V. A. BOKER.

AUTOMATIC FILING MACHINE.

APPLICATION FILED OCT. 27, 1920.

1,412,915.

Patented Apr. 18, 1922.

4 SHEETS—SHEET 1.

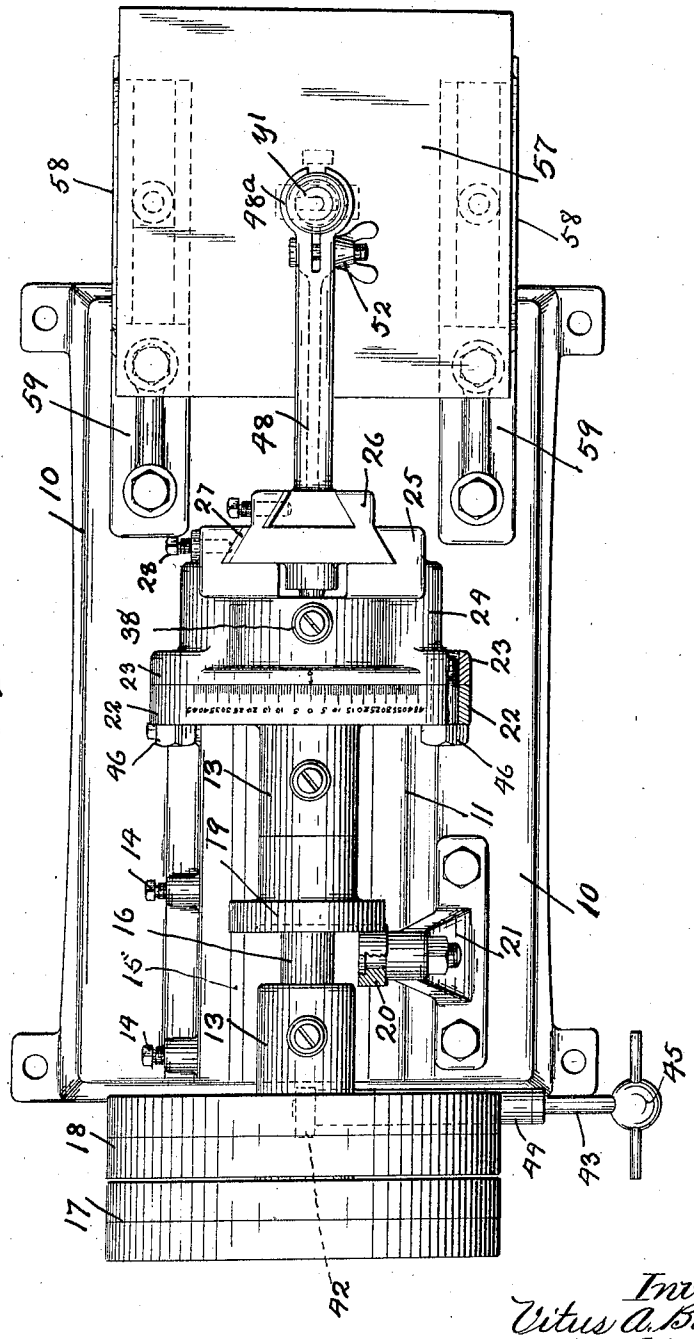


Fig. 1

