May 24, 1938. W. W. HARTMAN 2,118,197

BLADE SHARPENING MACHINE

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Fig. 1

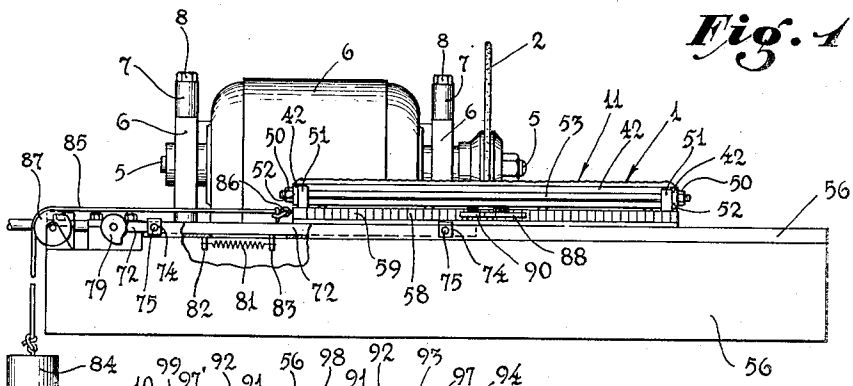


Fig. 2

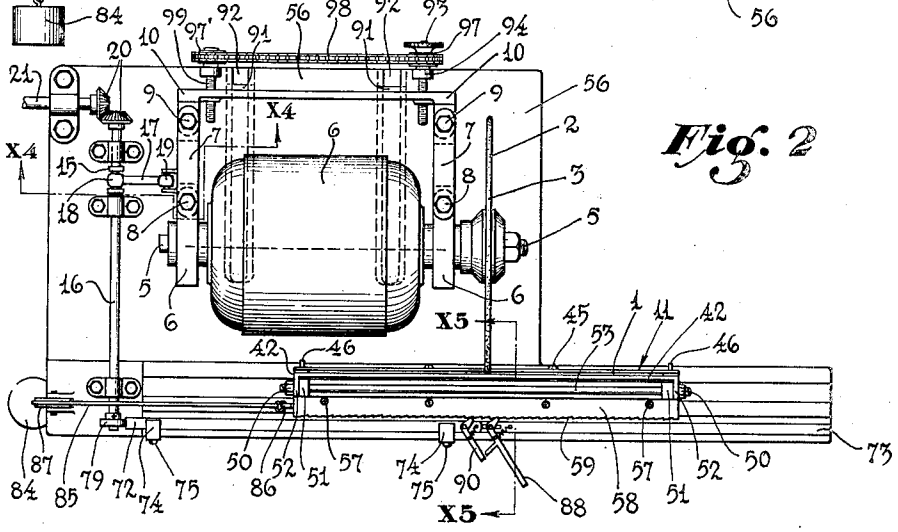


Fig. 3

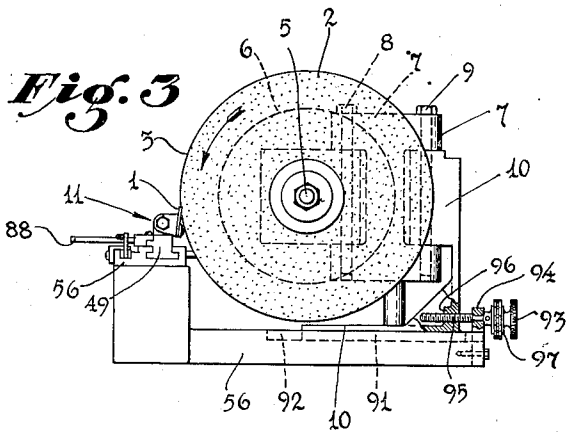
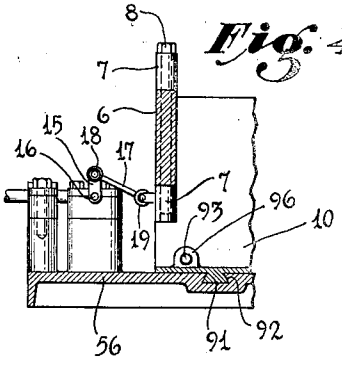


