No. 813,510. PATENTED FEB. 27, 1906.

T. R. MOORE.

MACHINE FOR GRINDING CUTLERY BLADES AND THE LIKE.

APPLICATION FILED JULY 31, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

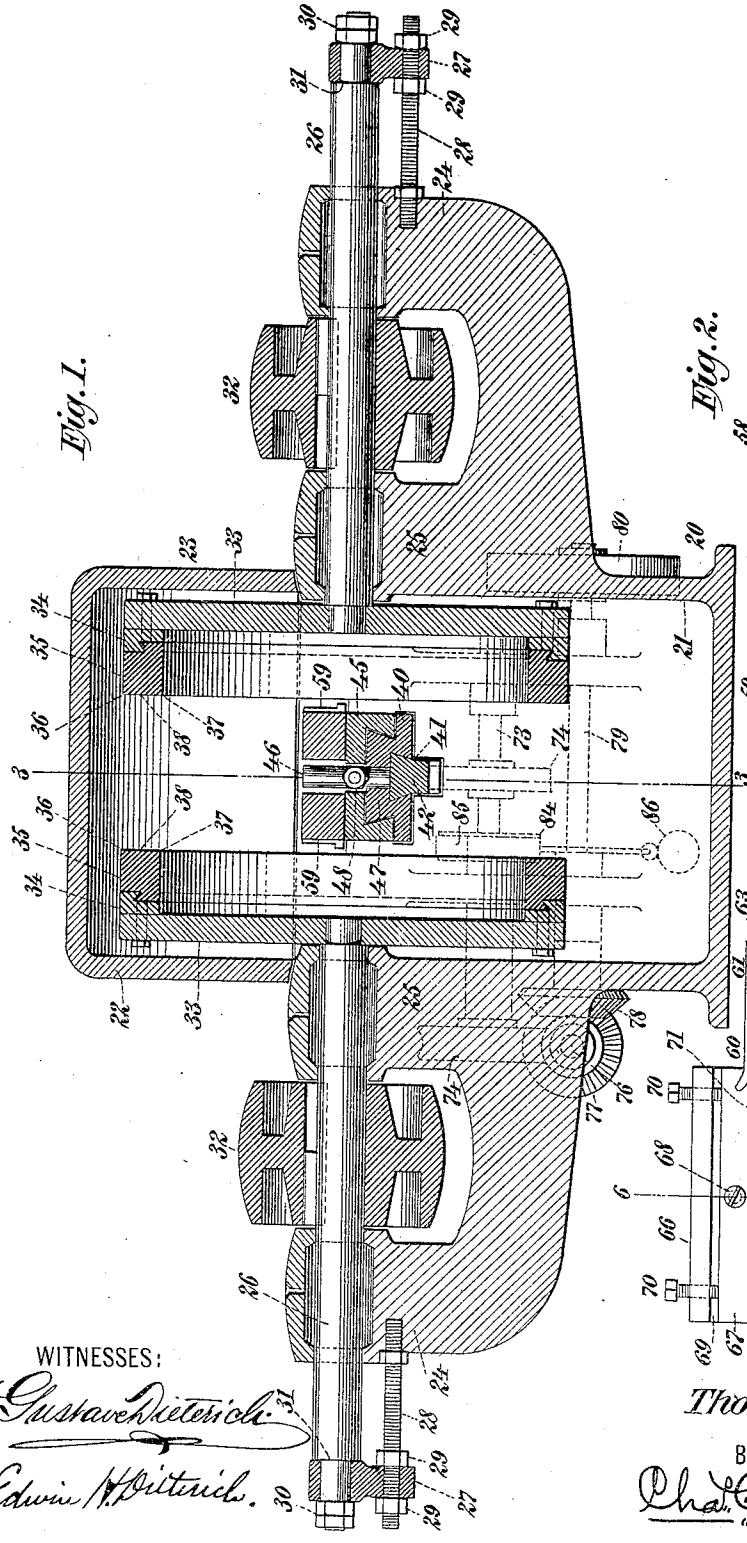
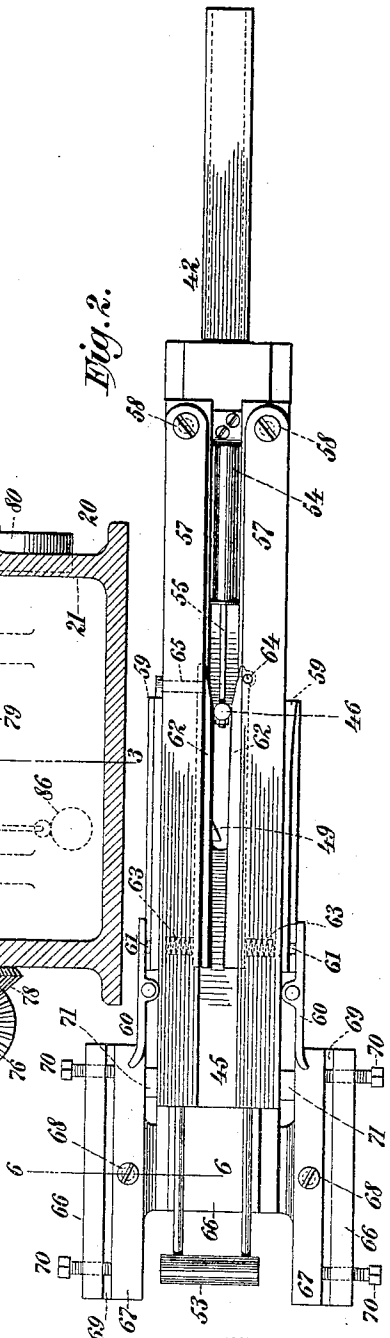


Fig. 2.



