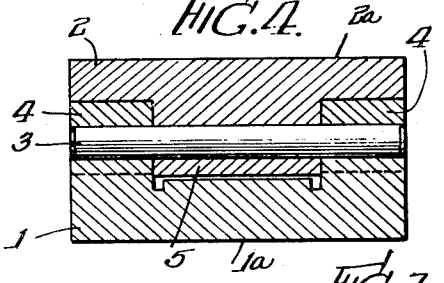

FIG. 5.

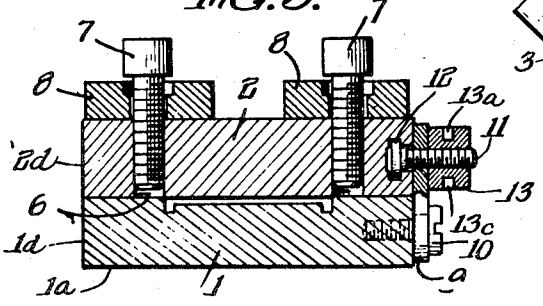

FIG. 6.

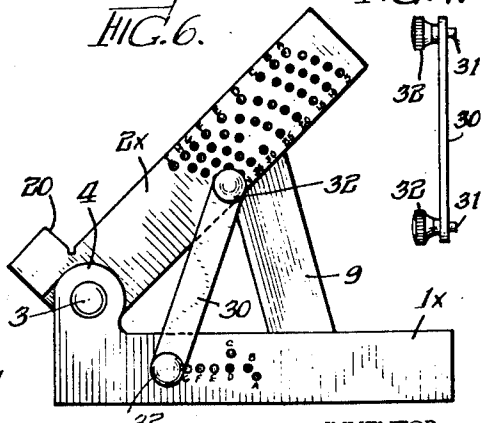

FIG. 7.

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ADJUSTABLE ANGLE PLATE

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Application February 4, 1942, Serial No. 429,555

5 Claims. (Cl. 90—59)

This invention relates to an adjustable appliance, commonly known as an "angle plate," and employed for supporting or securing work pieces in position to be marked, measured, or operated upon by various machining operations, such as facing, slotting, drilling, milling, and the like.

One object of the invention is to provide a relatively small and compact appliance of this character which is readily portable and which can be conveniently stored in a mechanic's tool chest.

Another object of the invention is to provide an adjustable angle plate constructed with such accuracy that substantially all of its exposed, flat surfaces may be employed as planes of reference in determining the angular position of adjustment of the plate, or in securing its accurate adjustment at a desired position.

A further object of the invention is to provide a simple and accurate angle plate designed for the successive mounting thereon of a plurality of similar work pieces in exactly similar positions for producing duplicate or multiple parts accurately and rapidly.

It is also an object of the invention to provide an adjustable angle plate consisting essentially of two leaves hingedly connected so that one leaf serves as a base, while the other leaf serves as a work support, and to furnish bracing means adjustably connecting the leaves, but so designed that it does not project above the work supporting surface of the movable leaf at any position of adjustment.

Other objects and advantages of the invention will appear from the following description, taken in conjunction with the drawing, in which:

Figure 1 is a perspective view of an adjustable angle plate embodying this invention.

Figure 2 is a vertical section taken substantially as indicated at line 2—2 on Fig. 1 and showing in broken outline a work piece and a tool in position to perform work thereon.

Figure 3 is a side elevation showing the two leaves of the angle plate in closed position and indicating in broken outline the limiting position in the range of adjustment of the swinging leaf.

Figure 4 is a vertical section through the hinge axis, being taken as indicated at line 4—4 on Fig. 3.

Figure 5 is a staggered vertical section, taken as indicated at line 5—5 on Fig. 3.

Figure 6 is a side elevation showing an optional feature applied to the angle plate for determining various positions of adjustment.

Figure 7 is an edge view of a removable measuring link employed in determining various positions of adjustment of the angle plate shown in Figure 6.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and re-arrangements of the parts may be made without departing from the spirit and scope of the invention, and that the same is not limited to the particular form herein shown and described, except in so far as indicated by the appended claims.