Fig. 4



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BLADE SHARPENING MACHINE

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Fig. 5

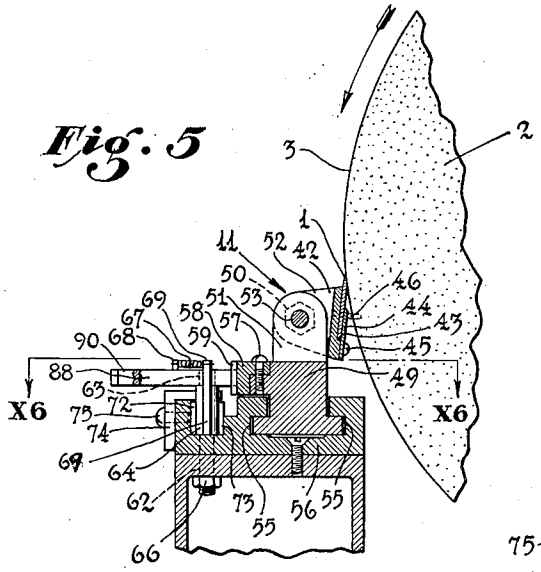


Fig. 7

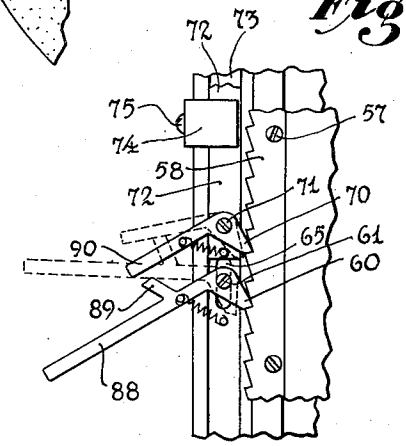


Fig. 6

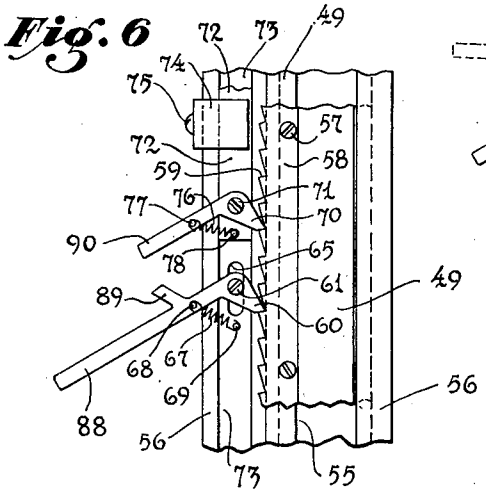
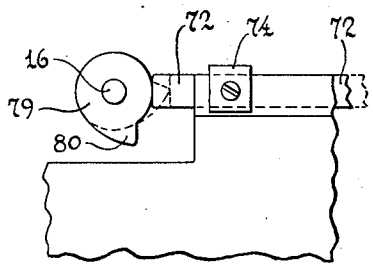


Fig. 8



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BLADE SHARPENING MACHINE

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Fig. 12

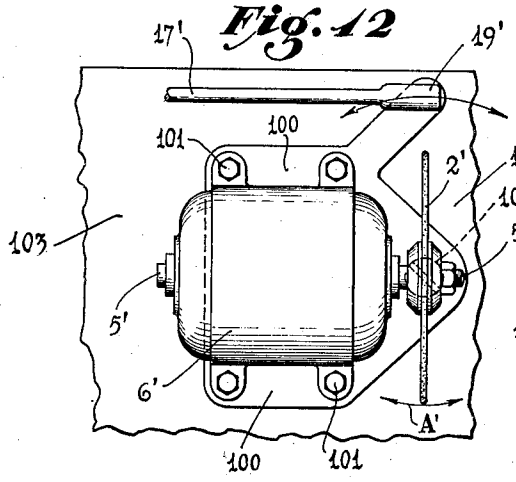


Fig. 13

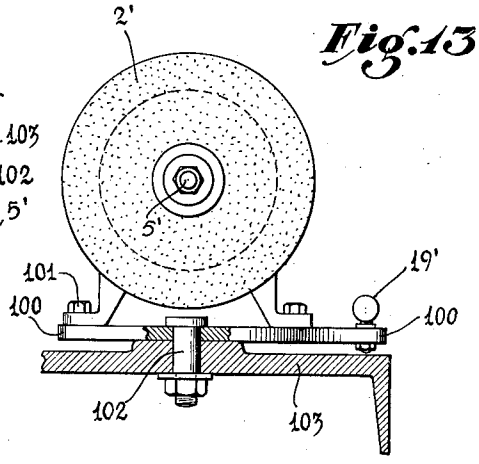


Fig. 14

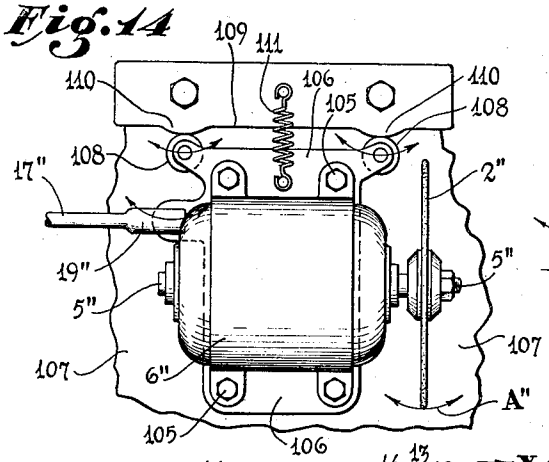
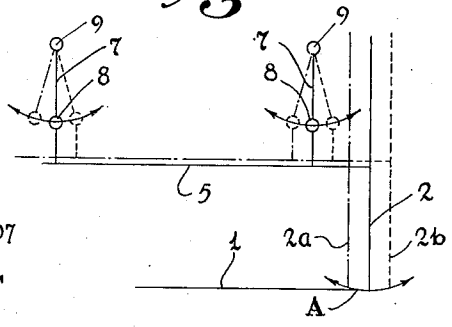


