March 30, 1948. J. A. YERKES 2,438,628

PENCIL SHARPENER

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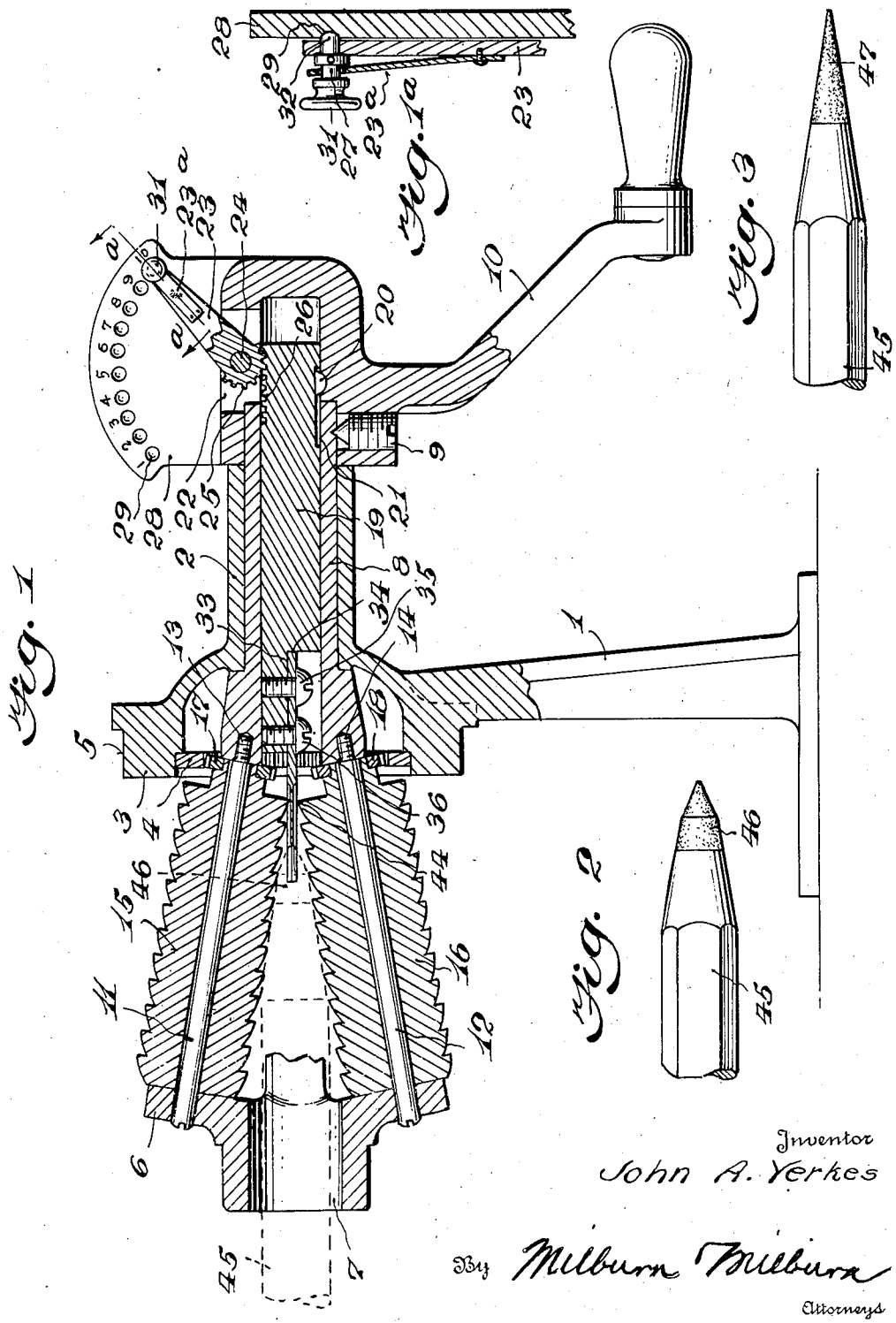


