May 10, 1932. J. N. WOODINGTON 1,857,421

SHARPENER FOR SLICING MACHINES

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Fig. 1.

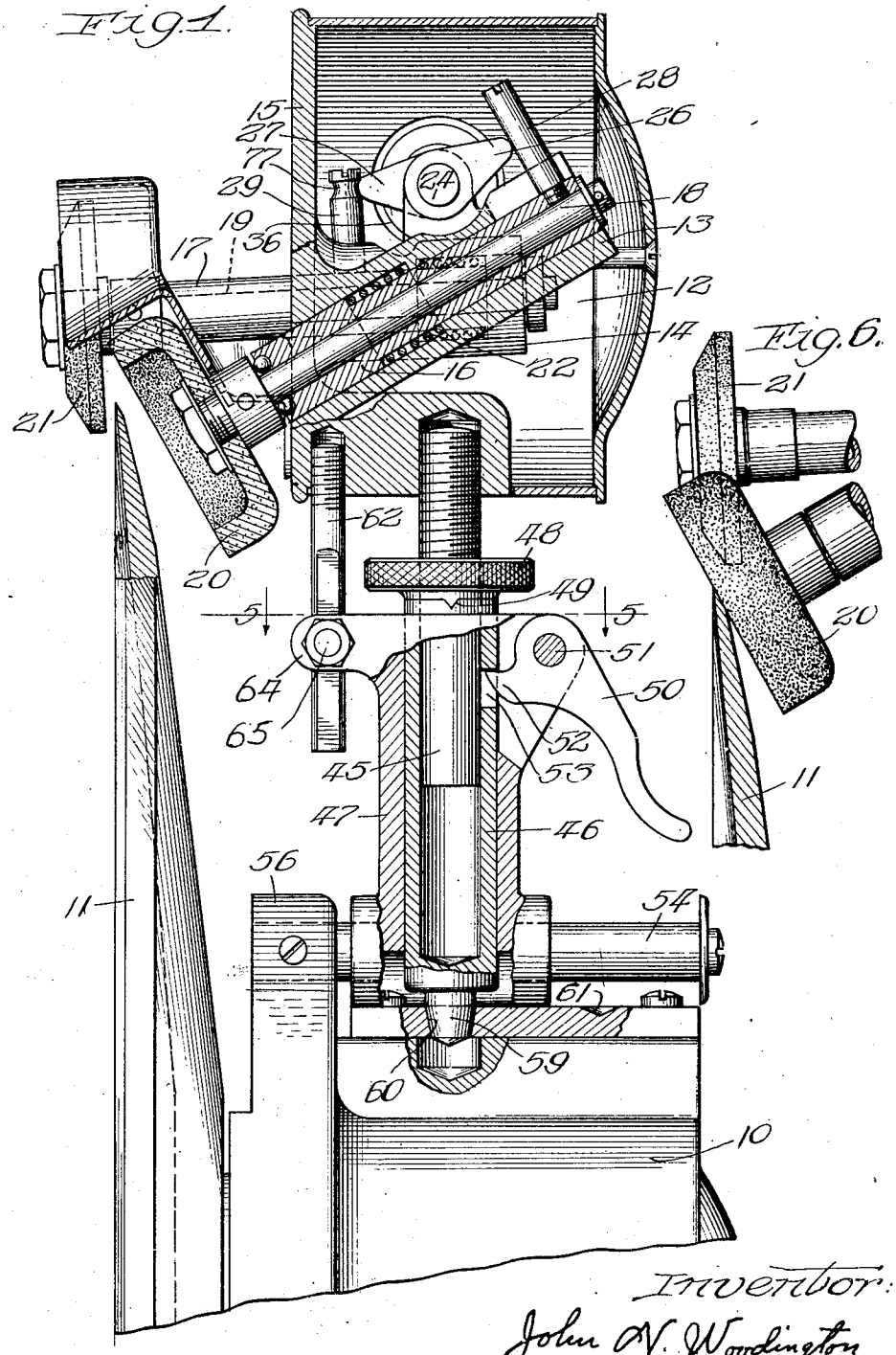


Fig. 6.

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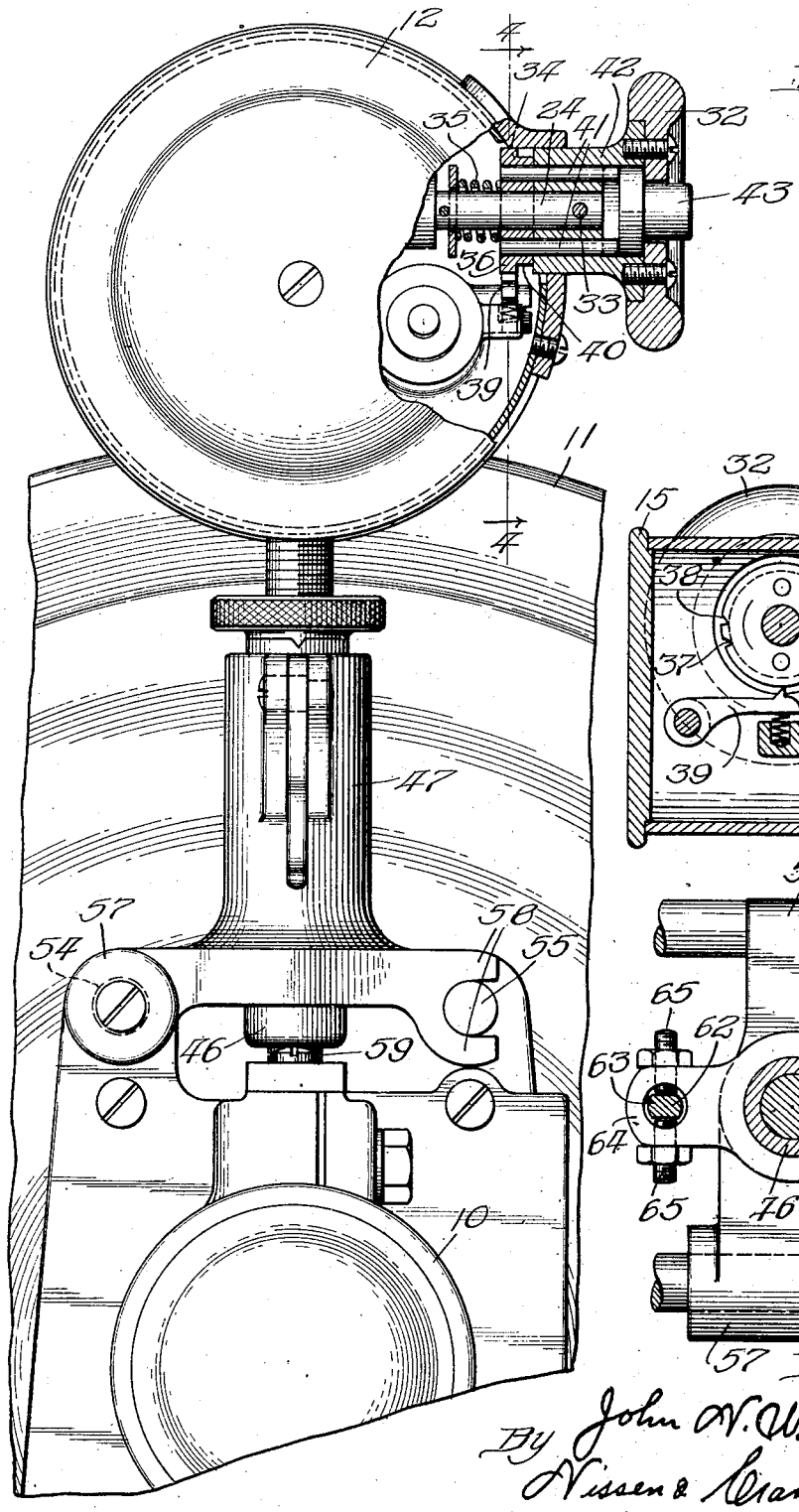


Fig. 2.

