Oct. 16, 1934. W. MAHLER 1,976,823

METHOD OF AND APPARATUS FOR SLICING BACON

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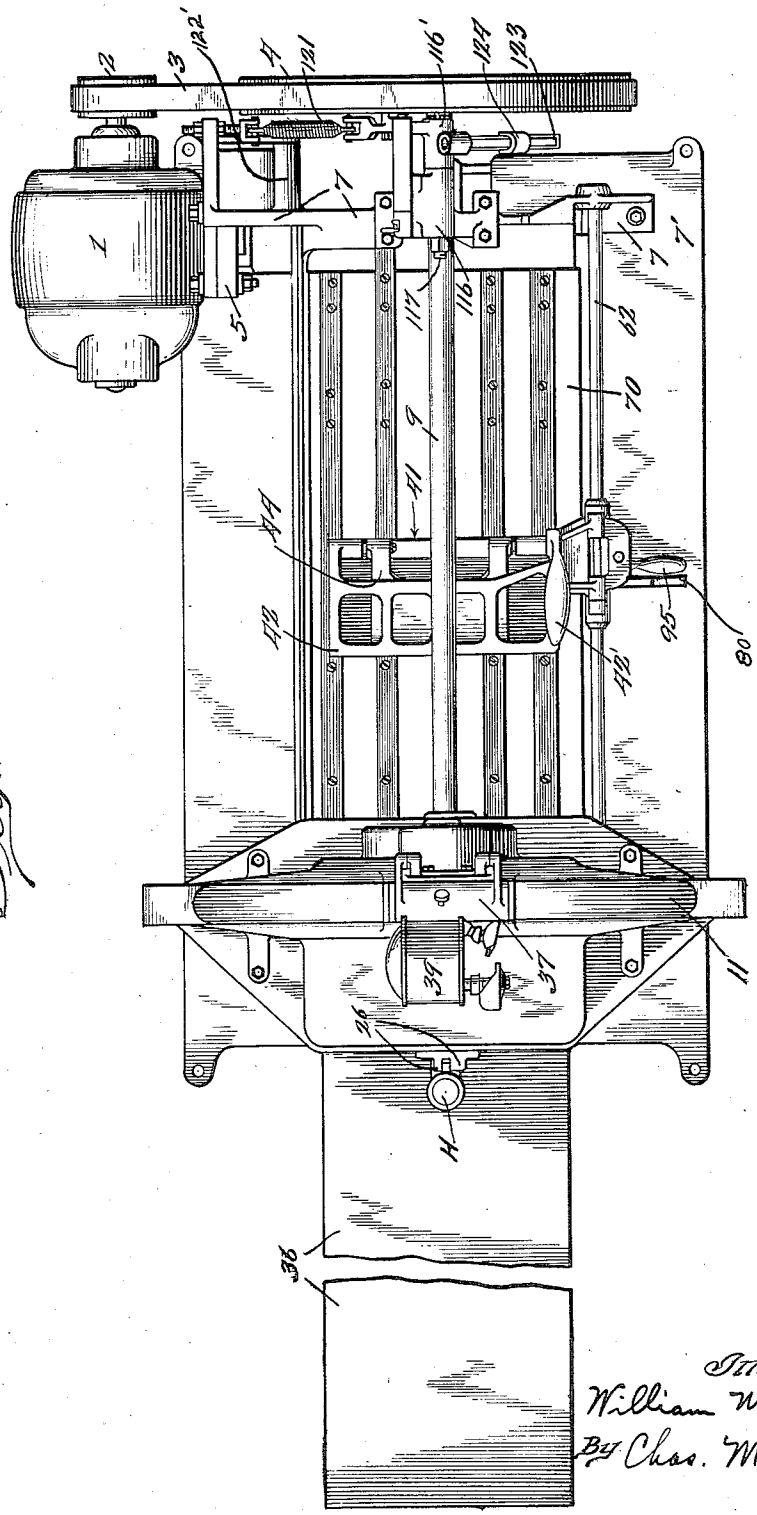


Fig. 1.