Fig. 1

Fig. 1a

Fig. 3

Fig. 2

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Fig. 4

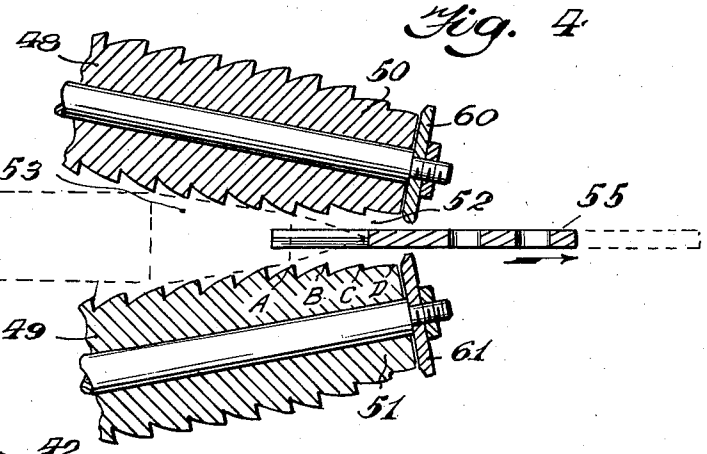


Fig. 6

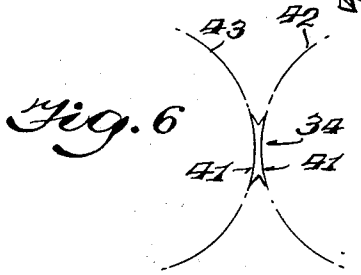


Fig. 5

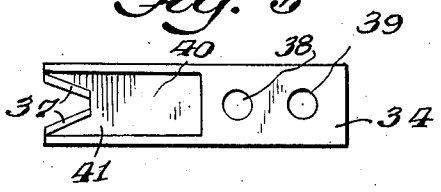


Fig. 7

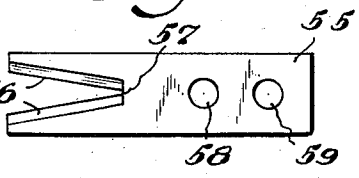


Fig. 9

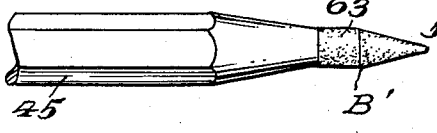


Fig. 10

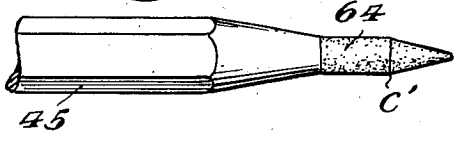


Fig. 8

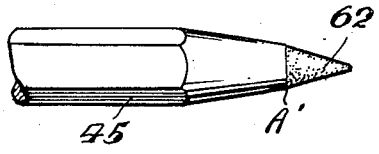
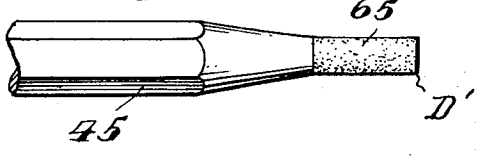


Fig. 11



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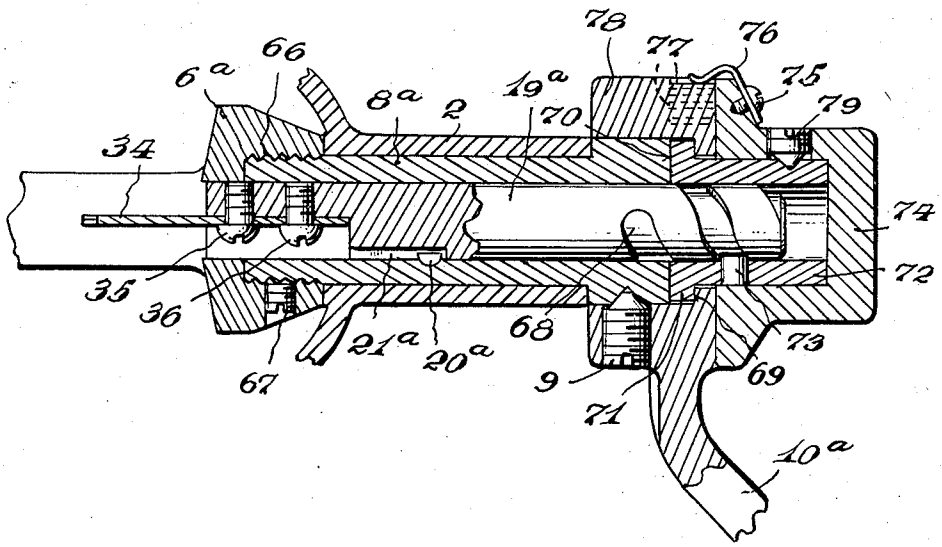
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Fig. 12