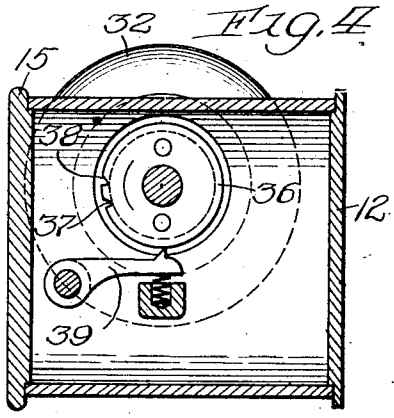


Fig. 4.

Fig. 5.

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Fig. 3.

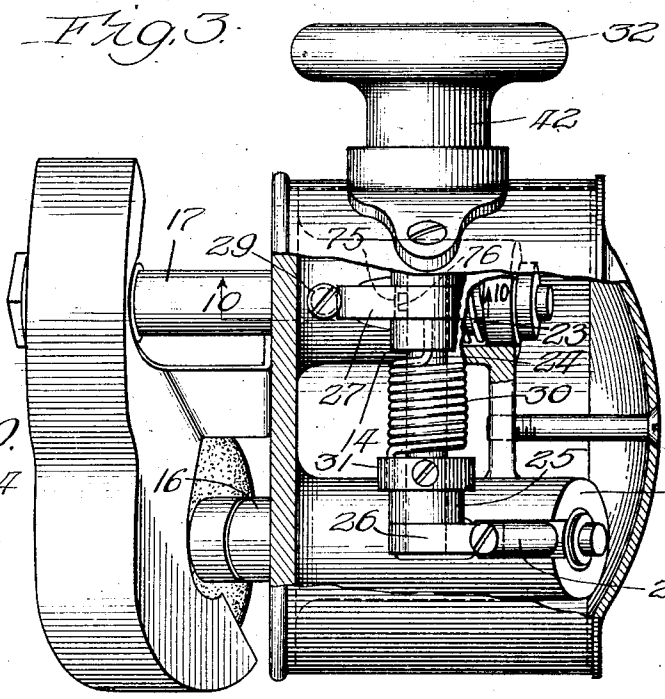
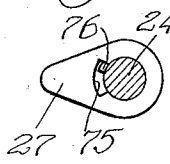


Fig. 10.



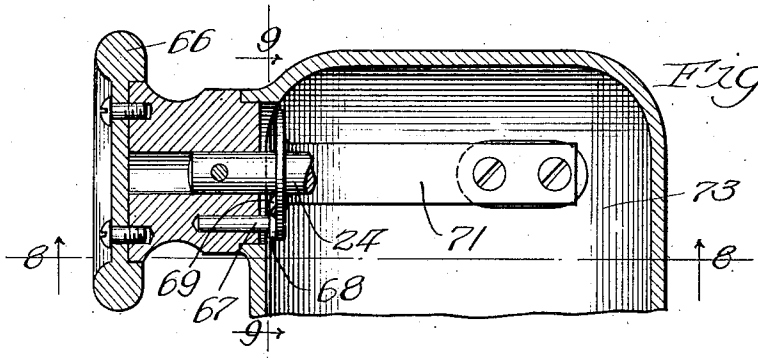
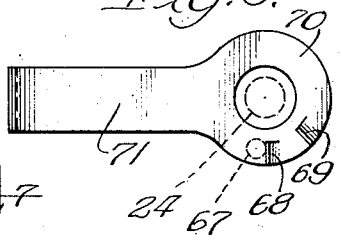


Fig. 7.

Fig. 9.



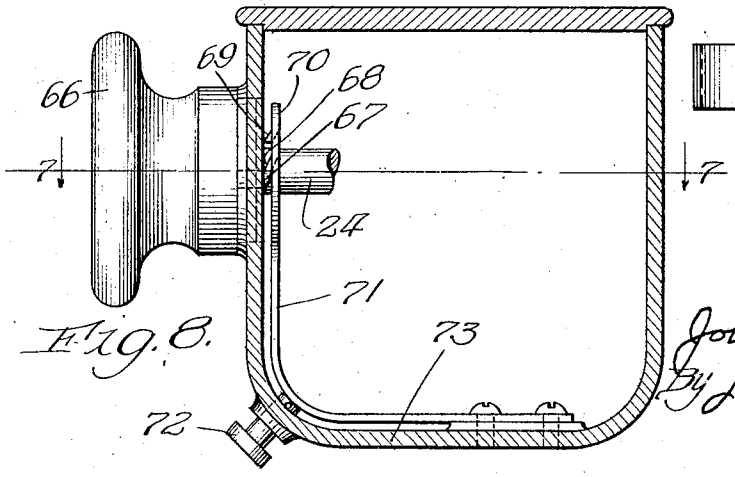


Fig. 8.

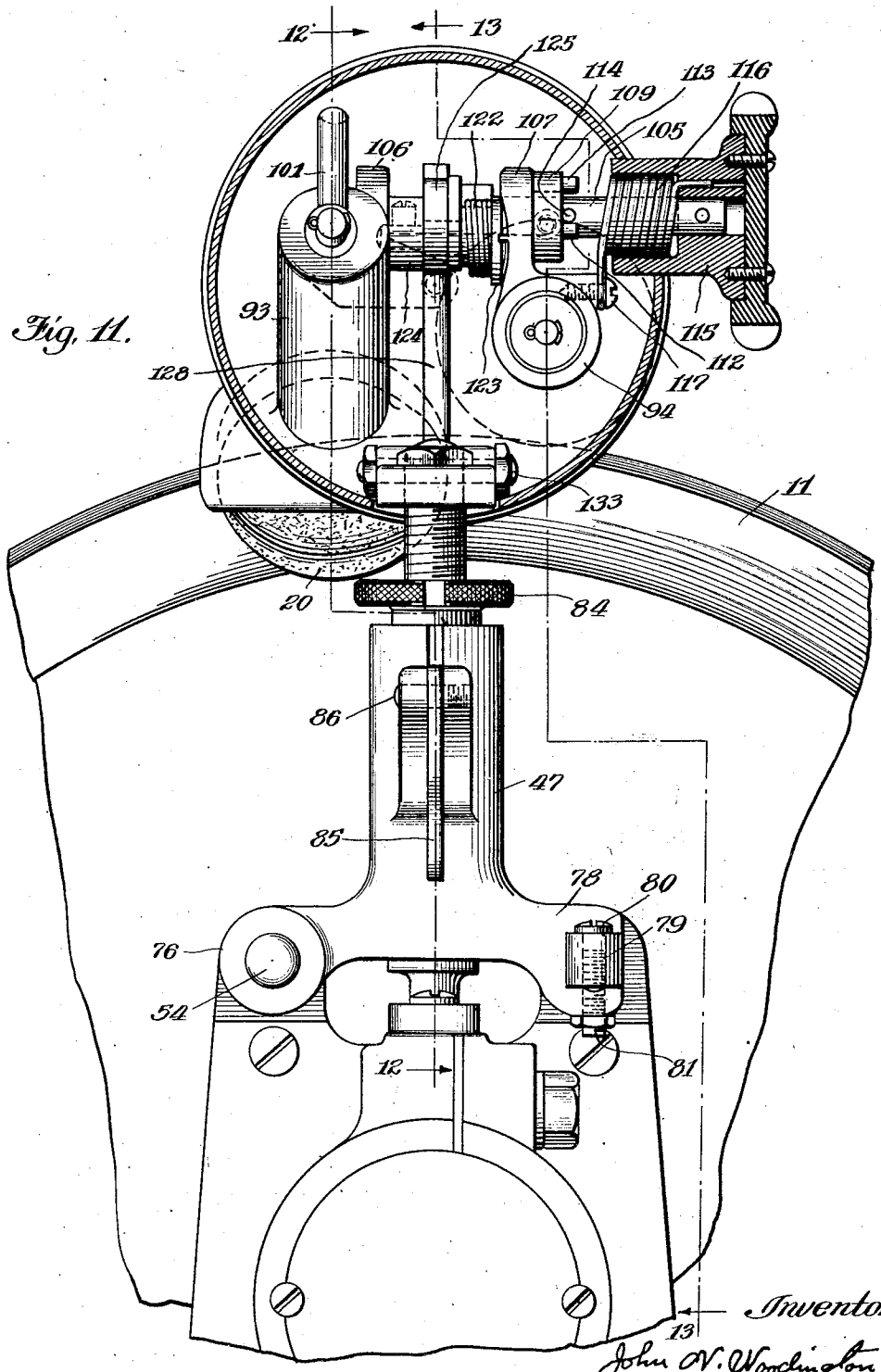
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Fig. 11.