Fig. 9



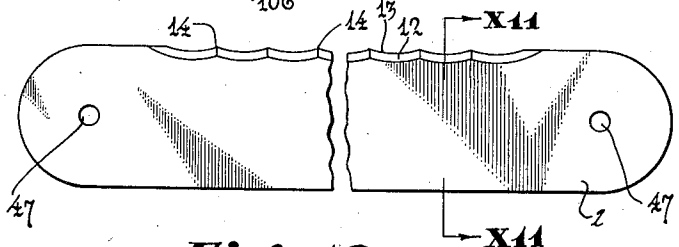


Fig. 10

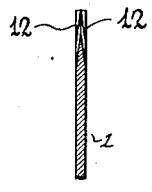


Fig. 11

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UNITED STATES PATENT OFFICE

2,118,197

BLADE SHARPENING MACHINE

William Walter Hartman, Los Angeles, Calif.

Application November 19, 1937, Serial No. 175,481

6 Claims. (Cl. 51—33)

With the foregoing and other objects in view, the gist of this invention resides in so presenting the blade to the grinding wheel that the thin edge of the blade is sharpened with a beveled cutting edge, and by then setting up relatively between the blade and the grinding wheel a back and forth motion comprising a grinding stroke, during which grinding stroke the blade and the periphery of the grinding wheel are moved relatively closer together as the center of the stroke is approached, and further apart as the end of the stroke is approached, thereby providing a very satisfactory and improved mode of grinding a fine sharp-pointed beveled edge on the scallops of the blade.

In practicing my invention it is immaterial whether the grinding wheel or the blade are moved to produce the grinding stroke, so long as either is thus moved with relation to the other, and likewise it is immaterial whether the grinding wheel or the blade are moved in causing these parts to come relatively closer together and further apart during the grinding stroke, so long as one or the other of these parts is thus moved relative to the other, but in the preferred form of this invention I consider it more advisable to move the grinding wheel rather than the blade, both for the purpose of producing the grinding stroke and also the approach and recession of the grinding wheel and blade toward and from each other, but my invention embraces mechanisms wherein the blade is thus moved instead of the grinding wheel or when both the blade and grinding wheel are moved.

Also I consider it desirable to make the length of the grinding stroke such that at one or both ends of each stroke grinding contact between the blade and the grinding wheel is broken, and that during the interval when the grinding contact is thus broken, feeding means should advance the relative position of the blade and grinding wheel to provide for the grinding of one scallop after the other. By making the grinding stroke long enough so that the grinding action sweeps clear out of each scallop at both ends of the scallop, or in other words by making such grinding stroke a little longer than the distance from a given point in one scallop to the corresponding point in the next scallop, and sweeping the grinding action out beyond both ends of each scallop, the blade produces real sharp points between the scallops, and for cutting certain materials such sharp-pointed, scalloped, beveled cutting edges are more satisfactory than when the edge is rounded or flat between the scallops.

For the purpose of producing the previously described grinding stroke, and the relative approach and recession between the blade and the grinding wheel periphery during the stroke, I find that moving the grinding wheel in an arcuate path, comprising either the arc of a circle or of any other desired curve, is a simple, efficient and practical arrangement for practicing my invention, because in this arrangement the one motion produces both the back and forth grinding stroke and the desired approach and recession of the blade and grinding wheel during the stroke, the latter motion being caused by the belly of the arc. It is therefore in this preferred form that I will describe my invention in detail, although it is understood that my invention as herein previously indicated can be embodied in other and varied forms of mechanism.

Also for purposes of simplicity I will describe and illustrate my invention as constructed for the grinding of short straight blades such as are used in reciprocatory bread-slicers, but I wish it to be understood that my invention is equally applicable to and intended for the grinding of all manner of blades wherever the thin edge thereof is to be ground with a sharp, beveled, scalloped cutting edge, including such types as endless band blades, circular disc blades, spiral blades, and other types.

Having in mind the foregoing basic nature and objects of my invention, I will now describe the preferred form of same. Other objects, features and improvements embraced in my invention will become apparent by consideration of the appended drawings, the following descripton, and the claims.

In the drawings Fig. 1 is a front elevation of a machine embracing my invention. Fig. 2 is a plan view of the machine shown in Fig. 1. Fig. 3 is an end view of the machine shown in Fig. 1, certain parts having been broken away to more clearly disclose other parts. Fig. 4 is a front elevation in section of a part of the machine shown in Fig. 1, the section being taken along the broken line X^4—X^4 shown in Fig. 2. Fig. 5 is an enlarged sectional view of a part of the machine shown in Fig. 1, the section being taken along the line X^5—X^5 of Fig. 2, looking in the direction of the arrows. Fig. 6 is an enlarged view of a part of the machine, taken in section along the broken line X^6—X^6 in Fig. 5, looking in the direction of the arrows. Fig. 7 is a view similar to Fig. 6, but showing in dashed lines the relative position of the operating pawls where they allow return of the carriage carrying member to its initial posi-