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PENCIL SHARPENER

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Application August 12, 1944, Serial No. 549,214

10 Claims. (Cl. 120—96)

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This invention relates to pencil sharpeners, and more particularly to pencil sharpeners of the type which include one or more rotatable cutters.

One of the primary objects of the invention is to provide for the production of a large variety of shapes of pencil-points, to enable the operator to select a shape which is most suitable for the particular type of pencil and the kind of work to be done.

Another important object of the invention is to enable the operator to select and produce the desired shape of pencil-point without removing the housing or chip container.

A further important object is to enable the selection of a particular point to be changed after insertion of the pencil into the machine, without injury to the existing point.

Other objects are simplicity of construction, ease of assembly and use of inexpensive parts.

Additional objects and advantages will be apparent from the following description, taken in connection with the drawings, in which:

Figure 1 is a central vertical sectional view of the preferred form of my pencil sharpener, with the usual housing or chip-container omitted;

Figure 1*a* is a fragmentary sectional view of the handle of the indicator arm shown in Fig. 1, taken on line *a*—*a* of that figure;

Figure 2 is a diagrammatic perspective view of the end of a pencil sharpened to a relatively short point;

Figure 3 is a similar view of the end of a pencil sharpened to a relatively longer point, in the usual manner;

Figure 4 is a fragmentary enlarged diagrammatic view, partly in central vertical section, of a modified form of the invention;

Figure 5 is a top plan view of the auxiliary cutter blade shown in Fig. 1;

Figure 6 is an end elevational view of the auxiliary cutter blade shown in Fig. 5;

Figure 7 is a top plan view of a modified form of auxiliary cutter blade;

Figures 8, 9, 10 and 11 are fragmentary diagrammatic perspective views of the ends of pencils with points such as may be produced by the modified form of the invention illustrated in Fig. 4; and

Figure 12 is a fragmentary central vertical sectional view of a modified form of adjusting means for the cutter blade shown in Fig. 1, parts being omitted or broken away and other parts being shown in elevation.

Broadly considered, the above-mentioned objects of the invention are accomplished by one or more rotatable cutters in association with an auxiliary cutter which performs the combined functions of a pencil stop and point sharpener.

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In the preferred form of the invention the cutter assemblage is carried by a head or cutter-carrier, which is rotatably mounted on a suitable base or support, which may take various forms or shapes for use in a horizontal or vertical position.

By way of illustration, the support may be a base casting 1 with an integral cylindrical shaft-housing 2 and a gear-housing 3 into which an internal gear 4 is pressed. A flanged cylindrical portion 5 may be provided for reception of the usual housing or chip container (not shown). These parts are fixed and do not rotate.

The rotating parts of the device include a frame 6, shaft 8 and cutters 15, 16. Frame 6, having a central aperture 7, for insertion of the pencil to be sharpened, is preferably integral with hollow shaft 8, rotatably housed in shaft-housing 2. Keyed to shaft 8 by set-screw 9 or other suitable means is a handle 10, which may be manually rotated. One or more cutter shafts, such as pins 11, 12, are suitably secured to frame 6, for example by threaded shoulders 13, 14, respectively, and have rotatably mounted upon them preferably cylindrical milling cutters 15 and 16, on which are pressed spur gears 17 and 18, respectively.

If handle 10 is revolved manually (or by power means, when desired and provided for), shaft 8 and its integral or rigidly attached frame 6 will revolve; milling cutters 15 and 16 will be rotated in an orbital path, carried with frame 6, and cutters 15, 16, through the meshing of spur gears 17, 18 and internal gear 4, will also rotate axially on pins 11 and 12. This form of construction and its operation are well known.