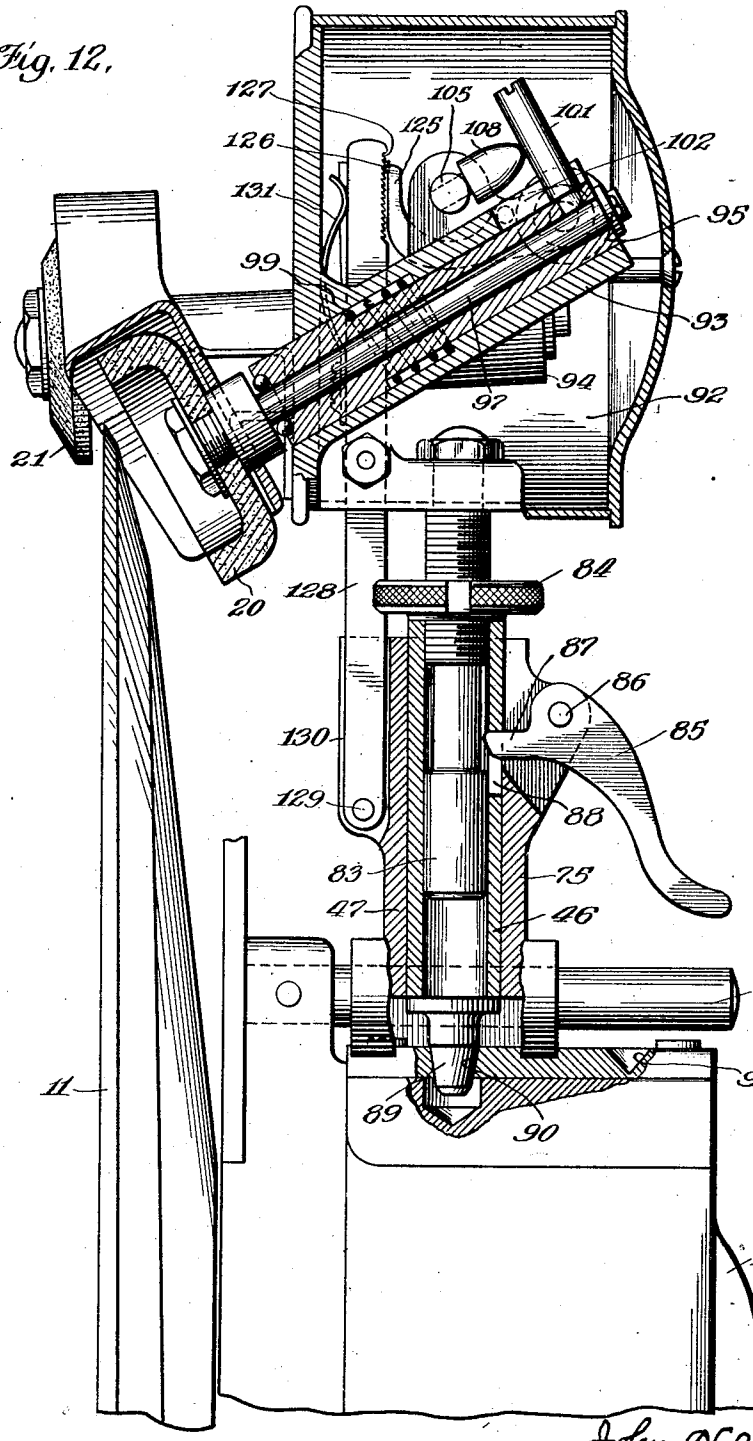
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Fig. 12.



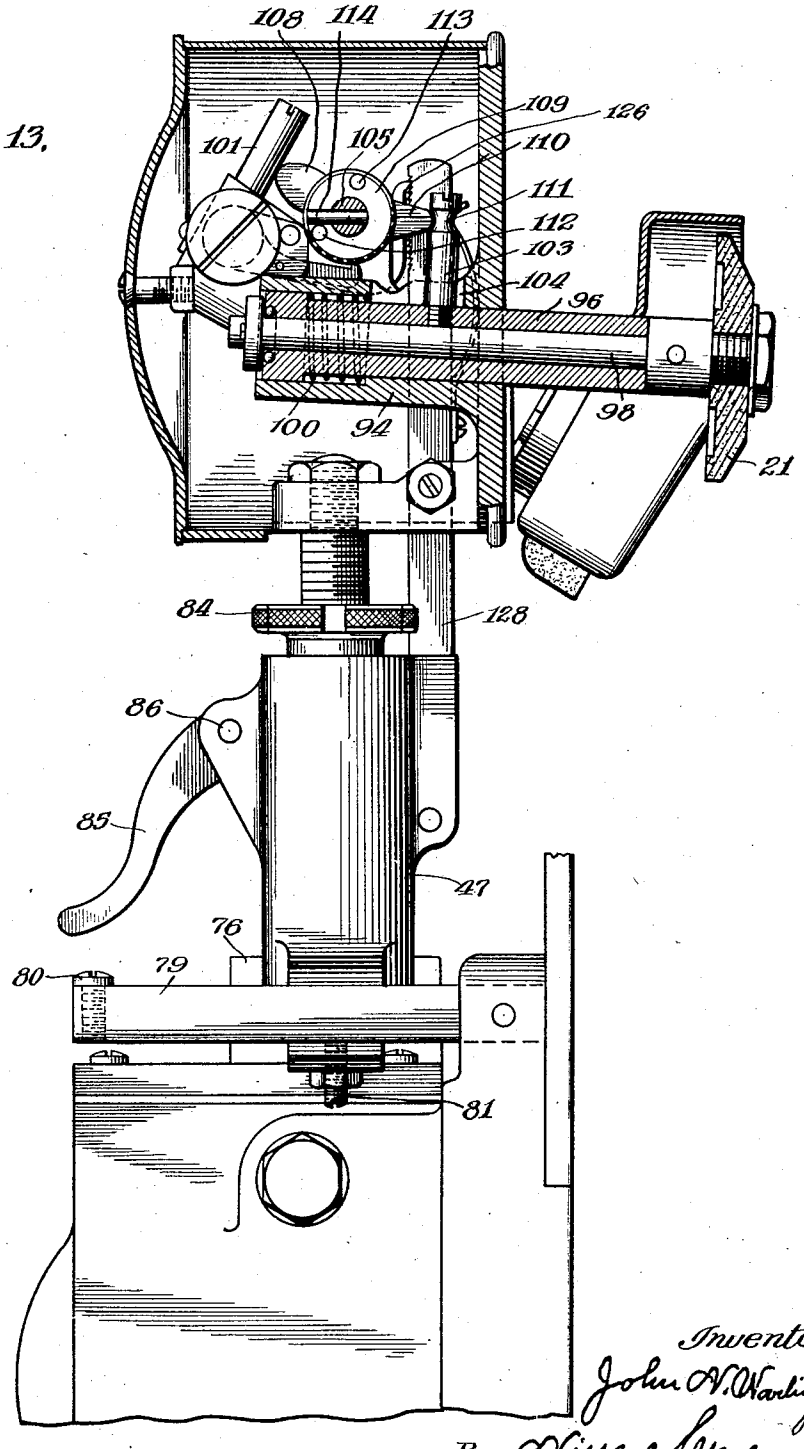
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SHARPENER FOR SLICING MACHINES

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Fig. 13.