tion where the grinding of the blade commences. Fig. 8 is an enlarged view in elevation of a fragment of the machine including the feeder actuating cam. Fig. 9 is a diagrammatic view of geometrical lines showing the relationship of essential parts of the machine at various positions during the feeder stroke. Fig. 10 illustrates the type of blade ground by that form of my invention which is illustrated in the drawings. Fig. 11 is a cross-section through this blade, taken along the line X^{11}—X^{11} of Fig. 10. Figs. 12 and 14 illustrative in simple manner two of the many alternative arrangements whereby the grinding wheel can be moved in a curved path as contemplated in certain forms of my invention. Fig. 13 is an end view of the arrangement shown in Fig. 12, certain parts being in section in order to more clearly illustrate the same.

In the drawings the blade to be sharpened is indicated by reference numeral 1, the rotatable grinding wheel by reference numeral 2, and the grinding periphery of this wheel by reference numeral 3. In conventional manner this grinding wheel is securely mounted on the grinder shaft 5, which in turn is rotatably carried in shaft-supporting means that in this case comprises the body of electric motor 6 which also serves to drive the grinder shaft, although obviously instead of this electric motor the shaft-supporting and driving means could be of other and more elementary nature, such as a simple frame equipped with bearings in lieu of the motor bearings, and having a belt pulley or other simple driving expedient between the bearings instead of the motor. This shaft-supporting member 6 is carried by two similar links 7, each of which is pivotally mounted at 8 to the shaft-supporting means 6, and is pivotally connected at 9 to a fixed supporting-means or member 10. By means of the supporting structure just described, it is obvious that the grinder shaft 5, and grinding wheel 2, can be swung back and forth on the fixed pivoted connections 9, and because the distance on each link 7 between the pivotal connections 8 and 9 is equal, it is obvious that the shaft 5 during such swinging motion will always remain parallel to itself, and that the shaft and grinding wheel will have an arcuate motion the general direction of which could be described as approximately parallel to the length of the shaft or at right angles to the plane of the grinding wheel. This relationship is diagrammatically illustrated in Fig. 9, wherein the two extreme positions of the grinding wheel are illustrated in dotted lines at 2^a and 2^b respectively, the arc through which this grinding wheel swings being in this figure illustrated at A. In order that Fig. 9 may be more readily understood, it should be noted that the solid lines illustrate the positions of the various parts at the center of the swinging stroke, while the dotted lines illustrate the positions of these parts at the extreme ends of the stroke. It is the motion of the grinding wheel along arc A that in this form of the invention comprises the grinding stroke, and in view of the belly of this arc A it is obvious that the grinding wheel moves closer to the blade 1 as the center of the stroke is approached, and moves away from blade 1 as the ends of the stroke is approached, to thereby grind along the scallop of the blade as previously indicated. In order more clearly to understand this it should be noted that the blade 1, in the blade-holder or blade-supporting means generally designated by reference numeral 11, see preferably Fig. 5, is supported at such angle or in such relation to grinding wheel 2, that the latter grinds on the thin edge of the blade 1 producing a bevel thereon indicated at 12 in Figs. 10 and 11. Now having in mind this angular relationship between the plane of the blade and the periphery of the grinding wheel, and also the manner in which the grinding wheel bodily approaches and recedes from blade 1 along arc A during the grinding stroke, it is apparent that the grinding wheel will grind the various scallops 13 of the blade to a sharp beveled edge in good efficient manner. By making the length of the grinding stroke, i. e. the distance between extreme positions 2^a and 2^b of the grinding wheel, Fig. 9, larger than the length of a scallop 13 of the blade, it is apparent that the grinding wheel will swing clear out of contact with the blade at the end of each scallop and it is in this way that the real sharp points 14 between the scallops are produced. As previously indicated a blade having such sharp-pointed, beveled, scalloped cutting edge, is much more satisfactory for some purposes than blades having the more usual rounded or flat contour of the cutting edge at the place where one scallop joins the next one. It is an important object of this invention to produce such sharp-pointed, beveled and scalloped cutting edge on blades of various type or nature where same are needed.

While in practice it would of course be somewhat satisfactory to manually move back and forth the parts already described in order to produce the grinding stroke, nevertheless this would be exceedingly rudimentary, and intsead I provide mechanical means for automatically producing this motion. This means is best illustrated in Fig. 2 and comprises essentially a crank 15 on shaft 16, the connecting rod 17 joining this crank to link 7 by means of any suitable form of universal joint at the respective ends 18 and 19 of connecting rod 17. By means of beveled gears 20 this shaft 16 is rotated from a main power supply shaft 21 which in turn is driven in any suitable manner. In Fig. 4 the throw of crank 15 has been exaggerated in order to make clear the nature of this member as a crank, but it will be readily understood that the throw of this crank is made such that the relatively short grinding stroke is just slightly longer than the length of the scallops in the blade, and I recommend that in lieu of an ordinary fixed crank any one of the many well known types of adjustable cranks be used so that the length of the grinding stroke can be adjusted, to accommodate various lengths of scallops that might be desired on the blade. The supplying of such adjustable throw crank, or equivalent adjustable member, is within the skill of the ordinary mechanic and I have not encumbered the drawings by illustrating the same.