The appliance which forms the subject matter of this invention is designed particularly for use by tool and die makers, in connection with relatively accurate work, such as the finishing of small parts on a precision grinder. The particular angle plate shown in the drawing to illustrate the invention is intended for use on a grinder having a flat bed arranged to function as a magnetic chuck. Therefore, the lower leaf or base 1 of the angle plate is made with a smooth, flat bottom surface 1^a which will rest flatly upon the table of the grinder and will be held firmly in position by the magnetic attraction. The other leaf 2, which serves as a work support for any work piece to be operated upon in the grinder or other machine with which the angle plate is employed, is hingedly connected to the leaf 1 by means of an accurately fitted hinge pivot 3 which extends through a pair of upstanding lugs 4 on the leaf 1 and through an interposed lug 5 on the leaf 2, as seen clearly in Fig. 4. The leaf 2 may be provided with any suitable work holding devices and a relatively simple arrangement for this purpose consists in drilling and tapping a number of holes 6 at intervals in the area of the leaf 2 and providing clamping screws 7 and slotted clamp bars 8 which may be arranged in any convenient manner, depending upon the shape and size of the particular work piece to be secured to the upper face 2^a of the leaf 2.

When the leaves 1 and 2 are folded together, as shown in Fig. 3, the upper surface 2^a is in a plane exactly parallel to the lower face 1^a and the under surface 2^b of the upper leaf fits flatly against the upper surface 1^b of the lower leaf. These adjacent faces 1^b and 2^b of the two leaves are accurately parallel to the faces 1^a and 2^a, respectively, so that when the work support 2 is to be adjusted in angular relation to the base 1 the desired angle may be measured between the surfaces 1^b and 2^b, if that should be more convenient than any other method. For example, a

sheet metal template cut to the desired angle may be inserted between the leaves when they are swung apart so that, by merely closing the leaves against the edges of such template as indicated at T in Fig. 2, they may be set at the desired angle. Or, since the end surface 1c of the base leaf 1 is finished accurately at right angles to the surface 1a, and the end surface 2c of the other leaf lies in a plane exactly at right angles to the face 2a of said leaf, a mechanic's scale with a protractor head can be applied to these end surfaces, it being evident that the angle between them will be the same as the angle between faces 1a and 2a at any position of adjustment of the leaves about their hinge axis.

For securing the leaves at any desired position of adjustment, I provide a brace arm 9 pivotally attached to the base 1 by a headed screw 10, and pivotally connected to the leaf 2 by a clamp screw 11. The head of the screw 11 is captive in a T-slot 12, as seen in Fig. 5, formed in one lateral face of the leaf 2, and a knurled nut 13 on the end of the screw 11 effects the clamping engagement. If desired, the nut 13 may be formed with one or more radial sockets 13a to receive a pin or bar 14 which will provide additional leverage for tightening the nut 13. The lugs 4 and 5 and the hinge pivot 3 are of relatively heavy construction and accurately fitted, so as to support the leaf 2 quite rigidly at all positions, and a single brace arm 9 is therefore sufficient to hold the leaf to its adjusted position.

With a single brace arm 9 applied against the lateral faces of the leaves 1 and 2 at one side of the device, the opposite lateral faces are all left clear and flat, and since these faces 1d and 2d are accurately formed in a common plane perpendicular to the faces 1a and 2a, the device may be turned bodily on its side so as to rest flatly on the faces 1d and 2d, if that position is found convenient for supporting the work in a machine for a given operation. With a magnetic chuck, it is even possible to secure the end surface 1c firmly to the flat bed of a machine, with the leaf 2 supporting a piece of work in angular relation to the bed.

In addition to its flat work receiving face 2a, the leaf 2 is provided with a flange or ledge 20 extending adjacent the hinge axis and parallel thereto. This makes a very convenient stop surface against which a piece of work may be lodged if it has a straight edge or surface which can engage the face of the flange 20; and, for the production of duplicate parts, this arrangement is especially convenient, since, after the leaf 2 is once adjusted at the proper angle and secured fixedly to the machine bed, the parts can be successively mounted in contact and alignment with the flange 20 and in clamping engagement with the face 2a so that they shall bear a definite relation to the cutter or grinding tool of the machine. Thus the production of such duplicate parts can proceed rapidly and accurately with the adjustable angle plate serving as a sort of jig to insure that the pieces will be exactly similar when finished. Fig. 2 illustrates a work piece W in broken outline thus lodged against the flange 20 in position to be operated upon by a drill indicated also in broken outline at D, it being understood that the drill is carried in the spindle of a machine and that such a machine has a work bed, not shown, upon which the surface 1a of the angle plate is secured.