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Fig. 14.

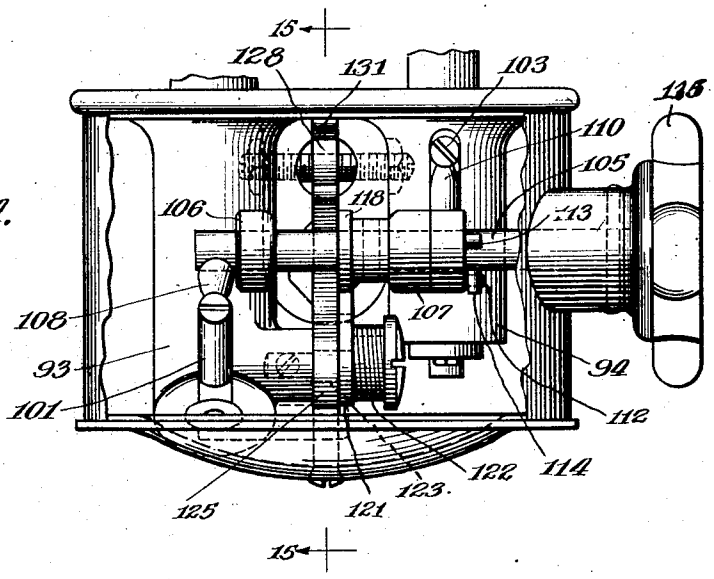
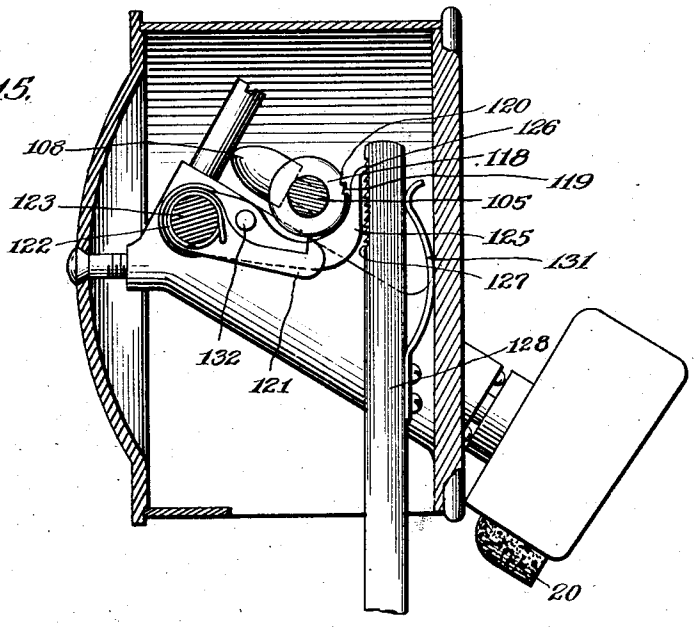


Fig. 15.



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Patented May 10, 1932 1,857,421

UNITED STATES PATENT OFFICE

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SHARPENER FOR SLICING MACHINES

Application filed May 12, 1927. Serial No. 190,758.

This invention relates to mechanism for sharpening the rotary circular knives of machines for slicing meat or other material, and has for one of its objects the provision of a sharpener having stones for grinding the bevel of one side of the slicing knife and for removing the burr formed at the opposite side of the knife, together with operating mechanism for the stones which shall require the stones to operate in proper sequence to give the best results.

A further object is to provide a mounting for the grinders which is movable into and out of operative position relative to the knife without injury to the edge of the knife.

A further object is to provide grinding mechanism which shall be of improved construction and operation.

Other objects will appear from the following description.

The invention is exemplified in the combination and arrangement of parts shown in the accompanying drawings and described in the following specification, and it is more particularly pointed out in the appended claims.

In the drawings—

Fig. 1 is a vertical sectional view of a knife sharpener showing one embodiment of the present invention;

Fig. 2 is a rear elevation of the sharpener shown in Fig. 1, with parts in section;

Fig. 3 is a top plan view of the mechanism shown in Figs. 1 and 2, with parts broken away;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a section on line 5—5 of Fig. 1;

Fig. 6 is a fragmentary view showing the stones in projected position but out of operative relation to the knife;

Fig. 7 is a fragmentary sectional view of a modified form of control for the grinding stones;

Fig. 8 is a section on line 8—8 of Fig. 7;

Fig. 9 is an elevation of the spring detent as shown in Figs. 7 and 8;

Fig. 10 is a section on line 10 of Fig. 3;

Fig. 11 is an elevation, with parts in section, showing a portion of a slicing machine having another form of the invention applied thereto;

Fig. 12 is a section substantially on line 12—12 of Fig. 11;

Fig. 13 is a section substantially on line 13—13 of Fig. 11;

Fig. 14 is a top plan view of the sharpener, with a part of the casing broken away; and

Fig. 15 is a section on line 15—15 of Fig. 14.

In grinding the rotary circular knives of slicing machines, it is desirable that the sharpening shall be done by grinding a bevel on the convex side of the knife and that after the grinding operation is completed, a stone shall be run along the opposite side of the edge of the knife to remove the burr formed by the grinding. To secure the best results, the finishing stone for removing the burr should not be permitted to pass along the edge of the knife more than once after the grinding operation has been completed and the grinding stone should not be permitted to engage the edge of the knife to produce a further burr after the finishing stone has passed along the knife edge. The present invention provides means for compelling proper sequence of the operation of the two stones and for avoiding injury to the edge after it has been formed.

Referring first to Figs. 1 to 6, inclusive, the numeral 10 designates the bearing of a slicing machine having a rotary circular disc knife 11 journaled thereon. A casing 12 is mounted on the bearing 10 and is provided with sleeves 13 and 14 supported on the front wall 15 of the housing 12. Bushings 16 and 17 are slidably mounted in the sleeves 13 and 14, respectively, and spindles 18 and 19 are journaled in the bushings 16 and 17, respectively. The spindle 18 carries a grinder 20 at its forward end disposed at the proper angle to engage the beveled face of the knife 11 for sharpening the edge of the knife. The spindle 19 carries the finishing stone 21. A spring 22 tends to project the stone 20 toward the knife 11 and a spring 23 tends to retract the stone 21 toward the knife 11. A shaft 24 is journaled in lugs 25 on the sleeves 13 and 14 and is provided with cam fingers 26 and 27 for engaging pins 28 and 29 secured to the bushings 16 and 17, respectively. A

spring 30 surrounds the shaft 24 and has one end secured to a collar 31 fixed to the shaft 28 and the other end held by one of the lugs 25. The spring 30 tends to rotate the shaft 24 in a clockwise direction, as viewed in Fig. 1, and is of sufficient strength to move the spindles 18 and 19 against the force of the springs 22 and 23. When the shaft 24 is free to rotate under the force of the spring 30 therefor the grinding stones 20 and 21 will be withdrawn from engagement with the knife 11 by the action of this spring through the cam fingers 26 and 27.