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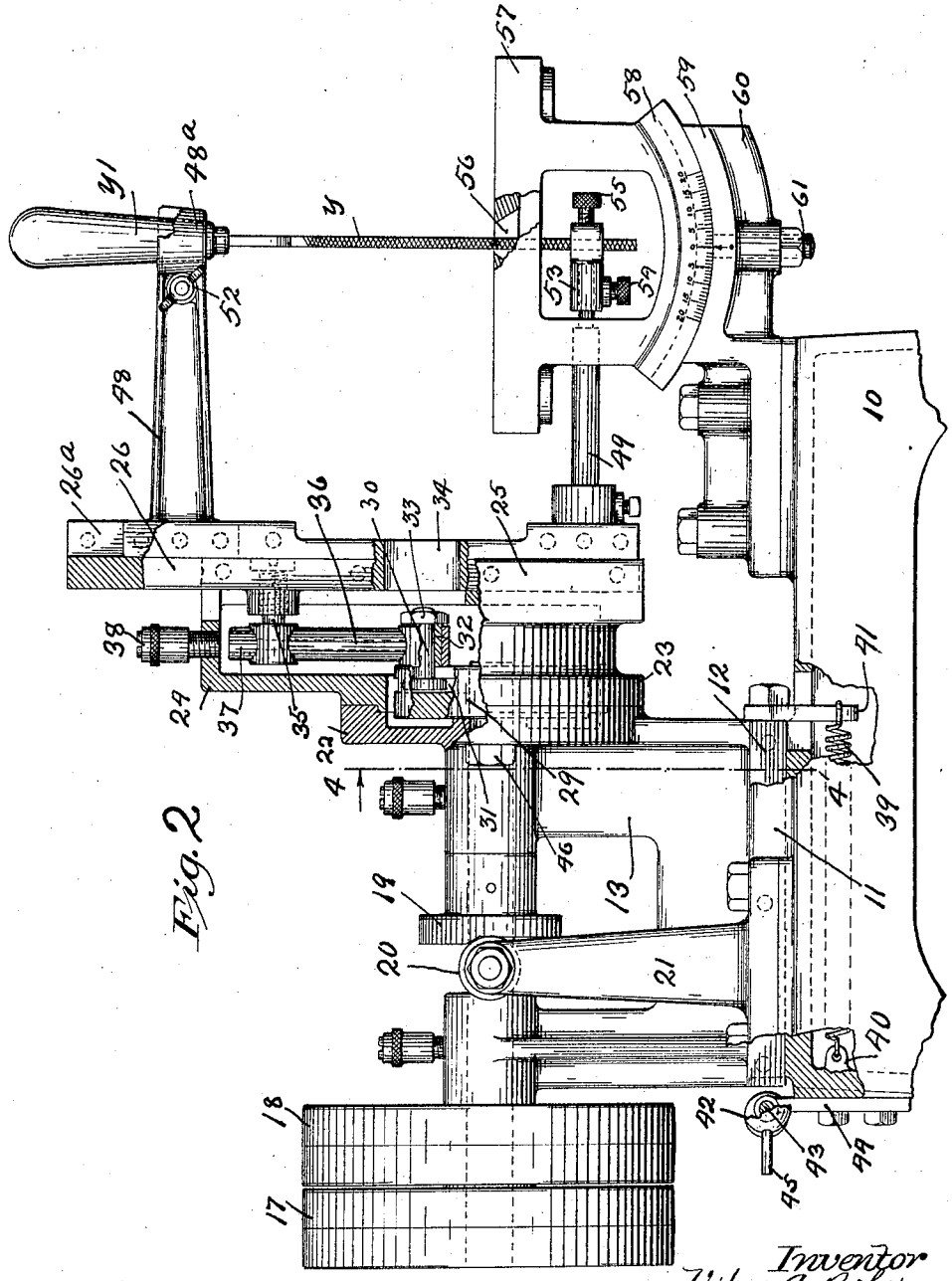


Fig. 2

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4 SHEETS—SHEET 3.