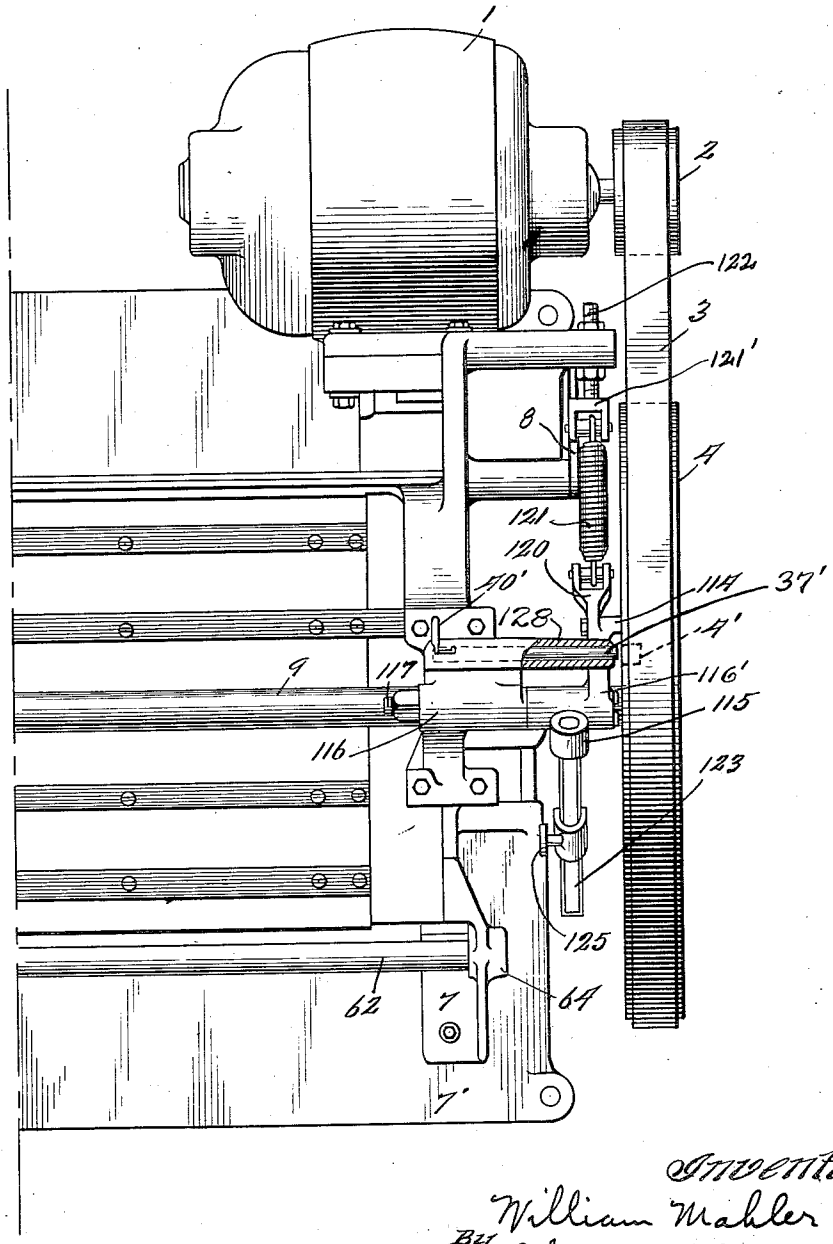
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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Fig. 2.