The end of the shaft 24 projects from the casing 12, as shown in Fig. 2, and is provided with a hand wheel 32 by means of which the shaft may be rotated against the force of the spring 30. The hand wheel 32 is secured to the end of the shaft 24 by means of a pin 33. A ratchet wheel 34 is slidably mounted on the shaft 24 adjacent the inner side of the hand wheel 32 and is pressed against the face of the hand wheel by a spring 35. As shown in Figs. 2 and 4, the ratchet wheel 34 is provided with a circumferential flange 36 having notches 37 and 38 therein. A detent 39 is arranged to engage the notches 37 and 38 to hold the shaft 24 against rotation under the force of the spring 30. The ratchet wheel 34 is provided with a reduced portion 40 immediately adjacent the flange 36, the surface of the reduced portion being flush with the bottom of the notches 37 and 38. A pair of pins 41 are secured to the ratchet wheel 34 and are slidably mounted in perforations in the hub portion 42 of the hand wheel 32. The outer ends of the pins 41 carry a push button 43. When the button 43 is pressed inwardly against the force of the spring 35, the ratchet wheel 34 will be slid inwardly to bring the reduced portion 40 into registration with the detent 39. It is apparent that this will free the ratchet wheel from the detent 39 and immediately release the shaft 24 and permit it to rotate under the force of the spring 30.

In operating the device to sharpen the knife 11, starting with the parts in position shown in Fig. 1, the hand wheel 32 will be rotated in a counter-clockwise direction and the cam fingers 26 are so located that the first effect will be to release the bushing 16 and permit the spring 22 to move the stone 20 into grinding contact with the beveled edge of the knife 11. The knife 11 is then rotated until the edge has been sharpened. The shaft 24 is held in the position to which it has been turned by engagement of the detent 39 with the notch 37 in the ratchet wheel 34. After the knife has been properly sharpened the hand wheel 32 is further rotated to bring the notch 38 into engagement with the detent 39. This will cause the stone 21 to engage the straight side of the knife edge and remove the burr formed by the grinder 20. The grinding operation can be continued with the parts in this position, if desired, for the stone 21 will continue to remove the burr formed by the stone 20 so long as both stones are in contact with the knife. It is only necessary, however, to rotate the knife a complete turn while the stones are in this position. The detent 39 prevents the operator from reversely rotating the hand wheel 32 to release the stones. When the grinding operation is completed, instead of releasing the stones by a reverse movement controlled by the hand of the operator, the release is accomplished by pressing the button 43 which trips the detent 39 and permits the spring 30 to release the stones by a quick action.

In order that the cam 27 may remain stationary and hold the grinder 21 away from the knife until after the grinder 20 has moved into contact therewith, the cam finger 27 has a limited rotary movement relative to the shaft 24. To produce this result the cam finger 27 is provided with a notch 75, as shown in Fig. 10, and a stop 76 is secured to the shaft 24 and operates in the notch 75 to limit the movement of the cam finger 27 relative to the shaft. When the parts are in the position shown in Fig. 1 the end of the cam finger 27 engages a groove 77 in the pin 29. As the shaft 24 is rotated in a counter-clockwise direction, as viewed in Fig. 1, the cam finger 27 will remain stationary until the stop 76 has engaged the lower end of the notch 75. This permits the grinder 20 to engage the knife 11. Further rotation of the shaft to shift the detent 39 from the notch 37 to the notch 38 in the ratchet wheel 34 will release the cam finger 27 from the groove 77 and free the grinder 21 so that it moves inwardly into contact with the knife 11 to remove the burr therefrom.

After the release of the cam finger 27 from the notch 77, the action of the pin 29 and of gravity moves the cam finger 27 in a counter-clockwise direction, as viewed in Fig. 1, to return the finger to the position, relative to the shaft 24, shown in Fig. 10. It will be noted from Fig. 1 that the grinder 20 has a greater distance to move before engaging the knife than has the grinder 21 so that the cam finger 27 will be separated from its pin 29 and upon reverse movement of the shaft will not reengage the pin 29 until after the grinder 20 has been disengaged from the beveled edge of the knife. The slight interval between disengagement of the two grinders permits the portion of the periphery of the knife interposed between the two grinders at the time the grinder 20 is removed to traverse the grinder 21 before its removal, thus insuring removal of the burr from this small portion of the knife edge. The parts are so adjusted that the time elapsing between the withdrawal of the stones is sufficient to permit a point on the periphery of the blade 11 to travel from the stone 20 past the stone 21.

If the two stones were removed exactly simultaneously, there would be a short space along the edge equal to the peripheral distance between the two stones from which the burr had not been removed, but by removing the stone 21 a very small interval of time after the removal of the stone 20 the portion of the blade which is interposed between the two stones at the time the stone 20 is removed is permitted to travel past the stone 21 before the stone 21 is removed. In this way the stone 21 travels along the entire peripheral edge of the blade after the final passage of the stone 21 thereover.

The housing 12 is supported on a pin 45 which is adjustably mounted in a sleeve 46, the sleeve being mounted to slide in a socket member 47. The thumb nut 48 is threaded on the pin 45 for adjusting the height of the housing 12 relative to the sleeve 46. A tooth 49 on the nut 48 engages a notch in the end of the sleeve 46 to prevent accidental rotation of the nut 48. A lever 50 is pivoted at 51 on the socket member 47 and is provided with a tooth 52 which enters a slot 53 in the sleeve 46 and holds the sleeve 46 in position in the socket member 47. The socket member 47 is mounted to slide horizontally on guide pins 54 and 55 which are supported by a flange 56 on the bearing 10. The member 47 is provided with a sleeve 57 which accurately fits the guide pin 54 while the pin 55 is engaged by bifurcations 58 which hold the socket member 47 from rotation about the pin 54 as an axis. The lower end of the sleeve 46 is provided with a stud 59 arranged to enter a recess 60 in the top of the bearing 10. A depression 61 is provided for receiving the bottom end of the stud 59 when the grinder is retracted away from the knife 11. It will be apparent that the grinder cannot be retracted so long as the housing 12 is in the position shown in Fig. 1. It is necessary to depress the lever 50 and raise the sleeve 46 and housing 12 at the same time releasing the stud 59 before the housing can be retracted. This lifting of the grinder by the lever 50 raises the stone 21 a sufficient distance to clear the edge of the knife 11 so that the knife cannot be injured by the movement of the grinder into its retracted position. Conversely the stones cannot be lowered on reverse movement of the grinder toward operative position until the stones are in position to clear the edge of the knife. If the housing should be raised and lowered while in its operative position, it is apparent that no injury will be done so long as the stones are retracted, as shown in Fig. 1. If the hand wheel 32 should be rotated to bring the stones into operative position the edge of the knife would still be uninjured because of the relation which the stones bear to each other, as indicated in Fig. 6. Lifting the stones would not injure the edge of the knife since in this movement the stones would be withdrawn away from the edge of the knife. The spindles 18 and 19 are so positioned that if the stones are projected they will take the position shown in Fig. 6 and if the casing 12 should be lowered while the stones are in this position, the stone 20 is first to engage the knife 11, and since this stone strikes the beveled face of the edge and not the sharpened portion, no injury is done as would be the case if the stone 21 were positioned to strike the edge of the knife first.

The height of the stones is regulated by the adjustment nut 48 by means of which the stones are adjusted to the proper position for grinding the edge of the knife. As the knife wears away the housing 12 may be adjusted downwardly by rotating the nut 48. When the stones are in proper relation to the knife depression of the lever 50 will impart sufficient movement to the upper stone 21 to raise it clear of the knife. This relation may be used for determining the proper adjustment of the nut 48. The operator may be instructed to depress the lever 50 and then rotate the nut 48 until the stone 21 clears the edge of the knife by a desired amount as, for instance, a sixteenth of an inch. This will insure proper position of the stones for grinding when the lever 50 is released. The adjustment is easily accomplished without removing the housing from its support and the amount of movement produced by the lever 50 is independent of the adjustment of the nut 48. The housing is prevented from horizontal rotation about the axis of the supporting pin 45 by means of a pin 62 projecting downwardly from the housing 12 and extending through an opening 63 in a lug 64 on the sleeve 47. Adjustment screws 65 engage opposite faces of the pin 62 so that the angular position of the housing 12 may be accurately adjusted to aline the flat face of the grinder 21 with the plane of the cutting edge of the knife.