Obviously as shaft 16 revolves, connecting rod 17 will transmit from crank 15 an oscillatory motion to links 7, and these in obvious manner will transmit this motion to grinding wheel 2 to produce the grinding stroke as is apparent from Fig. 9 and the description previously given.

I will now describe the manner and means for feeding or advancing the blade, intermittently, as the grinding proceeds, in order that the successive scallops of the blade become subject one after the other to the previously described action of the grinding wheel.

It is of course obvious that the nature of the parts for holding or supporting the blade, and for relatively advancing the position between

blade and grinding wheel, may vary extensively, not only according to the type of blade being ground, i. e. whether it is a relatively short blade of the type illustrated in Fig. 10, or whether it is a long endless band blade sometimes exceeding 15 feet in length, or whether it is a circular disc blade, a spiral edge blade, or a blade of any other type, but also according as to whether the blade alone is moved, or whether perhaps the grinding wheel is bodily moved along a non-moving blade, but all such modifications are within the broader aspects of this invention as previously disclosed.

In the form of the invention illustrated in the drawings it is blade 1 and blade-supporting means 11 that are moved to effect the feeding action, and I will now describe in more detail the parts involved in the holding and feeding of the blade in this form of the invention.

The blade-supporting means 11 consists of a member that might be called a blade-carriage 42, see Figs. 1, 2 and 5, on which blade 1 is held against the rear shoulder 43, Fig. 5, by a moderate pressure set up by the thin cap-plate 44 fastened to carriage 42 by means of screws 45. In this blade carriage 42 there may be arranged blade-spacing pins 46, see Fig. 2, spaced to fit into the end holes 47, of blade 1, see Fig. 10, and by the uniform spacing of these holes and pins, and the corelation of blade-carrier 42 with grinding wheel 2, through feeding means yet to be described, the successive scallops 13 of the blade are uniformly produced and sharpened in all blades.

The blade-carriage 42 is mounted with provision for angularly adjusting the blade 1 with reference to grinding wheel 2. This blade carriage 42 is mounted on the carriage-carrying member 49, see Fig. 5, by being frictionally bound thereto by nuts 50 which fasten the carriage 42 to the upstanding lugs 51 located to engage with the overhanging ends 52 of the carriage 42, it being understood that these lugs 51 are an integral part of the carriage-carrying member 49, these relationships being illustrated in Figs. 1, 2 and 5. It might be remarked that the nuts 50 operate on tie-rod 53 which passes lengthwise through the entire blade-carriage 42 having one of the two nuts 50 at each end of this tie-rod 53. The constructions just described permits blade 1 to be angularly adjustable in its grinding contact or relationship to grinding wheel 2. If nut 50 is loosened the position of carriage 42 can be angularly adjusted by rotation on tie-rod 53, and at the desired new position carriage 42 can again be locked by re-fastening nut 50. During normal operation this angular relation between the blade and the grinding wheel is of course fixed, but by the expedient just described this angle can be varied to suit requirements. The more nearly the blade approaches tangential contact with the grinding wheel, the longer will be the bevel 12 of the blade, see Fig. 11, and consequently the sharper but more delicate the edge will be; and correspondingly the more the blade angle is swung away from tangential contact with the wheel, the shorter will blade bevel 12 become and the less sharp but more substantial will the cutting edge be. If the blade angle is zero, that is the plane of the blade is tangential to the wheel, then the blade bevel 12 will correspond with the contour of the wheel. In other words, the adjusting feature just referred to, permits control of the bevel and sharpness of the blade.

The above described carriage-carrying member 49 is supported in the ways 55 in the base 56 of the machine, see Fig. 5, thereby permitting member 49, blade-carriage 42 and blade 1 to move in a fixed path along ways 55, crosswise of grinding wheel 2.