My invention pertains to certain features of novelty and improvement, which, in their preferred form, are illustrated in Figs. 1, 5 and 6. A preferably cylindrical shaft 19 is positioned in the bore of hollow shaft 8 in such manner as to permit longitudinal adjustment of shaft 19, or rotation of shafts 8 and 19 as a unit when handle 10 is revolved. A key 20, with its upper face flattened, is pressed into a suitable indentation in handle 10 and fits into a milled slot in shaft 19, preventing independent rotation of shaft 19, but permitting its limited longitudinal movement.

Loosely fitted into a slot 22 in handle 10 is an indicator arm 23, which is mounted for pivotal

adjustment on a pin 24 pressed into suitable holes in handle 10. On the lower end of arm 23 is formed a gear sector 25, adapted to engage gear teeth 26 on shaft 19. Arm 23, or its upper portion 23a, is preferably a stamping of resilient metal normally slightly bent, so that it tends to press laterally against an indicator panel 28, preferably integral with handle 10. Panel 28 is preferably indented with a number of circular concave indentations, ten being indicated in the drawing, each identified by a numeral. The upper portion of arm 23 is drilled for reception of a pin 27, which, as shown in Figure 1a, is provided with a handle 31 and a curved end 32 adapted to fit into any one of the indentations 29, to releasably secure arm 23 and shaft 19 in selected adjusted position. By this means shaft 19 may be shifted longitudinally to any position within the limits shown and locked in such adjusted position. In Fig. 1 shaft 19 has been shifted to the left a maximum distance, corresponding to position "10" on the panel 28.

Shaft 19 is milled to form a flat portion 33 on which is mounted a flat auxiliary cutter blade 34, secured to shaft 19 by machine screws 35 and 36, or by other suitable means. In its preferred form of embodiment, my auxiliary cutter, functioning as a combined pencil-stop and point-cutter, is in the form of a blade 34 (shown in Figs. 5 and 6) preferably made of thin tool steel, ground at one end to form a substantially V-shaped pair of cutting edges 37, and is provided with a pair of apertures 38, 39 adapted to receive screws 35, 36. The apex of the V formed by cutting edges 37 is slightly flattened; the flat portion 40 does no cutting, but acts as a stop to prevent excessive feed of the pencil lead after completion of the sharpening operation and produces a point which is frusto-conical at its tip, as shown in Fig. 2.

Blade 34 is ground on both sides, in the vicinity of cutting edges 37, to produce concavities 41; the path of the grinding wheel is indicated by dotted lines 42 and 43 on Fig. 6.

Auxiliary cutter blade 34 is positioned between milling cutters 15, 16 (Fig. 1), arranged in converging position to form a V-shaped or tapered space between them. At their apex there is a slight clearance 44 between cutters 15 and 16, through which space blade 34 projects. It is because of this small clearance that it is necessary to grind the concavities on blade 34.

Preferably the angle between cutting edges 37 of blade 34 is greater than the angle between milling cutters 15 and 16. In the drawings the latter angle is shown as substantially 20°, which is common practice, whereas the angle between cutting edges 37 is preferably 45°: the latter angle, of course, may be subject to considerable variation.

In operation, if arm 23 is swung to the extreme left position, that is, to indentation 29 of position "1," shaft 19 will be moved to the extreme right position and blade 34 will be shifted to the right until flat portion 40 of blade 34 coincides with apex 44 of cutters 15, 16, as to position. In this relative positioning of the parts the machine operates in the manner of an ordinary pencil sharpener, flat portion 40 acting as a stop and the usual pencil-point 47 (Fig. 3) being produced.

If an extremely short point is desired, arm 23 is swung to the extreme right, to the position "10" illustrated in Fig. 1, causing blade 34 to project to the left a maximum distance and resulting in the production of a pencil-point on pencil 45 such as that indicated in dotted lines on Fig. 1. This is similar to the ordinary point (Fig. 3), but the lead portion is dressed to form a cone 46 (Fig. 1) of larger angle, as clearly shown in Figure 2.