In the modification shown in Figs. 7, 8 and 9, the support for the grinders is similar to that in the form already described, but a different form of ratchet mechanism for controlling the shaft 24 is employed. In this modification the hand wheel 66 is provided with a tooth 67 projecting into the housing in position to engage the teeth 68 and 69 on a disc 70 surrounding the shaft 24 and supported by a spring 71. It is apparent that the teeth 67, 68 and 69 form a ratchet mechanism which operate to hold the shaft 24 against rotation in a manner similar to the ratchet mechanism previously described. A push button 72 is slidably mounted in the case 73 in position to engage the spring 71 and move it inwardly to release the shaft 24 for retracting the grinders.

In the form of the invention shown in Figs. 11 to 15, inclusive, the socket member 47 is provided with the horizontal sleeve 76 slid-

ably mounted on the rod 54 supported on the bearing member 10. A bifurcated arm 78 engages a rectangular slide 79 at the side of the support 10 opposite the slide rod 54. A screw 80 limits the backward movement of the arm 78 on the slide 79 and an adjustable screw 81 bears against the under surface of the slide 79 to take up any play. The socket member 47 receives the sleeve 46 in which a post 83 is mounted for vertical adjustment. A thumb nut 84 is threaded on the post 83 and rests on the upper end of the sleeve 46. By means of the thumb nut 84 the post 83 may be adjusted relative to the sleeve 46. A lever 85 is pivoted at 86 in a slot formed in one side of the socket 47 and is provided with a nose-piece 87 which engages a slot 88 in the sleeve 46. The lower end of the sleeve 46 carries a pin 89 arranged to rest in an opening 90 in the top of the bearing member 10. When the lever 85 is depressed the pin 89 will be raised from the opening 90 so that the socket 47 may be slid along the guides 54 and 79 to move the grinder toward and away from the cutting plane of the knife. It will be apparent that the socket member 47 cannot be shifted along the guides 54 and 79 until the sharpener has been lifted a sufficient amount to cause the grinder 21 to clear the edge of the knife 11. A depression 91 is provided for receiving the lower end of the pin 89 when the sharpener is withdrawn from the knife. A housing 92 is supported on the upper end of the post 83 and carries inwardly extending sleeves 93 and 94 in which bushings 95 and 96, respectively, are slidably mounted. A shaft 97 is journaled in the bushing 95 and supports the grinder 20 at its forward end. A shaft 98 is journaled in the bushing 96 and supports the grinder 21 at its forward end. A spring 99 urges the bushing 95 and grinder 20 toward the knife 11 and a spring 100 tends to retract the bushing 96 and grinder 21 toward the other face of the knife 11. A pin 101 is secured to the bushing 95 and slides in a slot 102 in the sleeve 93. A pin 103 is secured to the sleeve 96 and slides in a slot 104 in the sleeve 94.

A shaft 105 is journaled in ears 106 and 107 on the sleeves 93 and 94, respectively. The shaft 105 carries a cam pin 108 which bears against the pin 101 to control the position of the grinder 20. A collar 109 is rotatably mounted on the shaft 105 and carries a cam pin 110 for engaging the pin 103. The pin 103 is provided with a peripheral notch 111 for receiving the point of the pin 110. The collar 109 has laterally projecting pins 112 and 113 which are angularly spaced relative to each other and a pin 114 projects radially from the shaft 105 between the pins 112 and 113 to limit the rotation of the collar 109 on the shaft 105. A hand wheel 115 is secured to the end of the shaft 105, as shown best in Fig. 11, and a spring 116 is attached at one end to the hand wheel 115 and at the opposite end by a screw 117 to the sleeve 94. The spring 116 tends to rotate the shaft 105 in a counter-clockwise direction, as viewed in Fig. 13. The spring 116 is of sufficient strength to force the cam pins 108 and 110 into the position shown in Fig. 13 to compress the springs 99 and 100 and withdraw the grinders from contact with the knife 11.

The shaft 105 is provided with a ratchet wheel 118 having two notches 119 and 120 in the periphery thereof. A pawl 121 is pressed against the periphery of the ratchet wheel 118 by a spring 122 so that when the notches 119 or 120 register with the nose of the pawl 121 the pawl will engage the notches and hold the ratchet wheel and shaft against rotation under the force of the spring 116. The pawl 121 is pivotally mounted on a screw 123 which is supported by a lug 124 on the sleeve 93. A trip arm 125 is also pivotally mounted on the screw 123 and is provided with a nose-piece 126 which engages notches 127 in an upright bar 128. The bar 128 is pivoted at 129 in a slot 130 in the socket 47. A spring 131 presses the top end of the bar 128 toward the nose of the trip arm 125. The arm 125 carries a pin 132 which overlies the pawl 121.

When the parts are in the position shown in the drawings and it is desired to grind the knife 11, the hand wheel 115 is turned to rotate the shaft 105 in a clockwise direction, as viewed in Figs. 13 and 15, against the force of the spring 116. This will move the cam pin 108 upwardly and to the right and release the pin 101 so that the grinder 20 is moved forwardly by the spring 99 into contact with the beveled edge of the knife 11. When the shaft 105 is rotated to bring the notch 119 into engagement with the pawl 121, the shaft will be held in this position so that by rotation of the knife 11 the edge of the knife will be sharpened by the grinder 20. The rotation of the shaft 105 to this extent does not affect the sleeve 109 and the cam pin 110 since the pin 114 is merely moved in a clockwise direction to a point adjacent the pin 113. After the parts remain in this position a sufficient length of time to grind the knife the hand wheel 115 is given a slight additional movement in the same direction as before to bring the notch 120 into engagement with the pawl 121. During this additional movement the pin 114 will engage the pin 113 and rotate the collar 109 and cam pin 110 a sufficient amount to bring the pin 110 out of mesh with the peripheral groove 111 in the pin 103. This will free the pin 103 so that the spring 100 will draw the grinder 21 against the flat face of the knife in position to remove any burr formed by the grinder 20. The force of the pin 103 against the cam pin 110 and the action of gravity will cause the sleeve 109 to rotate upon the shaft 105 until the pin 112 again engages the pin 114. The

knife 11 will be given one or more turns with both stones in contact with the knife to remove the burr from the entire edge of the knife. After the sharpening operation has been thus completed, it is only necessary for the operator to press down the lever 85 and withdraw the socket 47. When the lever 85 is operated the grinders will be withdrawn in the proper order from the knife 11 through the action of the trip arm 125 and bar 128. It will be apparent that when the sleeve 46 is lifted by the lever 85, the housing 92 will be carried upwardly, but the bar 128 will remain stationary. This will produce a relatively downward pull on the trip arm 125 which will cause the pin 132 to engage the pawl 121 and release the pawl from the ratchet wheel 118. The spring 116 will then operate to rotate the shaft 105 to the position shown in Figs. 12 and 13.

It will be seen from Fig. 12 that the grinder 20 is normally further removed from the knife 11 than the grinder 21 so that at the time the grinders are placed into engagement with the knife the cam finger 110 will have a greater amount of rotation after its grinder 21 has been arrested by the knife 11 than will the cam finger 108 after its grinder 20 has been arrested. Upon reverse movement of the shaft 105 therefore the grinder 20 will be picked up by its cam finger and withdrawn from contact with the knife 11 slightly in advance of the withdrawal of the grinder 21. This interval of time between the removal of the two grinders permits the portion of the periphery between the contact points of the two grinders to traverse the grinder 21 before the grinder 20 is removed. If the two grinders were removed exactly simultaneously there would be a slight space on the periphery of the knife from which the burr formed by the grinder 20 would not have been removed by the grinder 21. It will be seen that the sharpener cannot be withdrawn from its position over the knife until the lever 85 has been depressed to raise the grinder 21 a sufficient amount to clear the edge of the knife. The same operation which lifts the sharpener automatically, releases the spring 116 to withdraw the grinders in the proper order from contact with the edge of the knife.