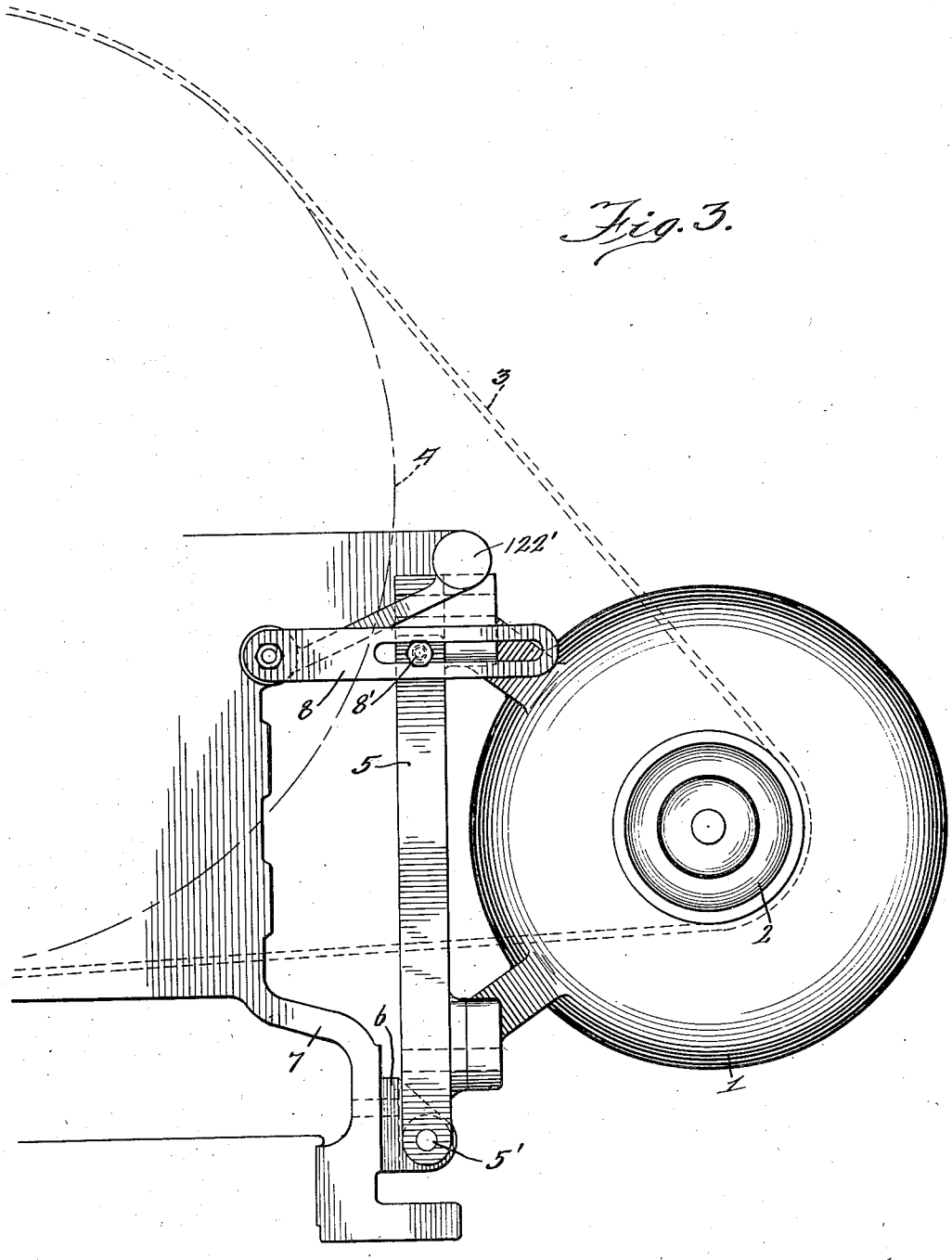
Inventor
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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Fig. 3.



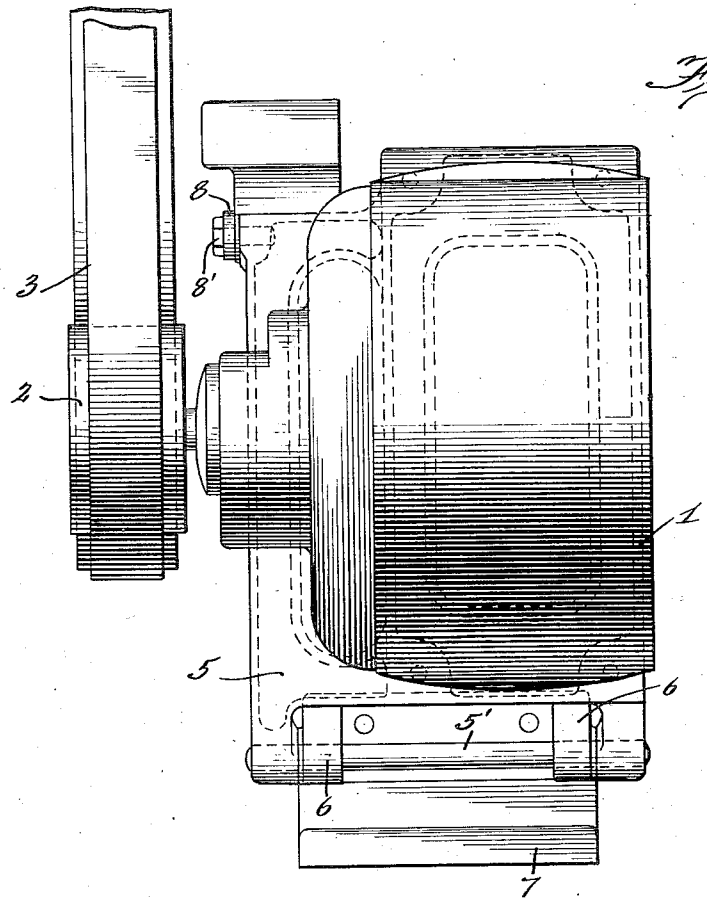
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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Fig. 4.