Fig. 7

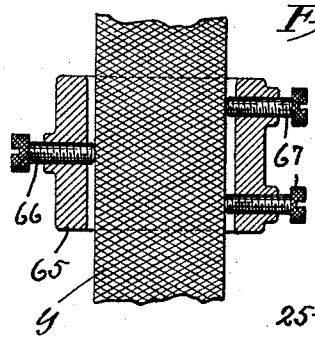


Fig. 3

Fig. 4

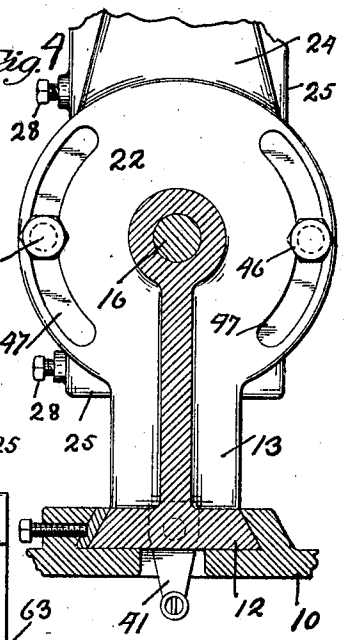


Fig. 6

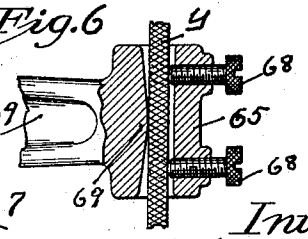
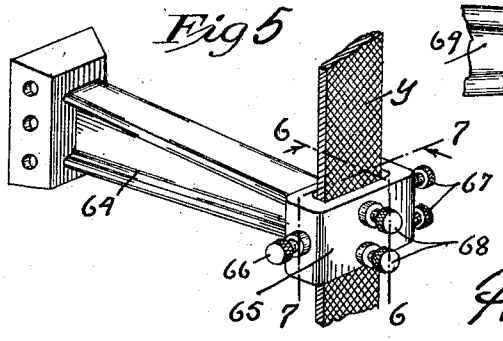


Fig 5



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4 SHEETS—SHEET 4.

Fig. 8

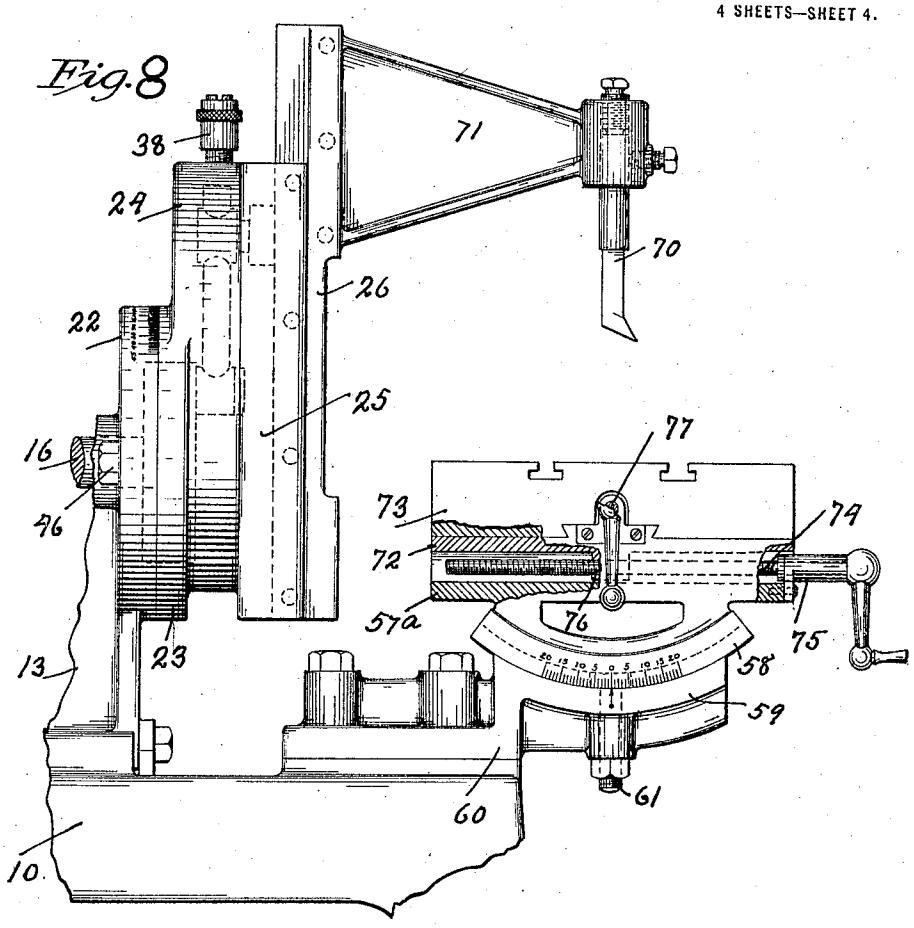
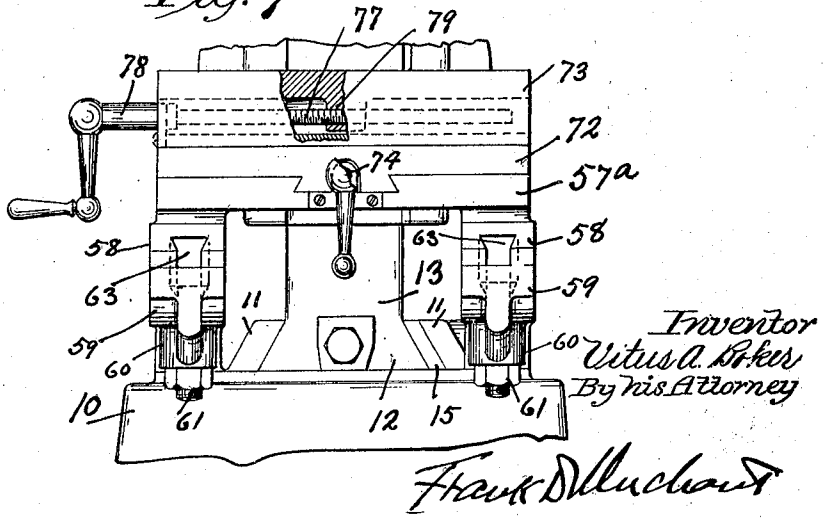