It will be seen from Fig. 11 that the portion of the grinder 20 which engages the knife 11 is in alinement with the vertical radius of the knife. As the knife is worn away, the position of the sharpener may be adjusted by rotating the thumb nut 84. This will cause the contact portion of the grinder 20 to travel inwardly in a radial direction relative to the knife 11 so that the grinder, at its point of contact with the knife, will always have the same relation to the knife irrespectively of the diameter of the knife. It will be noted that the thumb nut 84 is held against rotation by the bar 128 and in order to release the nut for adjusting the vertical position of the sharpener it is necessary to move the bar 128 to the left, as viewed in Fig. 12. This will free the trip arm 125 from the teeth 127 so that the point of engagement between the trip arm 125 and the bar 128 will be adjusted to correspond to the new position of the sharpener. It is desirable to release the pawl 121 before the sharpener 21 is raised clear of the knife and for this reason it is desirable to maintain the proper position of contact between the teeth 127 and the trip arm 125 corresponding to the adjustment of the sharpener by the nut 84. The casing 92 is held against rotation about the axis of the socket 47 by the bar 128. The bar 128 passes through a slot in the base of the casing and opposite sides of the bar are engaged by adjustable screws 133 which permit slight adjustment of the angular position of the casing 92 about the axis of the socket 47.

When the housing 92 is in its retracted position it will be elevated because of the slight depth of the recess 91. In this position the control lever 125 will hold the pawl 121 out of engagement with the ratchet wheel 118 so that the spring 116 will hold the grinders in retracted position. If the hand wheel 115 is rotated to permit projection of the grinders the spring will immediately retract them again upon release of the hand wheel. This prevents the grinders from being present in their projected position prior to lowering thereof toward the knife and insures clearance space between the grinders and knife at that time so that the knife edge will not be injured by movement of the grinders downwardly toward the knife.

I claim:—

1. A sharpener for a slicing machine knife comprising a pair of grinders arranged to engage opposite sides of a knife to be sharpened, springs for moving said sharpener into engagement with said knife, cams for controlling the movement of said sharpeners to effect a predetermined sequence of contact of said sharpeners with said knife, a spring for operating said cams to retract said sharpeners from engagement with said knife, a detent for holding said spring inoperative, and means for releasing said detent to permit quick retraction of said sharpeners by said spring.

2. A sharpener for a rotary circular slicing machine blade comprising a pair of grinders spaced circumferentially of said blade from each other, a spring for retracting said grinders from said blade, manual means for opposing said spring to permit movement of said grinders into engagement with said blade, a detent for holding said spring in position to permit said grinders to engage said blade, and means for releasing said detent to permit quick withdrawal of said grinders from said blade under the influence of said spring, said spring

being arranged to effect the withdrawal of said grinders successively at an interval of time sufficient to permit the portion of the blade lying between said grinders when the first grinder is withdrawn to be traversed by the other grinder before its withdrawal.

3. In a slicing machine having a rotary circular slicing knife and a support therefor, a sharpener comprising a pair of grinders, springs for urging said grinders toward said knife transversely of the plane of said knife, a spring for retracting said grinders, a detent for holding said retracting spring, and means for releasing said detent to permit retraction of said grinders when said grinder support is shifted.

4. In a slicing machine having a slicing knife and a support therefor, a sharpener for said knife comprising a pair of grinders, a spring for retracting said grinders from said knife transversely of the cutting plane of said knife, means for shifting said grinders in a direction transverse to the edge of said knife and parallel to the cutting plane thereof, a detent for preventing action of said retracting spring, and means for releasing said detent when said grinders are shifted parallel to the plane of said knife away from said knife.

5. In a slicing machine, a slicing knife having the edge thereof beveled at one side, a grinder for engaging the beveled side of said edge, a second grinder for engaging the opposite side of said edge, springs for moving said grinders toward said knife, a support for said grinders, means for moving said support away from said knife in a direction parallel to the plane of said knife, a spring for retracting said grinders from said knife transversely of the plane of said knife, a member operated by said retracting spring and connecting said retracting spring with said grinders and having lost motion connection with the second-mentioned grinder to permit movement of the first-mentioned grinder into contact with the beveled side of said edge prior to contact of the second-mentioned grinder with said knife, a detent for controlling said retracting spring, and means for releasing said detent when said grinder support is shifted in the direction of the plane of said knife to permit withdrawal of said grinders under the action of said retracting spring and free from manual regulation, the connection between said retracting spring and grinders being arranged to effect withdrawal of said grinders in reverse order from their movement into engagement with said knife.

6. In a sharpener for slicing machine knives a support, a grinder mounted on said support, said support being movable into and out of operative position relative to said knife, a spring for moving said grinder into an inoperative position on said support, a detent for holding said spring against operation, and means for preventing operation of said detent when said support is in inoperative relation with said knife.

7. In a slicing machine having a slicing knife, a grinder disposed when in operative position on one side of said knife, a support for said grinder on the other side of said knife, a guide upon which said support is movable away from said knife substantially parallel to the axis thereof, said support having a projecting part fitting into a recess, and means for raising said support to permit movement thereof away from said knife.

8. A sharpener for a slicing machine knife comprising a pair of grinders one applied to one side of the knife edge to sharpen the knife and the other applied to the opposite edge of the knife to remove the burr, means controlling the movement of said grinders to effect the application of said grinders successively, a spring for retracting both of said grinders from engagement with said knife, ratchet mechanism having a plurality of positions of adjustment for controlling said spring to effect the application of the sharpening grinder only or the application of both of said grinders to said knife, and means for releasing said ratchet mechanism to permit said spring to effect quick withdrawal of said grinders from engagement with said knife.

9. A sharpener for a slicing machine knife comprising a sharpening grinder and a burr removing grinder, springs for moving said grinders into engagement with the knife, cams for withdrawing said grinders against the force of said springs, a retractive spring for operating said cams, ratchet mechanism having a plurality of positions of adjustment for controlling the positions of said cams to effect the application of the sharpening grinder alone or both of said grinders to said knife, and means for releasing said ratchet mechanism to permit said retractive spring to effect quick withdrawal of both of said grinders from engagement with said knife.

10. A sharpener for a slicing machine knife comprising a pair of grinders, springs for moving said grinders into contact with the opposite portions of said knife, a retractive spring of greater effective force than both of said first mentioned springs combined and arranged to operate against the combined forces of said first-mentioned springs to retract said grinders from engagement with said knife, ratchet mechanism for controlling said retractive spring to hold one or both of said grinders in engagement with said knife, means for releasing said ratchet mechanism, and mechanism automatically operated by said retractive spring to first remove one of said grinders and then the other from engagement with said knife.

11. The combination with a slicing machine knife, of a sharpener for said knife dis-

posed at one side of said knife when in operative position, means for guiding said sharpener toward and from said knife along rectilinear lines parallel to the axis of the knife, means for elevating the sharpener while being moved toward said knife and moved down into operative relation with said knife when released, and means for effecting the application of the sharpener to the knife.

12. The combination with a slicing machine knife, of a sharpener comprising a pair of grinders adapted to be disposed on opposite sides of the cutting edge of the knife, means for guiding the sharpener as a unit toward and away from the edge of the knife along the rectilinear lines at right angles to the cutting plane of the knife, means for lifting the sharpener while it is being moved toward the knife so as to enable one of the grinders to clear the edge of the knife as it moves over and beyond the same, and means for effecting the application of the grinders to the knife after being brought into operative relation therewith.