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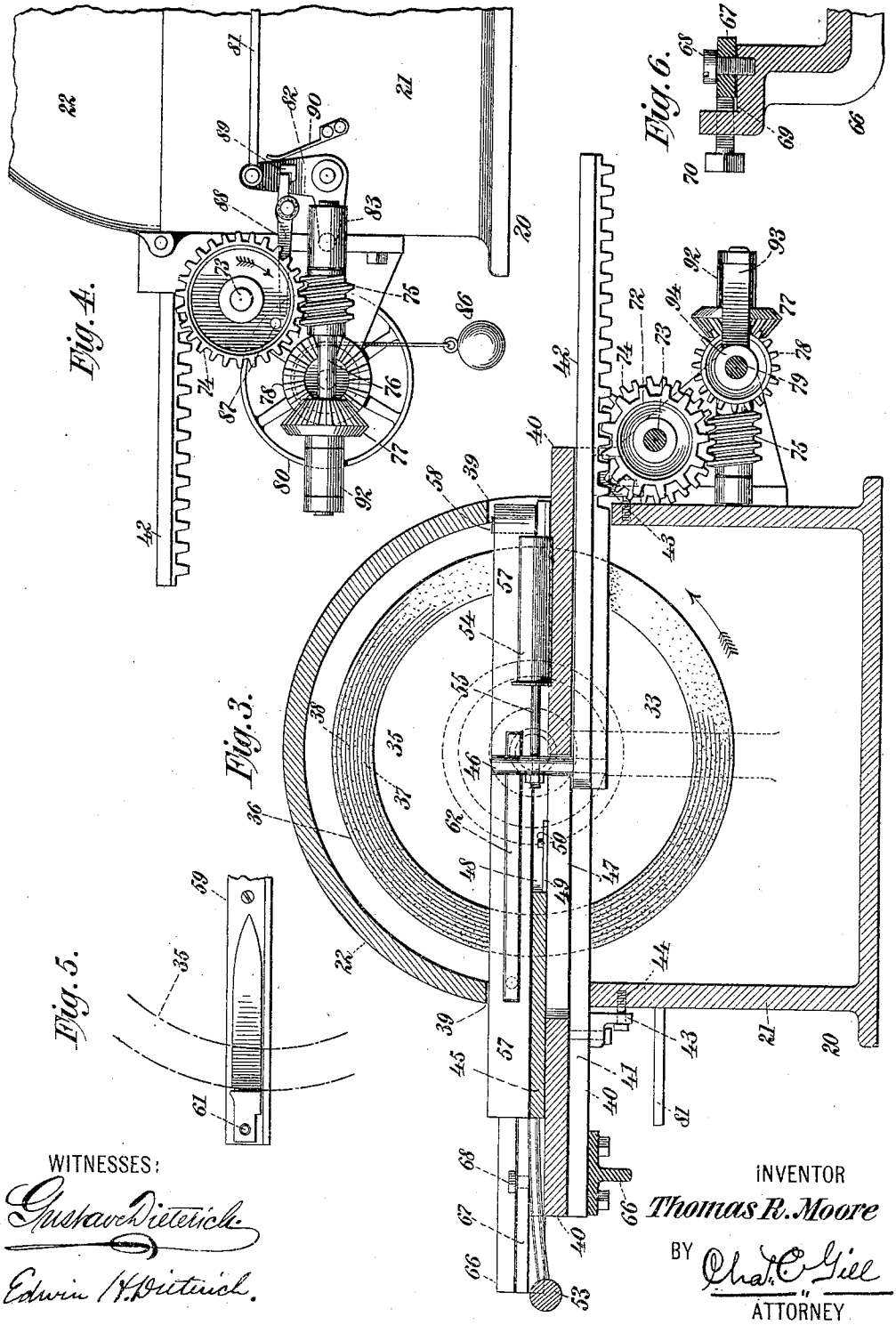

Fig. 4.

Fig. 6.

Fig. 3.

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 7.

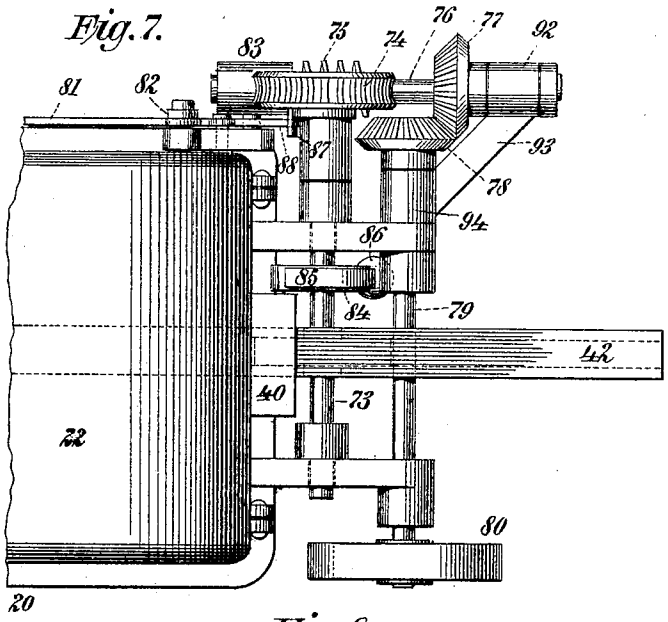


Fig. 8.