Fig. 9



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FILING MACHINE.

1,412,915. Specification of Letters Patent. Patented Apr. 18, 1922.

Application filed October 27, 1920. Serial No. 419,843.

To all whom it may concern:

Be it known that I, VITUS A. BOKER, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Automatic Filing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Primarily, my invention has for its object to provide an improved automatic filing machine, but the machine is capable of more general use for manipulating various different kinds of tools, such as used in making dies and various other metallic articles and which require the use of a file or metal-cutting tool, or for operating tools for cutting key-ways or for doing such work as may be done on small shapers or similar machines.

This improved machine involves various other novel features in its construction and in the manner of its operations and adjustments, which especially adapt it for use in economically doing high grade metallic die work, and the description thereof, as especially designed for such work and the manner of its use for such purposes, will be sufficiently suggestive to enable those skilled in the art to use the same for various other purposes.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a plan view of the complete machine;

Fig. 2 is a side elevation of the machine, with some parts broken away and with some parts sectioned;

Fig. 3 is a front elevation of the machine;

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2, some parts being broken away;

Fig. 5 is a perspective showing a tool-holding arm designed to hold a file at one end only;

Fig. 6 is a section taken on the line 6—6 of Fig. 5;

Fig. 7 is a section taken on the line 7—7 of Fig. 5;

Fig. 8 is a fragmentary side elevation illustrating a modified form of table and tool-holding arm; and

Fig. 9 is a front elevation of the table and associated parts shown in Fig. 8.

The machine equipped for operating a file is illustrated in Figs. 1 to 7, inclusive, and this arrangement will first be described.

All of the parts of the machine are supported directly or indirectly from the bed frame 10, which, as shown, is a cast structure. On its flat upper surface, this bed 10 is provided with longitudinally extended laterally spaced dove-tail guides 11, in which the dove-tailed base 12 of a bearing head 13 is mounted to slide. To provide for close adjustment and to compensate for wear, one of the guides 11 is provided with set screws 14 that work against a gib 15 placed between said guide and the adjacent side of the dove-tailed base 12 of the bearing head 13. This bearing head 13 is thus mounted for sliding forward and rearward movements.

The upper portion of the bearing head 13 is bifurcated, and, in the upper portion thereof, is journaled a driving shaft 16 that is held against axial movements and, hence, is movable forwardly and rearwardly with said head. In the rear end of the driving shaft 16 is a loose pulley 17 and a fixed pulley 18, over which will run a power-driven belt, not shown. Secured to the intermediate portion of the shaft 16 is a face cam 19, approximately one-half of the cam-acting surface of which is in a plane that is slightly offset axially from the other half thereof, (see Figs. 1 and 2). This cam-acting face of the cam 19 runs against a roller or small anti-friction wheel 20 journaled to the upper end of a post or bracket 21 that is rigidly secured or anchored to the bed 10.