In order to systematically feed the blade and blade-carrying members along ways 55, there is fastened to the blade-carrying carriage 49 by means of screws 57, a rack 58, having rack-teeth 59 thereon, see especially Figs. 1, 2, 5 and 6. Cooperating with this rack is a fixed pawl 60, oscillatively supported on pin 61, which is of one diameter along its lower portion 62, see Fig. 5, and approximately of the same diameter along its upper pawl carrying portion 63, but of enlarged diameter along the central portion 64 of pin 61. The lower end portion 62 of this pin may slide along slot 65 formed in the base 56, and nut 66 is provided for locking pin 61 in any desired position in slot 65. When thus locked, pin 61 is in fixed position, and pawl 60 may rotate about pin 61 in clockwise direction, as viewed in Fig. 6, when rack 58 and rack-teeth 59 are fed in downward direction as viewed in this figure. Tension spring 67, acting between the pawl pin 68, and fixed pin 69, keeps pawl 60 normally engaged with the rack-teeth 59. In addition to the fixed pawl 60, there is also a traveling pawl 70, oscillatively mounted on pin 71 which itself is fixed in the intermittently actuated feeder member 72. This feeder member is adapted to move back and forth in groove 73, formed in base 56 of the machine, see Figs. 5 and 6, and a keeper or strap 74, fastened to base 56 by means of screw 75, is provided for the purpose of keeping feeder member 72 restrained in groove 73. The traveling pawl 70 is normally urged against rack-teeth 59 by spring 76 acting between pawl pin 77 and pin 78, the latter being carried on feeder member 72, see Fig. 6. Feeder member 72 is intermittently actuated by a cam 79, see Figs. 1, 2 and 8, this cam being rigidly fastened to the previously described shaft 16. This cam 79 is of circular contour over most of its periphery, except as to the raised portion 80, see Fig. 8. When this raised cam portion 80 contacts the end of feeder member 72, the latter moves to the right as viewed in Fig. 8, the corresponding motion of feeder bar 72 in Figs. 6 and 7 being downward. This last described motion of member 72, acting through pawl 70, obviously actuates rack 58, its connected member 49, blade-carriage 42, and blade 1 to feed these parts crosswise of grinding wheel 2 by an amount determined by the relative size of raised cam portion 80, and the relative positions of traveling pawl 70, fixed pawl 60 and the length of rack-teeth 59. The proportion of the parts just described is such as to give the desired length of scallops 13 of the blade. After the cam portion 80 passes over feeder member 72, a retrieving spring 81, acting between fixed pin 82 and pin 83 fastened to feeder member 72, as best seen in Fig. 1 at the place where the base is broken away, serves to retrieve feeder member 72 against the circular portion of cam 79, and such retrieving action of the feeder 72 carries with it traveling pawl 70 to cause this pawl to engage a new rack-tooth, the rack 58 of course being held during this operation by means of the fixed or non-traveling pawl 60 already described. As best illustrated in Figs. 1 and 2, the entire carriage traveling system comprising the carriage-carrying member 49, blade-carriage 42, blade 1 and rack 58, is

normally urged into a retrieving action against pawl 60, by means of a retrieving weight 84, connected by cable 85, to the carriage carrying member 49 by hook or knot arrangement 86, the cable 85 running over pulley 87 to reduce friction. When the blade-carrying system has made a complete traverse across the entire length of the blade, the carriage can be quickly retrieved to initial position by manually actuating lever 88, extending from pawl 60, see preferably Fig. 7, this lever 88 being shifted clock-wise, and thereupon its projecting finger 89 will contact arm 90 which is integrally united with pawl 70, and both pawls 60 and 70 will thereupon be shifted from their respective full line positions shown in Fig. 7 to their respective dotted line positions as shown in that figure, the last named positions representing disengagement of pawls 60 and 70 from rack-teeth 59, thereby freeing the rack, and allowing the entire blade-carrying system to retrieve to its initial position under the influence of the retrieving-weight 84. All the blade-feeding mechanism previously described is so coordinated with the mechanism that moves grinder wheel 2 back and forth to produce the grinding stroke, that the intermittent feeding of blade 1 under impulse of cam portion 80, occurs during the interval when grinding contact has been broken between blade 1 and grinding wheel 2, approximately at or near the end of said grinding stroke. When the grinding wheel is in contact with blade 1, the latter is not feeding, because feeder-member 72 is at that time riding on the circular portion of cam 79. As previously described, the length of the grinding stroke is made sufficiently long so that grinding contact between wheel 2 and blade 1 is broken either at one or both ends of the grinding stroke, and it is at this interval when the grinding contact is broken, that the blade is advanced or fed ahead as described.

To provide for use of grinding wheels of various diameters, or to provide for compensating for the reduction of grinding wheel diameter through wear, the normally fixed supporting means 10, to which the swinging links 7 are pivotally fastened, is itself made slidably adjustable on base 56 of the machine, the long dovetailed guide-tongues 91 of member 10, sliding for this purpose in dove-tailed grooves 92 of base 56, as indicated in Figs. 2, 3 and 4. The adjustment is effected by turning adjusting screw 93, which is fixed against lengthwise movement in lug 94 of base 56, see Fig. 2, the end of this screw having threaded connection 95 with boss 96 of member 10 as indicated in Fig. 3. On screw 93 there is a sprocket 97 which by means of chain 98, see Fig. 2, connects synchronously with another sprocket 97' fastened on another screw 99 which is mounted to engage with base 56 and member 10 identically as screw 93 engages therewith. Obviously, by turning screw 93, which synchronously turns screw 99, through chain 98, the normally fixed member 10 will freely slide toward or away from the blade-supporting means, to effect the adjustment above described.

As illustrating some of the many modifications of the mechanism for giving the desired grinding stroke to the grinding wheel and grinding shaft, attention is now directed to Figs. 12 and 14.