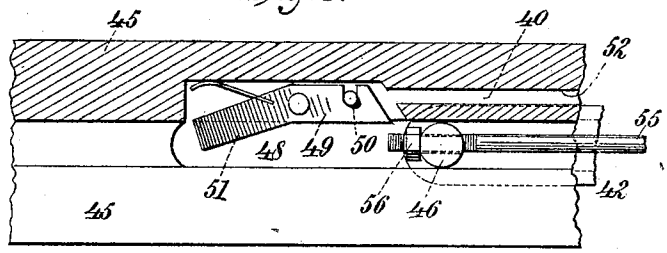
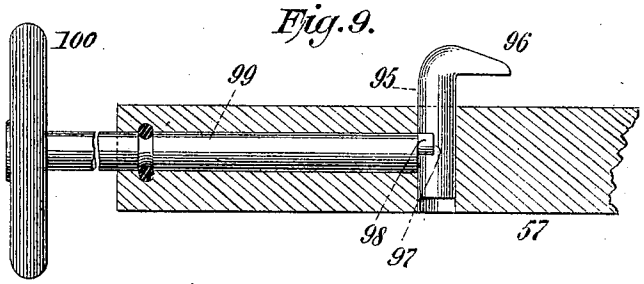


Fig. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR GRINDING CUTLERY-BLADES AND THE LIKE.

No. 813,510. Specification of Letters Patent. Patented Feb. 27, 1906.

Application filed July 31, 1905. Serial No. 271,888.

To all whom it may concern:

Be it known that I, THOMAS R. MOORE, a citizen of the United States, and a resident of Walden, in the county of Orange and State of New York, have invented certain new and useful Improvements in Machines for Grinding Cutlery-Blades and the Like, of which the following is a specification.

The invention relates to improvements in machines for grinding cutlery-blades and the like; and it consists in the novel features, arrangements, combinations, and methods of operation hereinafter described, and particularly pointed out in the claims.

I have presented my invention herein as embodied in a machine for grinding pocket-knife blades, the said machine comprising a suitable casing or housing, within which at opposite sides of the center are rotatably mounted grinding ring-wheels to be driven by power and in the center of which casing is mounted a slidable carriage adapted to support the blade-blanks, one at each side thereof, and carry the same against and along the faces of said grinding-wheels, the said carriage being provided with means for detachably holding the blade-blanks and effecting a yielding pressure of the same against the grinding-surfaces. The machine is also provided with means for automatically controlling the character of finish which shall be imparted to the blades, such as a flat finish or uniform surfaces or a finish which shall involve the tapering of the end of the knife-blade at its opposite sides. The machine also involves features of adjustment and means for effecting the sliding movement of the carriage between the grinding-wheels, and said machine is new in many of its general characteristics as well as in its details.

The invention enables the grinding of two blades at one time, one face of one blank being carried against one of the grinding-wheels and the opposite face of the opposite blank being carried against the other grinding-wheel during each forward movement of the carriage between said wheels, and, as will be understood from the description hereinafter presented, the machine involves a novel method of grinding knife-blades, in which the annular grinding-ring of the wheel is first caused to rotate against the blank and cut into the same what is, in effect, a groove adjacent to the tang of the blade, this groove extending transversely of the blade and defining the tang, after which the blade is fed along against the grinding-ring, and the latter, operating from its inner edge, grinds the remaining portion of the blade by widening or extending said groove until the point of the blade passes beyond said ring, the inner edge of the ring gradually cutting away the edge wall of the groove, while the face of the ring grinds the face of the blade left by the widening of said groove. This is an operation which is different from merely grinding the flat face of the blank, and by means of which I am enabled to obtain a uniform product and prevent the undue wearing off of that edge of the grinding-ring which is utilized in forming the shoulder of the tang, the blade under my method of operation after having the shoulder at the tang properly cut being fed in a direction from that edge of the ring which formed such shoulder, leaving said edge to perform the one duty of cutting well-defined shoulders on the blades at the tang portions thereof.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a central vertical transverse section of a machine constructed in accordance with and embodying the invention. Fig. 2 is a detached top view of a portion of same, Fig. 2 illustrating the carriage for moving the knife-blades between the grinding-wheels, the sliding rack-bar for first pressing with a yielding pressure the blades against the grinding-wheels and then moving the carriage along for the purpose of effecting the travel of the blades against the grinding-wheels, and at its left-hand end a stationary part of the machine with which the carriage coöperates in controlling the special cut or finish which shall be imparted to the blades during their travel. Fig. 3 is a vertical longitudinal section through the machine on the dotted line 3 3 of Fig. 1. Fig. 4 is a detached side elevation of a portion of the machine and is presented to illustrate more particularly the driving-gear and means for returning the carriage to its initial position after each forward travel of the same. Fig. 5 is a detached face view of one of the blade-holders, partly broken away, with the grinding-ring indicated by dotted lines. Fig. 6 is a detached vertical transverse section of a stationary portion of the machine on the dotted line 6 6 of Fig. 2, and illustrates more particularly one of the formers with its means of adjust-

ment for controlling the finish to be imparted to the blade by the grinding-wheel. Fig. 7 is a top view of the right-hand portion of the machine, looking at Fig. 3. Fig. 8 is an larged detached horizontal section through a portion of the carriage and is presented to illustrate the means for locking at the proper time the carriage to the bed or bar on which it may slide, so that there may be no travel of the carriage until the actuating rack-bar has on its forward motion traveled sufficiently far to free the carriage from its stationary bed, after which the rack-bar and carriage move onwardly together, the grinding-rings having then completed their first cut into the blade-blanks; and Fig. 9 is a horizontal longitudinal section through one of the pivoted blade-blank carrier-bars and illustrates a modified form of clip for holding the blade-blank in position on the carriage.