Rigidly secured to the upper front portion of the bearing head 13, and preferably cast integral therewith, is an annular bearing flange 22, against which is seated, for oscillatory adjustments around the axis of the shaft 16, the correspondingly formed annular portion 23 of a cast crank housing 24, which, on its front portion, is provided with normally upright laterally spaced dove-tail flanges 25. The dove-tailed portion of a vertically movable slide 26 is mounted to move in the dove-tailed channel formed between the dove-tail guide flanges 25; and to provide for close fit and to compensate for wear, a gib 27 is placed between one of said flanges 25 and the adjacent side of the slide

26, and said gib 27 is made adjustable by means of set screws 28 applied to the noted flange 25.

Secured to the front end of the driving shaft 16 and working within the housing 24, is a disk-like crank 29 provided with a crank pin 30. The crank pin 30 is adjustable radially toward and from the axis of the shaft 16, and as shown, this is accomplished by providing said crank pin with a head that works in a T-shaped radial slot 31 of the disk-like crank 29 and by providing said crank pin with a bushing 32 and a nut 33, (see Fig. 2).

The front plate of the housing 24 is cut away at the back of the slide 26, and to permit the nut 33 to be reached from the front of the machine, by a socket wrench or the like, said slide 26 is provided with a large hole 34.

The slide 26, on its back, is provided with a projecting wrist pin 35 that works through the opening in the front plate of the housing 24 and projects into said housing. A pitman or connecting rod 36 connects the crank pin 30 of the crank 29 to the wrist pin 35 of the slide 26, so that the latter will be reciprocated under rotation of said disk. As shown, the crank rod 36 is provided, at its upper end, with an open oil cup 37 that underlies and is adapted to receive from an oil cup 38 applied to the top of the housing 24, as best shown in Fig. 2.

The sliding bearing head 13 is yieldingly forced rearward so that the cam 19 will be pressed against the roller 20; and, as shown, this is accomplished by a coiled tension spring 39 that is anchored to a lug 40 on the under portion of the bed 10 and is connected to a short arm 41 rigidly secured to and depending from the lower front portion of said bearing head.

Sometimes it will be desirable to set the head 13 so that it will not be given axial movements, and to accomplish this, I have shown a stop-acting cam 42 that is secured to the inner end of an oscillatory shaft 43 mounted in a suitable bearing 44 on the rear portion of the bed 10 and provided at its outer end with a hand piece 45 by means of which said shaft and cam may be rotated or oscillated. When the cam 42 is in the position shown in Fig. 2, the cam 19, when rotated, will automatically move the bearing head 13 and parts carried thereby in a forward and rearward direction or axially of the shaft, but when said cam is turned 180 degrees, it will engage the base of the head 13 and hold the same, against the tension of the spring 39, in a permanent position with the cam 19 running without engagement with the roller 20.

The slide 26 is adapted to be set to reciprocate vertically or obliquely, by oscillatory adjustments of its support and guide made up of the housing 24 and guides 25. To rigidly secure said housing and guides in different adjustments, I preferably provide machine screws 46, that work in segmental slots 47 in the annular flange 22 and are screw-threaded into the annular portion 23 of the housing 24.

The slide 26 carries one or more tool holders adapted to hold a file or other tool, and, as shown in Figs. 1, 2 and 3, the tool holder comprises upper and lower arms adapted to support a file at upper and lower ends. To hold these upper and lower so-called tool-supporting arms, the slide 26 is preferably formed with a longitudinal dove-tail channel 26^a. The upper arm 48 and the lower arm 49 are both provided with dove-tailed base ends that work slidably within the channel 26^a and are adapted to be held in different vertical adjustments in respect to each other and in respect to the slide, by means of one or more set screws 50 and one or more set screws 51 that work with threaded engagement through one of the guide flanges 25.