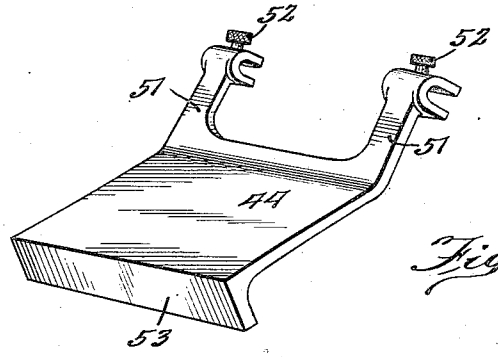


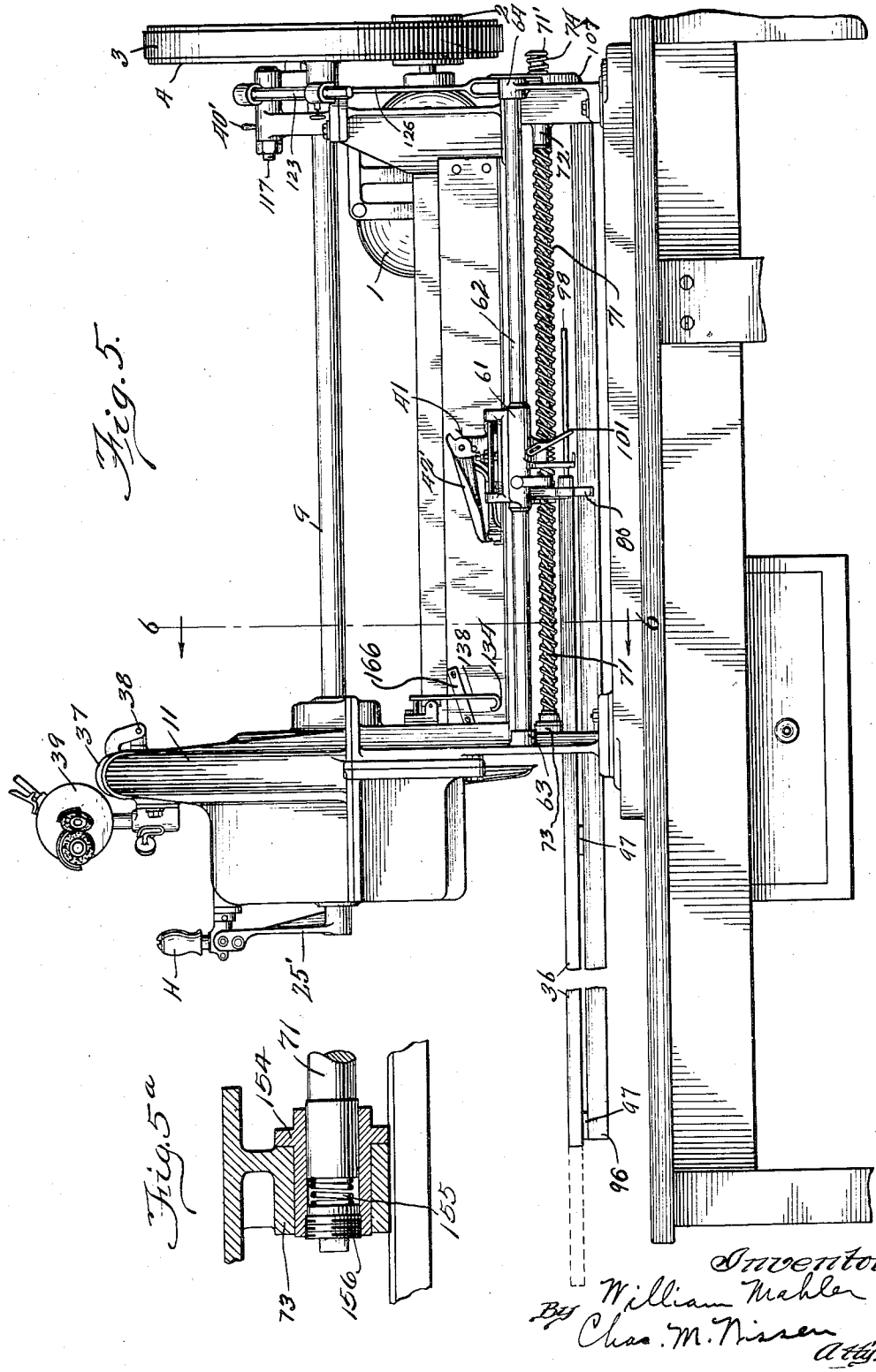
Fig. 4a

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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