In the drawings, 20 designates the general casing or housing of the machine, this casing comprising a lower or body portion 21 and a hinged hood or cover 32 and forming within it a suitable chamber to receive the grinding-wheels and permit the passage through the same and between said wheels of the carriage carrying the blade-blanks. I will first describe the grinding-wheels and then the carriage, with the means for operating the latter.

The casing 20 is formed on its opposite sides with bearing-arms 24 25, in the upper ends of which are journaled the alined shafts 26, upon whose inner ends are carried the grinding-wheels and upon whose outer ends are secured the hangers 27, which have smooth-bore apertures which pass upon the stationary screws 28, which project laterally from the bearing-arms 24 and carry adjusting-nuts 29 at opposite sides of said hangers 27. The hangers 27 are apertured at their upper ends to pass upon the ends of the shafts 26 and are held in fixed relation to said shafts by means of the nuts 30 and shoulders 31; but otherwise said hangers are free upon said shafts. The purpose of the screws 28, nuts 29, and hangers 27 is to enable the independent adjustment of the grinding-wheels toward and from each other and the blade-blanks in accordance with the conditions to be met and the wear of said wheels. Upon the shafts 26, intermediate the arms 24 25, are provided the driving-wheels 32, which are keyed upon the shafts and permit said shafts to slide through the same, so as to admit of the adjustment of said shafts and the grinding-wheels toward and from each other. The wheels 32 are secured to the shafts 26 on keys which are less in length, as shown in Fig. 1, than the distance between the arms 24 25.

The grinding-wheels consist of the metal disks 33, equipped with annular rings 34, to which the grinding-rings 35 are secured, these rings being substantially rectangular in cross-section so as to present outer sharp edges 36, inner sharp edges 37, and flat grinding-faces 38, this being the form of grinding-wheel which may be used with the greatest advantage when pocket-knife blades or blades of similar character are to be ground. The grinding-wheels are opposite to and face each other, as shown in Fig. 1. They receive their motion from the shafts 26, and between said wheels the carriage for the blade-blanks is caused to travel.

Extending through the lower portion of the openings 39 in the front and rear ends of the casing 20 is a stationary bar 40, which contains a dovetail groove 41 throughout its entire length and within which the rack-bar 42 is mounted and adapted to have a sliding movement, the said dovetail groove 41 conveniently supporting and guiding said bar 42. The bar 40 is held in position by means of brackets 43, carried thereby, and screws 44, which engage the walls of the casing 20. There is a small space left between the brackets 43 and the adjacent walls of the casing 20, so as to permit a limited adjustment longitudinally of the bar 40, this adjustment being for the purpose of gaging the point on the blanks at which the grinding-wheels shall commence to cut and being desirable, due to possible variations in the rings of grinding material and in the wear that may take place at the edges 36 of said ring. The upper portion of the bar 40 is in the form of a dovetail to receive and guide the bar 45, which, as shown in Fig. 1, has formed in its lower side a dovetail groove to guide upon the dovetail on the bar 40. The bar 45 forms the base of the carriage and is adapted to have a longitudinal traveling movement upon the bar 40, and the said bar 45 receives its movement in its forward direction from the rack-bar 42 and pin 46, carried thereby, the bar 40 being formed with the slot 47 to permit of the sliding movement of the pin 46, and the bar 45 being formed with the slot 48 to permit said pin 46 to have a predetermined forward movement before it engages and starts to move said bar 45. When the bar 45 is in its initial position upon the bar 40, it is locked to the latter by means of a spring-latch 49, Fig. 8, and pin 50, which is engaged by said latch. The pin 50 is secured to the bar 40, and the latch 49 is secured to the bar 45; and the purpose of the pin and latch is to lock the bar 45 stationary until the pin 46 of the rack 42 reaches the forward portion of the slot 48 to push the bar 45 along, this happening at the time the grinding-wheels have finished cutting into the blade-blanks at the tang portion of the latter, and it is desired that the said blanks shall then be moved along against said wheels. The latch 49 is formed with a cam end 51, as shown in Fig. 8, against which the pin 46, when traveling forwardly, will pass, and thereby turn the latch free from the pin 50,

after which the bar 45 will move forwardly under the force exerted by the rack-bar 42, said bar 45 then carrying the latch 49 away from the pin 50. The bar 45 is grooved out, as at 52, so as to enable the said bar to travel along without interference from the pin 50. The rear end of the latch 49 is beveled, as shown in Fig. 8, so that after the rack-bar 42 returns to its initial position (without the carriage-bar 45) and the bar 45 is pushed rearwardly by the operator by means of the handle 53, connected with it, the said latch 49 will automatically reëngage the pin 50, and thereby become locked to the bar 40 at the initial position of said bar 45. The means for returning the rack-bar 42 rearwardly to its initial position, leaving the bar 45 at the front or delivery end of the machine, will be hereinafter described, and this action takes place after the grinding operation has been completed and the operator is to remove the blade-blanks from the carriage. In order that the rack-bar 42 on its automatic return to its initial position may not become injured or have any of the parts connected with it impaired, I provide a pneumatic cushioning or checking cylinder 54 of usual character, the same being secured to the stationary bar 40 and lying in the slot 48 of the bar 45, and I connect the piston-rod 55 of this cylinder with the pin 46, carried by the rack-bar 42. When the rack-bar 42 moves forwardly, it will pull the piston-rod 55 with it, and thereby draw the piston to the front end of the cylinder 54, and when the mechanism for returning the bar 42 is released and said bar returns to its initial position the pin 46 will cause the piston-rod 55 to rapidly pass into the cylinder 54 and effect the usual checking action, a small vent being customarily provided in the rear end of the cushioning-cylinder. I preferably thread the outer end of the piston-rod 55 and screw it into a threaded aperture in the pin 46, so that said rod may be adjusted longitudinally to a limited extent, a nut 56 being provided on said rod adjacent to said pin for locking said rod. I also utilize the forwardly-projecting end of the rod 55 to engage the bar 45 at the forward end of the slot 48 as a means for pushing the bar 45 along, rather than to have the pin 46 directly engage said bar 45. The force of the pin 46 is what moves the bar 45; but if I permit the end of the rod 55 to make the physical contact with the bar 45 and said rod 55 is made adjustable I secure an adjustable contact between the pin 46 and bar 45, thereby enabling me to gage the exact time at which the bar 45 shall start to move with respect to the wear on the parts of the machine and other conditions to be met. For illustration, the bar 45 must not move forwardly until the pin 46 opens the latch 49, Fig. 8, and if due to any wear in the contacting portions of the pin 46 or latch 49 said pin should not act as quickly as before I can correct this difficulty by the adjustment of the rod 55 rearwardly, so that the pin 46 may travel forwardly a little farther than before prior to the contact of the rod 55 with said bar 45.