In Figs. 2 and 3, an ordinary flat file Y is shown as provided with a customary wooden handle Y^1, and, for clamping the handle of the file, the tool-supporting arm 48 is shown as provided with an outer end that is split to form curved clamping jaws 48^a that are adapted to be clamped onto the file handle Y^1 by a nut-equipped bolt 52. For clamping the flat lower end of the file, the lower tool-supporting arm 49 is provided with a head 53 formed with an elongated slot through which the lower end of the file is passed. The head 53 has a set screw 54, (see particularly Fig. 2), by means of which it may be rigidly secured to the arm 49 with freedom for sliding or axial adjustments thereon. Another set screw 55, applied through the outer end of said head, serves to rigidly clamp the lower end of the file to said head. Obviously, by axial adjustments of the head 53, the file can be set so that its operative face will be in or substantially in a vertical plane, regardless of whether said file has parallel or slightly converging sides.

The file, held as above described and operated as above indicated, will work through a central tool passage 56 formed in a work table 57. This work table has a novel relation to various other parts, as will hereinafter more fully appear, but this time, attention is called to the fact that when said table is horizontal, as shown in the drawings, its upper surface will be in a horizontal plane in which also lies the axis of the driving shaft 16. Also note that the axis of said shaft 16 is in a vertical plane that intersects the file Y and the file passage 56 centrally. In the preferred arrangement also, the axis on which the slide support and

guide is adjustable is coincident with the axis of said driving shaft 16. The importance of these relations will presently appear.

As already noted, the slide guide and support is mounted for rotative or oscillatory adjustments in a plane that is at a right angle to the axis of the driving shaft 16. The table 57, however, is mounted for oscillatory adjustments in a vertical plane that includes or that is parallel to the axis of said driving shaft. Preferably, this noted adjustment of the table is provided as follows:

At the sides, said table 57 is provided with rigidly secured laterally spaced depending bearing segments 58 that are seated on correspondingly formed segmental flanges 59 of a table-supporting bracket 60 that is bolted or otherwise rigidly anchored on the bed 10. For adjustably but rigidly securing the table 57 either horizontal or tilted in either direction, nut-equipped bolts 61 are provided. These bolts work through the brackets 60 and are provided with tapered heads 62 that work in dove-tailed segmental slots 63 formed in the segmental bearing flanges 59, (see Figs. 2 and 3).

Here it may be noted that the contacting segmental surfaces of the elements 58 and 59 are on the arc of a circle whose axis transversely intersects the common axis of the driving shaft 16 and the adjustable housing 24 at a right angle and intersects a point on said projected axis, that is, at the center of the tool passage 56 and which intersected point is in the plane of the upper surface of the table 57. Also, it will be observed that the above noted intersected point is at the center of the cross section of the file.

Very important functions result from the above noted relative arrangement of parts, and which may be stated as follows:

When the table 57 is adjusted from horizontal to oblique positions in either direction, the above noted intersected point, in the plane of the upper surface of the table, does not move in respect to the file or other tool and the tool or file passage 56, at its upper portion, does not move forwardly or rearwardly in respect to the file, but the lower portion of said tool passage does swing slightly forward or rearwardly so that, to obtain the smallest possible tool passage, said passage must be made downwardly flaring thereby to clear the file in all adjustments of the table.

When the housing 24 and slide guide 25 are oscillated around the axis of the shaft 16, to thereby set the file to work in an oblique position in either direction from a vertical position, the point of intersection of the common axis of said shaft and of said housing, with the axis of the table-supporting segments and with the central line of the file, does not change its position in respect to the face of the table and in respect to the center of the file passage 56, but, to provide clearance for the file under the different adjustments just noted, the file passage 56 should be made downwardly flaring also in a transverse direction or in a direction from one side to the other of the table.

In making dies and various other devices, more or less tapered angular holes must be frequently made and such holes must usually be made flaring or beveled on all sides.

Obviously, adjustments of the table 57 provides means for beveling or flaring the angular hole in a front to rear direction, and adjustments of the housing 24 and slide guide 25 provide means for beveling or flaring the hole in a transverse direction, said directions being stated in respect to the table on which the die or other object, not shown, will be rigidly secured while the hole therein is being filed and tapered as stated. Obviously, when both the file and the table are obliquely set, one corner of the file will be arranged to file completely into the corner of a rectangular hole that is beveled on all sides, that is, made flaring in all directions.