13. The combination with a slicing machine knife, of a sharpener comprising a sharpening grinder and a burr removing grinder, means for moving said sharpener into and out of operative relation with said knife, means comprising a manually actuated device for elevating the sharpener during its movement toward operative position to enable the burr removing grinder to clear the edge of the knife and move into operative relation with the opposite side thereof, said grinders moving automatically into operative position with said knife when said actuating device is released, and means for effecting application of said grinders to the knife after being brought into operative relation therewith.

14. The combination with a slicing machine knife, of a sharpener therefor, means for supporting said sharpener for movement toward and from the knife, a detent for holding the sharpener in its operative and inoperative positions, and means for releasing such detent and moving the sharpener into position for clearing the knife edge when the sharpener is being moved into or out of operative relation with said knife.

15. The combination with a rotary circular slicing machine knife, of a sharpener for said knife, a guide for said sharpener to direct the same into and out of operative relation with said knife along rectilinear lines parallel to the axis of the knife, means for holding said sharpener at such a predetermined radial distance from the axis of said knife as to prevent the sharpener from engaging the knife while being moved into or out of operative relation therewith, and means for holding the sharpener in operative relation with said knife.

16. The combination with a rotary circular slicing machine knife, of a sharpener for said knife, a support for said sharpener comprising guides on which said sharpener may slide into and out of operative relation with said slicing machine knife, locking mechanism for holding the sharpener in operative relation to said knife, and means associated with said support for compelling sufficient radial movement of the sharpener upon release of said locking mechanism to prevent contact of said sharpener with said knife during the movement of the sharpener into and out of operative relation with said knife.

17. The combination with a rotary circular slicing machine knife, of a sharpener for said knife, telescoping members for supporting said sharpener, means for extending said telescoping members to vary the position of said sharpener relative to said knife, and means comprising a lever for manually moving said telescoping members as a unit along rectilinear lines without changing their relative adjustment to move said sharpener along rectilinear lines radially with respect to said slicing machine knife.

18. The combination with a rotary circular slicing machine knife, of a sharpener for said knife, a support, an extensible connection between said support and said sharpener, means for adjusting said connection to adjust the position of said sharpener, means to prevent rotation of said sharpener relatively to said support, and a lever pivoted to said support for moving said connection relatively to said support along rectilinear lines to effect rectilinear movement of said sharpener radially with respect to said circular slicing machine knife.

19. The combination with a slicing machine knife having a beveled edge, of an inclined sharpening grinder adapted to be applied to said beveled edge, a second grinder adapted to be applied to the opposite edge of the knife, means controlled by a rotary knob for effecting the application of the sharpening grinder and burr removing grinder to the knife successively, and means operated by a push button for automatically removing the sharpening grinder and the burr removing grinder successively from engagement with the knife.

20. The combination with a rotary circular slicing machine knife having a beveled edge, of a sharpening grinder adapted to occupy an inclined position adjacent the said beveled edge, a second grinder adjacent the opposite edge of the knife, means for supporting said grinders for movement toward and from the knife, means controlled by a rotary knob for effecting the application of the grinders to the knife, and mechanism operable independently of the rotation of said knob for automatically releasing the inclined sharpening grinder from engagement with the knife and the release of the burr removing grinder from engagement

with the knife successively to effect the application of the burr removing grinder to the knife for a short interval after the removal of the sharpening grinder.

21. A sharpener for a rotary slicing machine knife blade comprising a pair of grinders, means for supporting said grinders in operative relation to the cutting edge of the blade at opposite sides thereof and spaced apart circumferentially with respect to said circular slicing machine blade, means for effecting the application of said grinders to the cutting edge of said blade, and mechanism for freeing said grinders from said blade successively with a predetermined intervening interval to afford the grinder last freed the opportunity to remove the burr from that portion of the blade between the grinders at the time the first grinder is free.

22. In a slicing machine, the combination with a slicing knife, of a support therefor, a sharpener for said knife comprising a pair of grinders and a grinder support, adjustable mechanism for mounting said grinder support on said knife support at adjusted radial distance of the grinder support from said knife support, a bar connected between said knife support and said grinder support to prevent rotation of the sharpener relatively to the knife support, and means for securing said bar in position to hold the grinders at adjusted radial distance from the axis of the knife.

23. In a slicing machine having a circular knife and a support therefor, the combination with a sharpener for said knife comprising a grinder adapted to engage the periphery of said knife, of means for mounting said sharpener on said support for adjustment of the sharpener radially relative to the knife, means comprising a sliding connection between said sharpener and said support for preventing rotation of the sharpener relatively to said support, and means for moving said sharpener along rectilinear lines to take the sharpener out of its operative relation to said knife.

24. A sharpener for a slicing machine knife comprising a pair of grinders movable toward and away from such knife, means for effecting the application of said grinders to said knife, a spring for retracting said grinders from engagement with said knife, ratchet mechanism having a plurality of positions of adjustment for holding one or both of said grinders in contact with said knife, and means for releasing said ratchet mechanism to cause said spring to effect quick withdrawal of the grinder or grinders from engagement with said knife.

25. In a slicing machine, the combination with a slicing knife, of a sharpening grinder, a burr removing grinder, means for shifting said grinder successively into contact with said knife by movement transversely to the plane of said knife, means for shifting said grinders away from said knife in a direction parallel to the plane of said knife, and means acting automatically when said grinders are moved away from said knife in a direction parallel to the plane of said knife to move the said grinders out of contact with said knife transversely to the plane of said knife and in reverse order from their movement into contact with said knife to cause the burr removing grinder to remain in contact with the knife a short interval of time after the sharpening grinder has been removed.

26. In a slicing machine, the combination with a slicing knife having a beveled edge, of a sharpening grinder movable into contact with the beveled side of said edge, a burr removing grinder for engaging the opposite side of said edge, and cam-controlled springs for moving said grinders into and out of engagement with said knife, arranged to bring the sharpening grinder into contact with the beveled edge while the other grinder is out of engagement with said knife and to effect withdrawal of said grinders from said knife in reverse order to their movement into engagement therewith, to cause the burr removing grinder to remain in contact a short interval of time after the sharpening grinder has been removed, the withdrawal of said grinders being effected by spring movement independent of manual regulation.

27. In a sharpener for the rotary knife of a slicing machine, the combination with a supporting base having a recess therein, of a supporting element having a tubular guideway therein, means connecting said supporting element to said supporting base for sliding movement relatively thereto in a direction substantially parallel to the axis of the knife of the slicing machine, a sharpener, an auxiliary support for said sharpener extending into said tubular guideway, a projection on the inner end of said auxiliary support adapted to fit into said recess to hold said supporting element together with said auxiliary support and said sharpener in a predetermined position relative to the knife of the slicing machine, and means for preventing rotation of the sharpener relative to said supporting element.

28. In a slicing machine, the combination with a knife sharpener, of a support, a cylindrical guideway in said support, a screw-threaded stud secured to said sharpener, a sleeve fitting in said guideway for rotation therein and having internal screw threads meshing with the screw threads on said stud, a knurled head on said sleeve to turn the same on said stud to lift or lower the latter and thereby adjust the position of said sharpener, and means for guiding the up and down movements of the sharpener.

29. In a slicing machine, the combination with a sharpener for the slicing machine

knife, of a pedestal for supporting said sharpener, means for guiding the pedestal along lines parallel to the axis of the knife, and means for extending the pedestal to move the sharpener radially away from the axis of the knife while the sharpener is being moved toward its operative position in relation to the knife.

30. In a slicing machine, the combination with a supporting base, of a sharpener for the knife of the slicing machine, an extensible pedestal connected to said sharpener, guiding mechanism between said pedestal and said supporting base, a lever for extending said pedestal to move the sharpener into position to clear the knife while the sharpener is being moved to and from its operative position in relation to the knife, and means coacting with said guiding mechanism and said pedestal for preventing contact of the sharpener with the knife except when brought into operative relation therewith.

In testimony whereof I have signed my name to this specification on this 5th day of May, A. D. 1927.

JOHN N. WOODINGTON.