I do not limit my invention to the adjustability of the rod 55 nor to the use of the rod 55 as a means for contacting with the bar 45, since I only utilize the rod 55 to engage the bar 45 as a convenient way of providing an adjustable contact between the pin 46 and bar 45.

Upon the rear portion of the bar 45 are pivotally secured the corresponding longitudinal bars 57, which lie upon and are carried by the bar 45 and are adapted to have a pivotal or oscillatory motion from and toward each other, said bars 57 at such time being turned upon the pivot-screws 58, by which they are secured to the bar 45. Upon the outer sides of the bars 57 are secured, by screws or otherwise, the blade-blank holders 59 and also the spring-clips 60, which are adapted to engage the tang ends of the blade-blanks and hold the latter against the holders 59, said holders 59 preferably being formed with a pin 61, Fig. 5, to enter the pin-hole in the tang of the blade-blank. The blade-holders 59 are simply recessed or shouldered plates against which the blanks are supported, the outer sides of said holders being open, as shown in Fig. 5, so that the grinding-rings may engage the blanks. At the inner sides of the bars 57 are pivotally secured the bars 62, which partly enter elongated recesses in the facing sides of the bars 57 and partly project from said recesses, as shown in Fig. 2. The rear ends of the bars 62 are loosely or pivotally secured to the bars 57, and the front ends of said bars 62 engage coiled springs 63, seated within sockets in the bars 57. At their rear facing edges the bars 62 are tapered, as shown in Fig. 2, so as to readily admit between them the pin 46, which during the forward travel of the rack-bar 42 moves against said bars 62 to press them outwardly, and thereby press the forward portions of the bars 57 outwardly in a direction from each other, so as to carry the blade-blanks against the grinding-rings 35. An important feature of the bars 57 is that they carry the blade-blanks or the work against the grinding-rings 35 with a yielding pressure, this yielding pressure being secured by the springs 63, against which the bars 62 act and which act against the bars 57. The bars 62 normally slightly converge toward their forward ends, so that during the first part of the travel of the rack-bar 42 and up to the time said bar commences to move the carriage or bar 45 the pin 46 may gradually by passing between the converging edges of the bars 62 move the blade-blanks against the grinding-rings 35 with an increasing pressure, so that the grinding-rings may properly make their first cut into the blade-blanks at

the tang end of the latter and to the full depth at which the grinding is to be done, and thereupon or when the pin 46 has reached a position to engage the bar 45 the bars 62 will have been moved outwardly from each other until their facing edges are parallel with each other, and the entire carriage then moving forwardly the blade-blanks may be kept in their then predetermined relation to the grinding-rings 35 and be moved while in such relation forwardly and against said rings, enabling the latter to finish the grinding of the blades, which although during this latter part of the operation held with a yielding pressure against the grinding-rings 35 are by the pin 46 and bars 62 maintained with a substantially uniform pressure against said rings. An important feature of the operation of my invention is that during the first portion of the travel of the pin 46 (the carriage-bar 45 then being stationary) the grinding-rings cut into the blade-blanks at the tang portion of the latter to the full depth at which said blanks are to be ground and that thereafter or during the movement of the carriage-bar 45 under the thrust of the rack-bar 32 the blades are carried along the grinding-rings, and the latter at their inner side edges 37 cut or grind off the metal transversely to the blade, the faces 38 of the rings acting to smooth the faces of the blanks left by the action of the side edges 37 of said rings. The grinding-rings thus initially each cut a groove in the blade, and then as the blade-blank is thereafter moved along the grinding-ring this groove is extended until it covers the entire blade or until the point of the blade has passed beyond the inner edges 37 of the grinding-ring. This method of grinding knife-blades is novel and of importance, and I desire to broadly claim the apparatus for carrying out this method without regard to special details of form and construction.

The rear ends of the bars 62 may be pivotally secured to the bars 57 by any suitable means, and at the lower side of Fig. 2 I illustrate one bar, 62, as being held at its rear end upon a pivot 64, while the other bar, 62, is shown as held upon the inner end of a screw 65, which is loose within an aperture in the bar 57.