If an intermediate point is desired, it may be obtained by shifting arm 23 to any selected intermediate position (positions "2" to "9"; Fig. 1). Thus any desired length of point may be selected between the limits illustrated in Figs. 2 and 3. As the point selected becomes longer, cone 46 becomes shorter, disappearing when the limit (point 47; Fig. 3) is reached. Thus it is possible to obtain an infinite variety of points between the limits noted above, although I prefer to limit the number to ten, as shown.

By means of the above-described preferred form of my invention a wide range of pencils, from those with small hard leads to those with large soft colored leads, may be sharpened to produce the point most suitable for its particular work, with resulting economy of pencils and greater satisfaction to the user.

A modified form of the invention is illustrated in Fig. 4, by means of which a series of pencil points may be produced which vary from the simple substantially conical point illustrated in Fig. 8, through the pointed cylindrical points of Figs. 9 and 10, to the blunt cylindrical point shown in Fig. 11.

It has been the practice to produce special blunt cylindrical points, such as are used by draftsmen and illustrated in Fig. 11, by equipping a sharpener with milling cutters of the form shown in outline in Fig. 4. Cutters 48 and 49 are dressed down to form frusto-conical portions 50, 51, respectively, their inner edges being disposed parallel to each other and separated by a space 52, preferably as wide as the diameter of the pencil-lead. By this expedient the wooden end portion 53 of the pencil 54 is dressed frusto-conical in shape (shown in dotted outline in Fig. 4), whereas the lead is trimmed of all wood and left cylindrical, as shown in Fig. 11.

In the modification illustrated in Fig. 4, a different form of auxiliary blade is used. This auxiliary blade 55 (Fig. 7) has a pair of cutting edges 56 converging to form a V with the apex slightly blunted to form a flat stop 57. The angle formed between edges 56 (Fig. 7), while preferably larger than the angle between the cylindrical walls of milling cutters 48 and 49 (Fig. 4), is preferably smaller than the angle between cutting edges of blade 34 (Fig. 5). It should be noted that, in the case of blade 55, it is unnecessary to grind concave faces such as concavities 41 of blade 34, since there is ample space for projecting blade 55 between cutters 48 and 49 (Fig. 4) without such grinding. Holes 58 and 59 in blade 55 serve purposes similar to holes 38 and 39 of blade 34.

Washers 60 and 61, secured to the ends of milling cutters 48, 49, respectively, by any suitable means, serve as auxiliary stops, which will be referred to hereinafter. I do not limit myself to this particular form of auxiliary stop, however, since many other forms well known in the art may be used.

In the operation of the modified form of the invention illustrated in Fig. 4, if blade 55 is projected between cutters 48 and 49 a distance such as to bring the ends of the cutting edges 56 of blade 55 to the line designated by point A, a pencil point such as point 62 (Fig. 8) will be produced. Preferably no wood is cut by blade 55 and the base of the cone of lead, at A', is located ex-

actly where the wood starts. Point 62 is preferably the shortest point and should be compared with point 46 (Fig. 2).

If blade 55 is withdrawn to point B (Fig. 4), a pointed cylindrical point is produced (such as point 63 of Fig. 9). This should be compared with point 47 (Fig. 3) and may be regarded as a general utility point. The base of the cone of point 63 is at B'.

If blade 55 is withdrawn to the line of point C, an extraordinarily long pointed cylindrical point 64 (Fig. 10) is produced. As in Figs. 8 and 9, the dimensions of the cone are substantially unchanged, but its base is at point C', leaving a longer cylinder of lead exposed.

In producing the pencil points illustrated in Figs. 8, 9 and 10, stop 57 of blade 55 (Fig. 7) functions in a manner similar to stop 40 of blade 34 (Fig. 5).

To produce a completely blunt cylindrical point, such as point 65 (Fig. 11), blade 55 is withdrawn to point D (Fig. 4), or farther, so that the converging cutting edges 56 are ineffective; the lead cone consequently disappears from the pencil point (see point D'; Fig. 11). Since stop 57 of blade 55 is withdrawn to a position where it is no longer effective as a stop, auxiliary stops 60 and 61 function to stop the pencil lead and the sharpener functions in substantially the same manner as the simple blunt-point sharpeners of ordinary design hereinbefore described.