The file-operating operation is probably obvious, but may be briefly stated as follows:

The work must, of course, be properly held on the table and properly positioned in respect to the file. When the file is moved downward, it will move on a true straight line and, at the limit of its downward movement, the cam 19 will offset the file so that, under its return or upward movement, it will be moved clear of the surface that is positioned to receive the filing action under the downward movement of the file. Thus, wearing of the file by a back dragging action will be prevented and the proper filing action will be produced.

Inasmuch as the housing 24 and the slide guide 25 are adjustable on an axis that is coincident with the axis of the driving shaft 16 and of the crank disk 29, adjustments of said housing and slide guide, to position the file for different lines of movement, does not at all change the stroke of the crank. Nevertheless, as already indicated, the movement of the file or the length of the reciprocation thereof can be varied by radial adjustments of the crank pin 30. The variable throw adjustment of the crank pin, however, is important for another use, which will now be described.

For filing pockets or depressions in dies or the like, where the file or tool can not be passed completely through the die, it is necessary to support the file from one end or portion only, and for doing this, I prefer-

ably provide a file-supporting arm 64, such as illustrated in Figs. 5, 6 and 7. This arm 64 is like the arm 48 in that it is provided with a dove-tailed base for engagement with the dove-tailed slide 26, but, at its outer end, it has a rectangular head 65 through which the flat body portion of the file Y is passed. At one side, the head 65 is provided with a set screw 66 and, at its opposite side, with vertically spaced set screws 67. In its front wall, said head 65 is provided with vertically spaced set screws 68. The set screws 68 are adapted to clamp the file flatwise against a rounded or angular bearing surface 69 formed on the back wall of the vertical passage through the head 65, and the two set screws 67 are adapted to clamp one edge of the file against the opposing set screw 66. Thus, with the head 65 always in its normal position, the file, regardless of its exact form, can be properly set forwardly, rearwardly and laterally and, hence, rigidly secured to the head and arm and set for the proper filing action with one end projecting, so that it will properly enter the pocket to be filed in the die or other object. Of course, the arm 64, like the arm 48, may be set in any desired vertical position on the reciprocating slide. Moreover, said arm can be set either at the upper or lower end of the slide, so that it will operate downwardly from above the table or upwardly from below the table. In using the file supported at one end or at one place, for filing pockets or the like, as above stated, it is frequently desirable to change the length of the stroke of the file, and this, as is evident, can be readily done by adjusting the crank pin 30 radially in the crank disk 29.

In practice, it will often be desirable to employ several file or tool-holding arms for interchangeable use, and the advantage of this is that an arm, with a file or tool properly set, can be quickly removed and another arm, with a file or tool properly but differently set, can be temporarily used to do a certain kind of work, and then the first used arm, with the file or tool still properly set thereon, can be reapplied and again used, thus saving very considerable time that would be otherwise required to reset the files or tools for a particular purpose.

The arrangement illustrated in Figs. 8 and 9, is substantially as already described, except that the table is of modified construction and that a shaper tool 70 is detachably secured to a tool-carrying arm 71 that is adapted to be secured to the slide 26 in the same manner as the arms 48 and 64. The table 57ª, in its lower portion, is like the table 57, but it is provided with a slidably adjustable supplemental top section 72 and a second supplemental top section 73. The top section 72 has dove-tailed engagement with the table 57ª and is adjustable in a forward and rearward direction under the action of a screw-rod 74, that is swiveled in a bearing 75 on the table 57ª and is engageable with a depending lug 76 of the top section 72. The top section 73 is movable in a direction transversely of the table or at a right angle to the screw-rod 74 and has dove-tailed engagement with the top section 72. The adjustment of the top section 73, in respect to the section 72, is accomplished by a screw-rod 77 that is swiveled in a sleeve 78 on the top section 72 and engages a depending lug 79 of said top section 73. In this arrangement, the die or other work is arranged to be secured on the face of the extreme top section 73 in the customary way or by any suitable means.

The modified arrangement of the table and tool-supporting arm illustrated in Figs. 8 and 9, adapts the machine for use as an upright shaper and will be found especially useful in making dies and doing like work.

The efficiency of the machine above described has been demonstrated in practice.