Fig. 6 illustrates a modification having an added feature by which the adjustment of the angle plate to various positions may be quickly and accurately accomplished. This construction comprises all the features heretofore described, including the brace arm 9 secured against the lateral faces of the two leaves 1x and 2x at one end of the hinge axis. The lateral faces of these leaves at the other end of the hinge axis are provided with a series of accurately positioned holes and a removable link 30 is arranged to connect these holes in pairs to determine different angular positions of the leaves. The holes on the leaf 1x are shown as marked with a series of letters A, B, C, D, etc., and the holes on the leaf 2x are in groups of five, each marked with one of the same letters, A, B, C, D, etc. Each end of the link 30 has a stud 31 secured rigidly in it, and these studs are dimensioned to fit accurately in the holes of the two leaves. For example, with one stud 31 in the hole A of the leaf 1x, and the other stud 31 in the uppermost hole of group A in leaf 2x, the leaves will be spaced apart at an angle of one degree. By shifting the second stud to the next hole in group A, the angle will be changed to two degrees, and with the stud in the bottom hole of group A, the angularity between the leaves will be five degrees. Then, by changing the first stud to the hole B in the base leaf 1x, a second series of positions may be secured by placing the other stud in the several holes of group B in leaf 2x, giving a range of six to ten degrees. As shown, this arrangement provides for angular positions varying by steps of one degree, from one degree to forty-five degrees, and it will be evident that with an angle plate providing more area in its lateral surfaces, or by the employment of smaller studs 31 the number of holes may be increased, or, if desired, one or more additional links of different length may be provided to secure exact angular adjustments through a greater range. For adjusting the angle plate when the measurement is in fractional degrees, it will be preferable to use a special template, such as that shown at T in Fig. 2 for each individual job or to accomplish the adjustment by means of the protractor applied to the end surfaces 1c and 2c as already described.

I claim as my invention:

1. An adjustable angle plate comprising two leaves both of substantial area hinged together and arranged to fold, one upon the other, one leaf having an upwardly exposed work supporting surface, a unitary rigid brace arm pivoted at one end to the lateral face of one leaf, the adjacent lateral face of the other leaf being longitudinally slotted, and a captive bolt slidable in said slot pivotally engaging the other end of said brace arm at a fixed position thereon, with a clamping nut on said bolt adjustable to secure the bolt and the brace arm at any position in the length of the slot.

2. A adjustable angle plate comprising a base leaf and a work supporting leaf of substantial area hinged together and arranged to fold, one upon the other, a unitary rigid brace arm pivoted at one end to the lateral face of one leaf, the adjacent lateral face of the other leaf being longitudinally slotted, and a captive bolt slidable in said slot pivotally engaging the other end portion of said brace arm at a fixed position on said arm, with a clamping nut on said bolt adjustable to secure the bolt and the brace arm at any position in the length of the slot, said brace arm terminating between the bottom plane of the base leaf and the plane of the work supporting surface of the other leaf.

3. An adjustable angle plate comprising a base leaf and a work supporting leaf of substantial area hinged together and arranged to fold, one upon the other, a unitary rigid brace arm pivoted at one end against the lateral face of one leaf, the adjacent lateral face of the other leaf being longitudinally slotted, and a captive bolt slidable in said slot pivotally engaging the other end of said brace arm and fixed thereon with a clamping nut on said bolt adjustable to secure the bolt and the brace arm at any position in the length of the slot, the opposite lateral faces of said leaves respectively being accurately finished and lying in a common plane perpendicular to said hinge axis and to the work supporting surface, whereby said faces may serve to base the angle plate against a face plate or a machine table with its work supporting face perpendicular thereto.

4. A precision angle plate comprising a base leaf and a work supporting leaf hinged together for folding toward and from each other, a unitary rigid brace arm pivoted at one end to the lateral face of one leaf, the adjacent lateral face of the other leaf having a longitudinal T-slot, and a captive bolt slidable in said slot pivotally engaging the other end of said brace arm at a fixed position thereon with a clamping nut on said bolt adjustable to secure the bolt and the brace arm at any position in the length of the slot, the opposing inner faces of said leaves being accurately parallel to the outer faces of the leaves respectively, and the end surface of each leaf remote from the hinge axis being a plane finished surface accurately perpendicular to said inner and outer faces of the leaf.

5. A precision angle plate comprising two leaves hinged together for folding toward and from each other, means to secure them at any position within their range of folding adjustment, and means for determining a series of adjustments comprising a plurality of holes in the lateral face of one leaf at one end of the hinge axis, a plurality of holes in the lateral face of the other leaf at the same end of said axis, and a measuring link having a pair of spaced studs, one of which is engageable with any selected hole in one leaf, the other stud being engageable with any selected hole in the other leaf to fix the leaves in a desired angular relation while the securing means is adjusted to hold them at such position.

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