Both the preferred embodiment illustrated in Fig. 1 and the modified form shown in Fig. 4 utilize the important feature of the projection of the auxiliary cutting blade 34 or 55 into the tapered space between the converging milling cutters 15, 16 and 48, 49, respectively. The auxiliary cutters (blades 34, 55) revolve at the same rate as the orbital revolution of the milling cutters (15, 16 or 48, 49); the auxiliary cutter tends to steady the pencil lead, so that there is considerably less likelihood of breakage than if the lead were projected from between the milling cutters without the aid of the auxiliary cutter as a guide and stop.

Even after the pencil is inserted into the cutter assemblage a pencil point other than that registered in the machine may be selected without injury to the existing point, by shifting the auxiliary cutter 34 or 55 longitudinally, i. e., on the longitudinal axis of the pencil being sharpened.

The modified form of adjusting means for the auxiliary cutter blade, shown in Fig. 12, is adapted to be used in connection with the milling cutters 48, 49, and may be substituted for the blade adjusting means of Fig. 1. This modified adjustment may be preferable in certain forms of pencil sharpeners.

In the Fig. 12 form of adjusting means blade 34 is secured, by screws 35, 36, to a shaft 19a (similar to shaft 19 in Fig. 1) slidably mounted in the bore of hollow shaft 8a, which is secured to frame 6a by a threaded connection 66, provided with a set screw 67. A key 20a pressed into a suitable indentation in the wall of hollow shaft 8a cooperates with flat portion 21a of shaft 19a to prevent rotation of shaft 19a, while permitting it to be moved axially to a limited extent.

Axial movement of shaft 19a and of cutter blade 34 mounted thereon may be effected by adjustment of a knurled knob 74. As shown in Fig. 12 cutter blade 34 is extended inwardly toward the milling cutters 48, 49 (not shown in this figure) the maximum distance.

Knob 74 is locked to a bushing 72, preferably by a set screw 79. Bushing 72, a flange 71 of

which is loosely fitted between the end face 70 of hollow shaft 8a and a shoulder 69 on handle 10a, is rotatable independently of handle 10a or hollow shaft 6a. A pin 73, pressed into an aperture in bushing 72, engages in a spiral groove 68 in shaft 19a.

Step by step adjustment of knob 74, for corresponding adjustment of shaft 19a and cutter blade 34 through the pin and groove connection 73—69, is facilitated by the provision of grooves 77, preferably ten in number, spaced around a portion of the peripheral surface of an enlarged substantially circular part 78 of handle 10a, and a lock-spring 76 secured, by screw 75, or other suitable means, to knob 74 and formed to enter one of the grooves 77 yieldably and releasably.

In operation, as handle 10a is held stationary, knob 74 may be manually revolved to an extent which represents the desired axial adjustment of shaft 19a and cutter blade 34, and lock spring 76 may be seated in the corresponding groove 77 to lock knob 74 and cutter blade 34 firmly but yieldably against accidental displacement.

The operation of this modified form of blade-adjusting means, relative to the other parts of the pencil sharpener device disclosed and claimed herein, is substantially the same as that of the blade-adjusting means shown in Fig. 1 and described as the preferred form of embodiment.

I claim:

1. A pencil sharpener comprising a support, a head rotatably mounted on said support, substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, and a cutting blade carried by said head substantially axially thereof and projecting between the converging ends of said cutters into the space between said cutters, said cutting blade having a substantially V-shaped cutting edge and the faces of said cutting blade being hollow-ground to permit the projection of said cutting blade between the faces of said converging milling cutters.

2. A pencil sharpener comprising a support, a head rotatably mounted on said support, substantially cylindrical milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, a cutting blade carried by said head substantially axially thereof and projecting between said cutters into the space between said cutters, said blade having a substantially V-shaped cutting edge the faces of which form an angle greater than the angle between the cutting faces of said cutters, whereby the point produced by said blade is of larger angle than the point produced by said cutters, and means mounting said cutting blade for movement between a position substantially at the ends of said milling cutters and various other positions between said milling cutters.