What I claim is:

1. A machine of the kind described having a table and a tool carrying slide guide, each mounted for angular adjustment on an axis which axes if projected intersect, the said table having a tool passage at the point of intersection of said axes, and a reciprocating slide movable on said slide guide and carrying means for moving a tool through the passage of said table at the point of intersection of said axes.

2. The construction defined in claim 1, in which the axes on which said slide guide and table are adjustable are in a horizontal plane.

3. The construction defined in claim 1 in further combination with a power-driven crank having connections for reciprocating said slide in the different angular adjustments of said slide guide.

4. The construction defined in claim 2 in further combination with a power driven crank having a connection for reciprocating said slide in the different angular adjustments of said slide guide.

5. The construction defined in claim 1 in further combination with means for moving said slide and tool laterally to retract the latter from its work under one direction of movement.

6. The construction defined in claim 4 in further combination with means for moving said slide and tool laterally to retract the latter from its work under one direction of movement.

7. The construction defined in claim 1 in which the point of intersection of said axes is in the plane of the top of said table.

8. The construction defined in claim 1 in which the axes on which said slide guide and table are adjustable are in a horizontal plane

and their point of intersection is in the plane of the top of said table.

9. In a machine of the kind described, the combination with a rotary shaft equipped with a crank and having a face cam with offset portions, a roller mounted on the fixed support and engageable with the face cam of said shaft to impart slight axial movements thereto, a slide guide, a tool-carrying slide movable in said guide, a connecting rod for reciprocating said slide from said crank, a work table, and means for rotating said shaft.

10. In a machine of the kind described, the combination with a base, of a spring-retracted bearing head mounted for slight sliding movements on said base, a power driven shaft journaled in and movable axially with said head bearing, a crank on one end of said shaft, a slide guide supported by and movable with said bearing head, a tool-carrying slide movable in said slide guide, a connecting rod for reciprocating said slide from said crank, a face cam carried by said shaft and having offset portions, a roller support fixed on said base, and a roller on said roller support operative on said face cam to impart slight sliding movements to said bearing head and parts mounted thereon.

11. In a machine of the kind described, the combination with a base, of a spring-retracted bearing head mounted for slight sliding movements on said base, a power driven shaft journaled in and movable axially with said head bearing, a crank on one end of said shaft, a slide guide supported by and movable with said bearing head, a tool-carrying slide movable in said slide guide, a connecting rod for reciprocating said slide from said crank, a face cam carried by said shaft and having offset portions, a roller support fixed on said base, a roller on said roller support operative on said face cam to impart slight sliding movements to said bearing head and parts mounted thereon, said slide guide being mounted for oscillatory adjustments around the axis of said shaft, and a work table.

12. In a machine of the kind described, the combination with a base, of a spring-retracted bearing head mounted for slight sliding movements on said base, a power driven shaft journaled in and movable axially with said head bearing, a crank on one end of said shaft, a slide guide supported by and movable with said bearing head, a tool-carrying slide movable in said slide guide, a connecting rod for reciprocating said slide from said crank, a face cam carried by said shaft and having offset portions, a roller support fixed on said base, a roller on said roller support operative on said face cam to impart slight sliding movements to said bearing head and parts mounted thereon, said slide guide being mounted for oscillatory adjustments around the axis of said shaft, and a work table mounted for oscillatory adjustments to set the same either horizontal or inclined.

13. In a machine of the kind described, the combination with a work table, of a slide guide equipped with a tool holder for co-operation with said table, means for reciprocating said slide to operate the tool, means for moving said slide laterally to throw the tool into action under one movement and out of action under its other movement, and a stop for interrupting said lateral movement of said slide.

14. In a machine of the kind described, the combination with a work table, of a crank-equipped shaft, a slide guide, a connecting rod for reciprocating said slide on said crank shaft, a tool-holding device on said slide, a bearing for said shaft having a slight movement longitudinally of said shaft to move the tool into operative position under one movement and into an inoperative position under its other movement, a cam on said shaft, an abutment co-operating with said cam to move said shaft bearing and parts carried thereby longitudinally of said shaft, and a stop device for holding said shaft bearing in a position in which the cam of said shaft is thrown out of action on its co-operating abutment.

In testimony whereof I affix my signature.

VITUS A. BOKER.