It is desirable that pocket-knife blades be tapered at their pointed end, so that the blade at its pointed end may be thinner than at the tang end thereof, and to accomplish this result I provide upon the upper ends of a rigid frame 66 the formers 67, which are pivotally secured upon screws 68 and rest upon the tables 69, provided by said frame 66, as shown in Figs. 2 and 6. The formers 67 are thus pivotally secured upon the tables 69 and adjacent to the opposite ends of said formers 67. The frame 66 is equipped with adjusting-screws 70, whose ends engage the end portions of the formers 67. By means of the screws 70 the formers 67 may be adjusted on any desired inclination. Upon reference to Fig. 2 it will be seen that the formers 67 are at opposite sides of the forward ends of the pivoted bars 57, the bars 57 carrying at their forward end small blocks 71 of hardened metal to engage and rub against the facing sides of the formers 67. If it were desired to grind a blade-blank so that it would be of uniform thickness from end to end, the formers 67 would be set parallel with each other, so that said formers would have no influence upon the bars 57 or the work carried thereby further than to aid in keeping said bars parallel with each other; but should it be desired to taper the pointed ends of the blades the outer ends of the formers 67 will be set outwardly from each other to a slight extent, so that as the pointed ends of the blanks reach the grinding-rings the latter may make a somewhat deeper cut, and thereby be enabled to taper off said blanks. The formers 67 by their position and due to the fact that the bars 57 move against them control the finish the grinding-rings 35 shall impart to the blade-blank, their finish varying with different blades of the same size and also with blades of different sizes.

The carriage represented by the bar 45 and pivoted bars 57 will be in its forward position or projecting from the front of the casing 20 when the blade-blanks are inserted upon the holders 59, the front of the machine being at the left-hand side of Fig. 3, and after the blade-blanks are placed upon the holders 59 the carriage will be pushed inwardly until it is in about the position represented in Fig. 3, so that the first action of the grinding-rings 35 may be to cut into the blade-blanks at the tang portion of the same, and thereafter as the carriage moves forwardly said rings complete the grinding of the blades, so that by the time the blade-blanks have been projected forwardly beyond the casing 20 they will have been ground throughout their entire length. Two blade-blanks are carried through the machine at each operation of the machine, and at the end of each operation I remove the blank from one, say the upper holder 59, as represented by Fig. 2, and place it upon the other holder 59 and put a fresh blank upon the said upper holder 59, the side of the thus transposed blank which was ground by one of the rings 35 being placed against its holder, so that the other side may be exposed and ground by the other ring 35 during the next operation of the machine, whereby at the end of each operation after the first one one blade will have been completely ground and be removed from the machine. One holder 59 will have a flat face, against which the blade-blank may rest, and the other holder 59, especially when pocket-knife blades are being ground, should have a face which is

slightly outwardly inclined at one end, so that when the blade first ground is transposed to and placed against it the then tapered portion at one side of the point of the blade may have a firm backing, which would not be the case if the ground and tapered face of the blank were placed against a flat surface, and thus at the lower side of Fig. 2 it will be seen that the face of the holder 59 is shown as slightly tapered to accommodate the ground and tapered face of the half-finished blank to be removed from the opposite holder 59 and delivered it to be finished.

I have described above that the rack-bar 42 has a limited movement forwardly, permitted by the slot 48, before it starts to actuate the carriage-bar 45, carrying the pivoted blade-holding bars 57, that thereafter the rack-bar 42 and carriage travel forwardly together, that thereafter the rack-bar 42 is returned automatically to its initial position, and that then after the operator attends to the blade-blanks the carriage is pushed to its initial position by means of the handle 53. The means for operating the rack-bar 42 comprise the gear mechanism. (Shown in Figs. 3, 4, and 7.) The rack-bar 42 is engaged by a pinion-wheel 72, secured on a shaft 73, upon one end of which is a gear-wheel 74 in engagement with a worm 75, secured upon a short longitudinal shaft 76, carrying a beveled gear-wheel 77 in mesh with a corresponding wheel 78, secured upon the driving-shaft 79, upon which a drive-wheel 80 is secured. Motion imparted to the wheel 80 and shaft 79 will be communicated, through the gear-wheels 78 77, to the worm-shaft 76 and from the latter, through the worm 75 and gear-wheel 74, to the shaft 73 and pinion-wheel 72, whereby the latter is enabled to drive the rack-bar 42 forwardly. When the rack-bar 42 has traveled to the full limit of its forward motion, so that the knife-blade blanks become exposed, the said rack-bar 42 will be immediately returned to its normal initial position, while the operator attends to the change of the blade-blanks or the supply of new blanks to the blade-blank holders. I therefore provide a trip and reversing mechanism, to be actuated automatically at the time the rack-bar 42 reaches the limit of its forward motion, and a resetting mechanism, to be actuated by the operator after he has pushed the carriage back to its initial position. In resetting the driving mechanism the operator will simply pull on the rod 81, which extends forwardly from one arm of the bell-crank lever 82 into a convenient position to be reached by a person standing at the front end of the machine, the said bell-crank lever 82 having pivoted to its other arm the bearing 83 for the front end of the worm-shaft 76.

The means for reversing the motion of the pinion-wheel 72 for returning the rack-bar 42 to its initial position comprise a band-wheel 84 on the shaft 73, from which band-wheel is suspended a weight 86. During the forward travel of the rack-bar 42 the band 85 is wound upon the wheel 84 and the weight 86 thereby elevated, and when the mechanism at the worm 75 is tripped and said worm lowered from the wheel 74 the weight 86, pulling downwardly, will reverse the motion of the shaft 73 and pinion-wheel 72 and return the rack-bar 42 to its initial position.