3. A pencil sharpener comprising a support, a frame rotatably mounted on said support, milling cutters rotatably mounted on said frame in angular relationship forming a space between said cutters, said cutters being substantially cylindrical with their adjacent end portions frusto-conical, said frusto-conical end portions forming a substantially rectangular shaped space between adjacent longitudinally extending portions of said cutters, an auxiliary cutter on said frame substantially axially thereof and projecting between the ends of said cutters into the space be-

tween said cutters, and means mounting said auxiliary cutter for movement between a position substantially at the ends of said milling cutters and various other positions between said milling cutters.

4. A pencil sharpener comprising a support, a frame rotatably mounted on said support, said frame including a hollow shaft, milling cutters rotatably carried by said frame in angular relationship, forming between them a space, an auxiliary cutter carrier slidably mounted in said hollow shaft, an auxiliary cutter carried by said carrier and projecting between said milling cutters into said space, and manually-operable means engaging said carrier for adjusting said carrier and said auxiliary cutter to project said auxiliary cutter a selected distance axially into said space.

5. A pencil sharpener comprising a support, a frame rotatably mounted on said support, said frame including a hollow shaft open at its ends, milling cutters rotatably carried by said frame in angular relationship, forming between them a space, an auxiliary cutter carrier slidably mounted in said hollow shaft, an auxiliary cutter carried by said carrier and projecting between the ends of said milling cutters axially into said space, said hollow shaft and said cutter carrier being slidably positioned in and removable from said support, a rotatable handle, and means detachably securing said handle to said frame to permit removal of said handle and said cutter carrier from said frame through an end of said hollow shaft.

6. A pencil sharpener comprising a base, a head rotatably mounted on said base, shafts carried by said head and projecting therefrom in substantially V-shaped arrangement, a substantially cylindrical milling cutter supported on each of said shafts, the cutting faces of said cutters being disposed in angular relationship to form a substantially V-shaped space between said cutters, an auxiliary cutter blade adjustably carried by said head substantially axially thereof and slidably mounted thereon to project the end of said blade between the ends of said cutters axially into the space between said cutters, means for rotating said head, means operable from the exterior of the device for adjusting said auxiliary cutter blade axially into said substantially V-shaped space for producing a point of selected length on a pencil inserted between said cutters, and means mounting said auxiliary cutter blade for movement between a position substantially at the ends of said milling cutters and another position between said miling cutters.

7. A pencil sharpener comprising a support, milling cutters rotatably mounted on said support in axially-converging relationship forming a generally-tapered space between said cutters for reception of a pencil to be sharpened, an auxiliary flat blade point cutter rotatably mounted on said support on an axis of rotation coincident with the axis of said space, means for rotating said milling cutters about the axis of said space and for rotating said auxiliary cutter on said axis, and means mounting said auxiliary cutter for movement between a position substantially at the ends of said milling cutters and various other positions between said milling cutters.

8. A pencil sharpener comprising a support, a frame rotatably mounted on said support, said frame including a hollow member, milling cutters rotatably carried by said frame in angular relationship forming between them a space, an auxiliary cutter slidably mounted in said member and projecting between said milling cutters into said space, and manually operable means engaging said auxiliary cutter for adjusting said auxiliary cutter to project said auxiliary cutter a selected distance axially into said space.

9. A pencil sharpener comprising a support, a frame rotatably mounted on said support, said frame including a hollow member open at its ends, milling cutters rotatably carried by said frame in angular relationship forming between them a space, an auxiliary cutter carrier slidably mounted in said member, an auxiliary cutter carried by said carrier and projecting between the ends of said milling cutters axially into said space, said hollow member and said cutter member being slidably positioned in and removable from said support, a rotatable handle and means detachably securing said handle to said frame to permit removal of said handle and said cutter carrier from said frame through an end of said hollow member.

10. A pencil sharpener comprising a support, a head rotatably mounted on said support, milling cutters carried by said head with their cutting faces in converging relationship to form a tapered space between said cutters, a cutting blade carried by said head substantially axially thereof and projectable into the space between said cutters, said blade having a cutting edge with a contour arranged to assist in supporting the pencil point as the milling cutters and blade conjointly shape a pencil point having portions of different angular relationship, and means mounting said cutting blade for movement between a position substantially at the ends of said milling cutters and various other positions between said milling cutters.

JOHN A. YERKES.

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