In the modification shown in Fig. 12, grinding wheel 2', grinder shaft 5' and motor 6', are solidly mounted on plate 100 by means of bolts 101, this plate 100 being itself pivotally connected by a large pin 102 to the fixed base of the machine 103, see Figs. 12 and 13, especially the latter. As viewed in Fig. 12 it is seen that the center of pivot pin 102 passes through the center of the grinding wheel 2', so that when the plate 100 is swung back and forth on pin 102 by means of connecting rod 17' which is joined oscillatively to plate 100 by the universal joint 19', grinding wheel 2' will obviously swing back and forth through an arcuate grinding stroke indicated by the arc A', this arc being exactly at right angles to the medial plane of the grinding wheel at all points of the grinding stroke. The connecting rod 17' in Fig. 12 can be actuated in the same manner as the connecting rod 17 in Fig. 2.

In the modification of my invention as shown in Fig. 14, grinding wheel 2'', grinder shaft 5'' and motor 6'', are securely fastened by screws 105 to plate 106 which rests and slides upon the flat base plate of the machine 107. This plate 106 at its rear is provided with rollers 108 which roll against a vertical face 109, having cam elevations 110. Plate 106 is constantly urged against face 109 by the heavy spring 111. Obviously when plate 106 is swung back and forth from right to left by means of connecting rod 17'', which is pivoted to plate 106 at the universal joint 19'', the grinding wheel 2'' will swing through an arcuate or curved grinding stroke indicated at A'' in Fig. 14, the belly of the curve being produced by the cam elevations 110 operating on the rollers 108. Motor 6'' and plate 106 will rest firmly on the fixed base 107 by virtue of the weight of the parts, or if this is deemed insufficient, guides can readily be provided for holding plate 106 in slidable contact with plate 107, although this simple guide expedient has been omitted from the drawings for sake of simplicity. Connecting rod 17'' can be actuated by a crank in the same manner as connecting rod 17, see Fig. 2, to produce the grinding stroke indicated at A''.

From Figs. 9, 12 and 14, it is noted as a characteristic of all these forms of my invention that the alternating or back and forth movement of the grinding wheel and its associated parts, impressed by the stroke producing elements, comprises at the periphery of the grinding wheel a curved grinding stroke indicated in these figures respectively by the curved double pointed arrows A, A' and A'', the curvature of this stroke being convex when viewed from the position of the grinding wheel; i. e. the center of curvature of this curved grinding stroke created at the periphery of the grinding wheel, along arrows A, A' and A'' of Figs. 9, 12 and 14, lies on the same side of the blade that the grinder shaft lies on.

In the preferred forms of my invention, the said grinding stroke is of predetermined length, as created and determined by the stroke producing means, i. e. crank 15 in Fig. 2, this stroke producing action being imparted by connecting rod 17, 17' or 17'' to the grinding wheel and its associated parts in Figs. 2, 12, and 14. Such predetermined or definite stroke length is preferable to the uncertain and variable stroke length obtained when my stroke is only manually produced in the more rudimentary forms of the grinder.

In addition to the particular modifications shown in Figs. 12 and 14, for producing the desired grinding stroke by moving of the grinding wheel, many other modifications of the invention could be supplied, and as stated at the beginning of this specification, my invention em-

braces not only such modifications as are shown in Figs. 12 and 14, wherein the grinding stroke is procured by moving the grinding wheel, but my invention also embraces modifications wherein the blade is moved to produce the grinding stroke, so long as the relative movement between the blade and the grinding wheel, irrespective of which of these members is moved, falls within the relationships of my invention as herein previously expressed and as expressed in the appended claims.

In Figs. 12 and 14 only the grinding wheel and its mounting for producing the desired grinding stroke are shown, and it will be readily understood that the blade can be presented to the grinding wheels in Figs. 12 and 14 respectively, in the same manner and by the same mechanism as previously described in detail in connection with Figs. 1, 2, 5 and 6, and since this is so obvious, the blade-holding and feeding mechanism has been omitted from Figs. 12 and 14 for sake of simplicity.

In view of the foregoing detailed description, it is believed that the nature, scope and operation of my invention is now apparent.

I claim:

1. A machine for grinding a scalloped cutting edge on the edge of a thin blade having a thin edge and a face, said machine comprising in combination, a grinder shaft, a grinding wheel securely fastened to said shaft, movably mounted shaft supporting means, blade supporting means for supporting a thin blade and presenting the thin edge thereof to the periphery of said grinding wheel with the face of the blade extending at an angle to the periphery of said grinding wheel to grind a sharp beveled cutting edge on the thin edge of the blade, means for imparting a rotary motion to said shaft and grinding wheel about the axis of said shaft, stroke producing means for imparting to said shaft supporting means and said shaft and grinding wheel a relatively short alternating movement comprising at the periphery of said grinding wheel a curved grinding stroke the general direction of which sweeps the periphery of said grinding wheel in grinding engagement along the length of a scallop on the thin edge of the blade, and the center of curvature of which curved grinding stroke lies on the same side of the blade that the grinder shaft lies on, the said curved grinding stroke being of a predetermined length slightly exceeding the length of a scallop on the blade to thereby break grinding contact between the blade and the grinding wheel at an end of the stroke, and feeder means so coordinated with said stroke producing means that the feeder means is actuated during the interval while grinding contact between the blade and grinding wheel is broken at an end of the grinding stroke for advancing the blade and grinding wheel relative to each other by approximately the length of a scallop on the blade, to thereby grind sharp-pointed beveled scallops on the edge of the blade.