Upon the side of the wheel 74 is secured a pin 87, Fig. 4, and upon the side of the casing 20 is pivoted a latch 88, one end of which lies in the path of the pin 87 and the other end of which normally engages a shoulder 89, provided on the vertical arm of the bell-crank 82. A spring 90 presses the bell-crank shoulder 89 against the latch-bar 88. When the rack-bar 42 reaches the end of its forward travel, the pin 87 will move against and tilt the rear end of the latch 88 and pull the other end thereof from the shoulder 89, and at this time the spring 90, coupled with the weight of the bearing 83 and parts connected therewith, will turn the bell-crank 82 rearwardly and lower the worm 75 from the gear-wheel 74, thus leaving the gear-wheel 74, shaft 73, and pinion 72 in condition to be reversed by the weight 86. The worm 75 is journaled at its rear end in a bearing 92, which is connected by a bar 93 with a loose sleeve 94 on the shaft 79. After the rack-bar 42 has been returned to its inital position the operator will by pulling on the rod 81 turn the bell-crank lever 82 to restore the worm 75 into mesh with the gear-wheel 74, and at this time the latch 88 will reëngage the shoulder 89, thus leaving the mechanism in its original initial condition, in which condition the gear 72 will again move the rack-bar 42 forwardly. The operator when the rack-bar 42 and carriage-bar 45 reach their forward position will pay no attention to the said rack-bar, because said bar, due to the tripping of the latch 88, will take care of itself and be returned to its normal initial position; but he will attend to the blade-blanks and then by means of the handle 53 push the carriage inwardly to its inward position, ready for the next operation of the machine. Thereupon he will pull on the rod 81, so as to reset the power mechanism and permit the rack-bar 42 to again move forwardly.

The operation of the machine will be substantially understood from the description hereinbefore presented, and hence but a brief further explanation is required. In Figs. 1, 2, and 3 I illustrate the carriage and its parts in their initial position, and it may be assumed that blade-blanks have been supplied to the holders 59. Under this condition the operator will pull on the rod 81 to set the driving mechanism, and immediately the rack-bar 42 will start forwardly. The rack-bar 42 moves independently of the carriage-

bar 45 through the distance permitted by the slot 48 in said bar 45, and during this movement of the rack-bar 42 the pin 46, carried thereby, presses against the bars 62 and moves the work against the grinding-rings 35 with a yielding pressure without causing any longitudinal travel of the blade-blanks. When the rack-bar 42 reaches the limit of its independent movement, it unlatches the bar 45 from the bar 40 and causes the bar 45, carrying the bars 57, to move forwardly, thereby carrying the knife-blade blanks along the grinding-rings 35, the particular finishing or shape of the blanks being controlled by the formers 67. When the rack-bar 42 and carriage-bar 45 reach the limit of their forward movement, exposing the blade-blanks beyond the casing 20, the latch 89 becomes tripped and the shaft 73 is given its reverse motion for restoring the bar 42 to its initial position, said bar 42 being cushioned on its return movement by the pneumatic pressure within the cylinder 54. The operator then removes the finished blank from, say, the right-hand holder 59 and the half-finished blank from the left-hand holder 59, placing the latter blank upon the right-hand holder 59 and a new blank on the left-hand holder 59, and he thereupon pushes the bar 45 inwardly, so as to carry the blanks in between the grinding-rings 35. After the carriage-bar 45 has been pushed inwardly the operator will again pull on the rod 81 to reset the driving mechanism, and the rack-bar 42 will move forwardly, as before, at first independently of the bar 45 and then with the bar 45.

In Fig. 9 I illustrate a modified form of clip as a substitute for the clips 60, (shown in in Fig. 2,) this modification consisting in supplying each of the bars 57 with a transverse pin 95, having a bent end 96 to engage the tang of the blade and provided with a horizontal recess 97 to receive a crank-pin 98, formed on the end of a rotary shaft 99, the latter at its outer end being provided with a hand-wheel 100. By turning the hand-wheel 100 the clip end 96 of the pin 95 may be caused to move toward or from the bar 57, and thus be enabled to clamp or release the tang of the blade-blank.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for grinding blades, a grinding-ring, a carriage for holding the blade-blank, means for holding said blank against said ring until the latter has cut into the blank to sufficient depth, and means for then moving said carriage to carry said blank along said ring, whereby the edge and face of the latter are enabled to complete the grinding operation; substantially as set forth.

2. In a machine for grinding blades, a grinding-ring, a carriage for holding the blade-blank, means for holding said blank against said ring until the latter has cut into the blank to sufficient depth, means for then moving said carriage to carry said blank along and against said ring to complete the grinding operation, and means for setting said blank during the movement of said carriage to control the taper or finish to be imparted to the blade; substantially as set forth.

3. In a machine for grinding blades, a pair of facing grinding-rings, a carriage for holding two blade-blanks and adapted to be moved between said rings, means for holding said blanks against said rings until the latter have cut into the blanks to sufficient depth, means for then moving said carriage to carry said blanks along said rings to complete the grinding, and means for setting said blanks during the movement of said carriage to control the taper or finish to be imparted to the blades; substantially as set forth.

4. In a machine for grinding blades, a grinding-ring, a carriage having a holder for the blade-blank, means for yieldingly pressing said holder to hold the blank against said ring until the latter has cut into the blank to sufficient depth, and means for then moving said carriage and holder to carry said blank along said ring to complete the grinding; substantially as set forth.

5. In a machine for grinding blades, a grinding-ring, a carriage having a holder for the blade-blank, means for yieldingly pressing said holder to hold the blank against said ring until the latter has cut into the blank to sufficient depth, means for then moving said carriage and holder to carry said blank along said ring to complete the grinding, and means for setting said blank during the movement of said carriage to control the taper or finish to be imparted to the blade; substantially as set forth.

6. In a machine for grinding blades, a pair of grinding-rings, a carriage having holders for two blade-blanks, means for yieldingly pressing said holders to hold the blanks against said rings until the latter have cut into the blanks to sufficient depth, means for then moving said carriage and holders to carry said blanks along said rings to complete the grinding, and means for guiding said holders during the movement of said carriage to control the taper or finish to be imparted to the blades; substantially as set forth.