2. A machine for grinding a sharp-pointed scalloped beleved cutting edge on the edge of a thin blade having an edge and a face, said machine comprising in combination, a rotatably mounted shaft, a grinding wheel mounted on said shaft, blade-supporting means for supporting a thin blade having an edge and a face and for presenting the edge of the blade to the periphery of the grinding wheel with the face of the blade extending in such direction that said grinding wheel grinds a sharp, beveled cutting edge on the edge of the blade, power driven stroke establishing means for establishing between said grinding wheel and said blade-supporting means short grinding strokes of predetermined length slightly exceeding the length of a scallop on the blade and along such path that the distance between the blade and the center of the grinding wheel is reduced as the center of the stroke is approached and is increased sufficiently as the end of the stroke is approached to break grinding contact between the grinding wheel and the blade at an end of the stroke, and power driven feeder means so coordinated with said power driven stroke establishing means that the feeder means is actuated during the interval while grinding contact between the grinding wheel and blade is broken at an end of the grinding stroke for advancing the blade and grinding wheel relatively to each other by approximately the length of a scallop on the blade, to thereby grind sharp-pointed beveled scallops on the edge of the blade.

3. A machine for grinding a sharp-pointed scalloped beveled cutting edge on the edge of a thin blade having an edge and a face, said machine comprising in combination, a rotatably mounted shaft, a grinding wheel mounted on said shaft, blade supporting means for supporting a thin blade and for presenting the edge of the blade to the periphery of the grinding wheel with the face of the blade extending in such direction that said grinding wheel grinds a sharp beveled cutting edge on the edge of the blade, power driven stroke producing means for imparting to said grinding wheel short grinding strokes of predetermined length slightly exceeding the length of a scallop on the blade and along such path that the distance between the blade and the center of the grinding wheel is reduced as the center of the stroke is approached and is increased sufficiently as the end of the stroke is approached to break grinding contact between the grinding wheel and the blade at an end of the stroke, and power driven feeder means for imparting a blade feeding motion to said blade supporting means, said power driven feeder means being so coordinated with said power driven stroke producing means that the feeder means is actuated during the interval while grinding contact between the grinding wheel and blade is broken at an end of the grinding stroke for advancing the blade relative to the grinding wheel by approximately the length of a scallop on the blade, to thereby grind sharp-pointed beveled scallops on the edge of the blade.

4. A machine for grinding a sharp-pointed scalloped beveled cutting edge on the edge of a blade that is relatively thin compared with its width, said machine comprising in combination, a rotatably mounted grinder shaft, blade-supporting means for supporting in grinding relation a blade that is relatively thin compared with its width the length of the blade in the vicinity where it is supported by said blade-supporting means extending in a general direction parallel to said grinder shaft, stroke establishing means for establishing between said blade-supporting means and said grinder shaft a relatively short stroke the length of which slightly exceeds the length of a scallop on the blade, means for controlling the shape of said stroke so that the distance between the blade and said grinder shaft is reduced as the center of the stroke is approached and is increased as the end of the stroke is approached, and feeder means mechanically so coordinated with said stroke establishing means

that the feeder means is actuated to perform its feeding at an end of the aforesaid stroke to advance by the approximate length of a scallop on the blade the relative position of the blade and said grinder shaft.

5. A machine for grinding a sharp-pointed, scalloped, beveled cutting edge on a blade, said machine comprising in combination, fixed supporting means, a rotatably mounted shaft, a grinding wheel mounted on said shaft, shaft-supporting means for supporting said shaft, blade-supporting means for presenting the thin edge of a blade into grinding relation with the periphery of said grinding wheel at an angle for grinding a sharp beveled edge on the thin edge of the blade, means for swinging said shaft-supporting means and said shaft and grinding wheel back and forth in relatively short grinding strokes the length of each such stroke being longer than the length of a scallop on the blade, the last said means including two links each being provided with two pivotal connections, the distance between the two pivotal connections of one link being equal to the distance between the two pivotal connections of the other link, and one of said pivotal connections of each link connecting it with said shaft-supporting means and the other pivotal connection of each link connecting it with said fixed supporting means.

6. A machine for grinding a scalloped, beveled cutting edge on a blade, said machine comprising in combination, fixed supporting means, a rotatably mounted shaft, a grinding wheel mounted on said shaft, shaft-supporting means for supporting said shaft, blade supporting means for presenting the thin edge of a blade into grinding relation with the periphery of said grinding wheel for grinding a sharp beveled edge on the thin edge of the blade, means for swinging said shaft supporting means and said shaft and grinding wheel back and forth in relatively short strokes the last said means including two movable links both of which respectively have pivotal connections with said shaft-supporting means and also with said fixed supporting means, and feeder means for intermittently advancing said blade-supporting means with relation to said grinding wheel approximately when said grinding wheel is at or near the end of a grinding stroke.

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