7. In a machine for grinding blades, a grinding-ring, a carriage having a pivoted bar thereon on the outer side of which is a holder for a blade-blank, a pressure-bar on the inner side of said pivoted bar, and a spring intermediate said bars, combined with means for pressing against said pressure-bar with a gradually-increasing pressure for a definite period to thereby force the blade-blank against said ring, and means for then moving said carriage, with said blank still against said ring, to carry the blank along the

ring to complete the grinding; substantially as set forth.

8. In a machine for grinding blades, a grinding-ring, a carriage having a pivoted bar thereon on the outer side of which is a holder for a blade-blank, a pressure-bar on the inner side of said pivoted bar, and a spring intermediate said bars, combined with means for pressing against said pressure-bar with a gradually-increasing pressure for a definite period to thereby force the blade-blank against said ring, means for then moving said carriage, with said blank still against said ring, to carry the blank along the ring, and means for guiding said pivoted bar during the travel of said carriage to control the taper or finish to be imparted to the blade; substantially as set forth.

9. In a machine for grinding blades, a pair of grinding-rings, a carriage having holders for two blade-blanks, one of said holders having a flat face and the other a face conforming to the ground side of a blank, means for holding said blanks against said rings until the latter have cut into the blanks to a sufficient depth, and means for then moving said carriage to carry said blanks along said rings to complete the grinding; substantially as set forth.

10. In a machine for grinding blades, a pair of grinding-rings, a carriage having holders for two blade-blanks, one of said holders having a flat face and the other a face conforming to the ground side of a blank, means for holding said blanks against said rings until the latter have cut into the blanks to a sufficient depth, means for then moving said carriage to carry said blanks along said rings to complete the grinding, and means for guiding said holders during the movement of the carriage to control the taper or finish to be imparted to the blades; substantially as set forth.

11. In a machine for grinding blades, a pair of grinding-rings, a bar stationary between said rings, a carriage-bar mounted on said stationary bar, a pin and latch for locking said bars together at the initial position of said carriage-bar, and a pair of blade-blank-holding bars carried by said carriage-bar, combined with a sliding bar adapted to move between said holding-bars and during the first part of its movement press the blanks against said rings and then on its continued movement to free said latch and push said carriage-bar to carry said blanks along against said rings, and means for actuating said sliding bar; substantially as set forth.

12. In a machine for grinding blades, a pair of grinding-rings, a bar stationary between said rings, a carriage-bar mounted on said stationary bar, a pin and latch for locking said bars together at the initial position of said carriage-bar, and a pair of blade-blank-holding bars carried by said carriage-bar, combined with a sliding bar adapted to move between said holding-bars and during the first part of its movement press the blanks against said rings and then on its continued movement to free said latch and push said carriage-bar to carry said blanks along against said rings, means for effecting the forward travel of said sliding bar, and means for automatically returning said sliding bar to its initial position, leaving the carriage-bar in its forward position; substantially as set forth.

13. In a machine for grinding blades, a pair of grinding-rings, a bar stationary between said rings, a carriage-bar mounted on said stationary bar, a pin and latch for locking said bars together at the initial position of said carriage-bar, and a pair of pivoted bars mounted on said carriage-bar and having blade-blank holders on their outer sides and spring pressure-bars on their inner or facing sides, combined with a sliding bar guided in said stationary bar and having a pin extended upwardly through a slot in said carriage-bar and between said pivoted bars, and means for actuating said sliding bar, said sliding bar with its pin being adapted during the first part of its movement to engage said pressure-bars and press the blanks against said rings and then on its continued movement to free said latch and push said carriage-bar to carry said blanks along against said rings; substantially as set forth.

14. In a machine for grinding blades, a pair of grinding-rings, a bar stationary between said rings, a carriage-bar mounted on said stationary bar, a pin and latch for locking said bars together at the initial position of said carriage-bar, and a pair of pivoted bars mounted on said carriage-bar and having blade-blank holders on their outer sides and spring pressure-bars on their inner or facing sides, combined with a sliding bar guided in said stationary bar and having a pin extended upwardly through a slot in said carriage-bar and between said pivoted bars, means for effecting the forward travel of said sliding bar, and means for automatically returning said sliding bar from its forward to its initial position, leaving said carriage-bar in its forward position, said sliding bar with its pin being adapted during the first part of its movement to engage said pressure-bars and press the blanks against said rings and then on its continued movement to free said latch and push said carriage-bar to carry said blanks, along against said rings; substantially as set forth.

15. In a machine for grinding blades, a pair of grinding-rings, a carriage having a pair of pivoted bars thereon on the outer sides of which are holders for the blade-blanks, means for yieldingly pressing said pivoted bars outwardly during a stationary condition of said carriage for a definite period for enabling said rings to act against the

blanks, means for then moving said carriage and bars to carry the blanks along against said rings, and adjustable formers for controlling the relation of the blanks to the said rings during the travel of said carriage; substantially as set forth.

16. In a machine for grinding blades, a pair of grinding-rings, a carriage having a pair of pivoted bars thereon on the outer sides of which are holders for the blade-blanks, means for yieldingly pressing said pivoted bars outwardly during a stationary condition of said carriage for a definite period for enabling said rings to act against the blanks, means for then moving said carriage and bars to carry the blanks along against said rings, and adjustable formers for controlling the relation of the blanks to the said rings during the travel of said carriage, said formers comprising pivoted plates against which said pivoted bars are moved and adjusting-screws to set said plates and being mounted on a stationary part of the machine; substantially as set forth.

Signed at Walden, in the county of Orange and State of New York, this 27th day of July, A. D. 1905.

THOMAS R. MOORE.

Witnesses:
SAMUEL D. YOUNG,
ASA SNYDER.