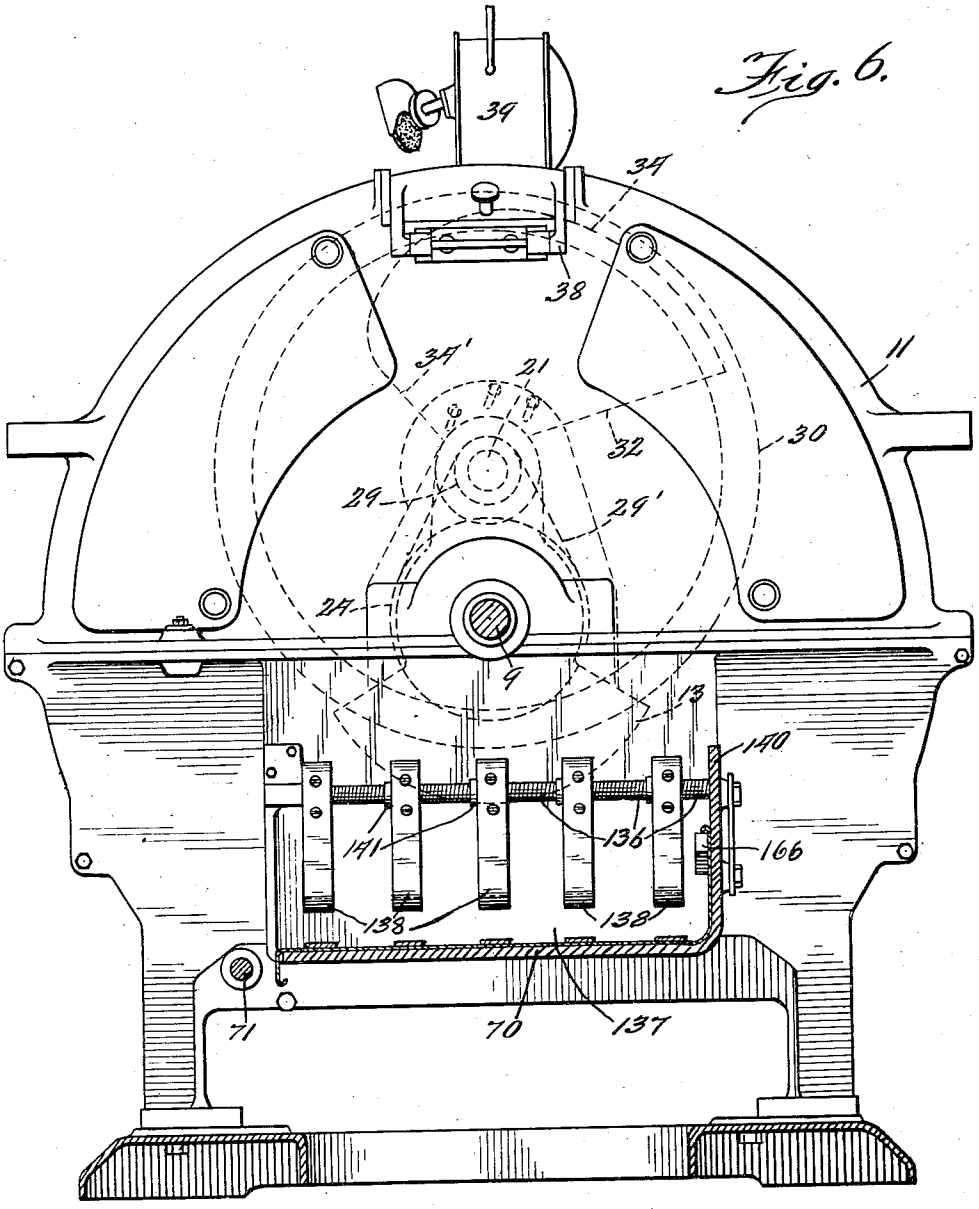
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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Fig. 6.



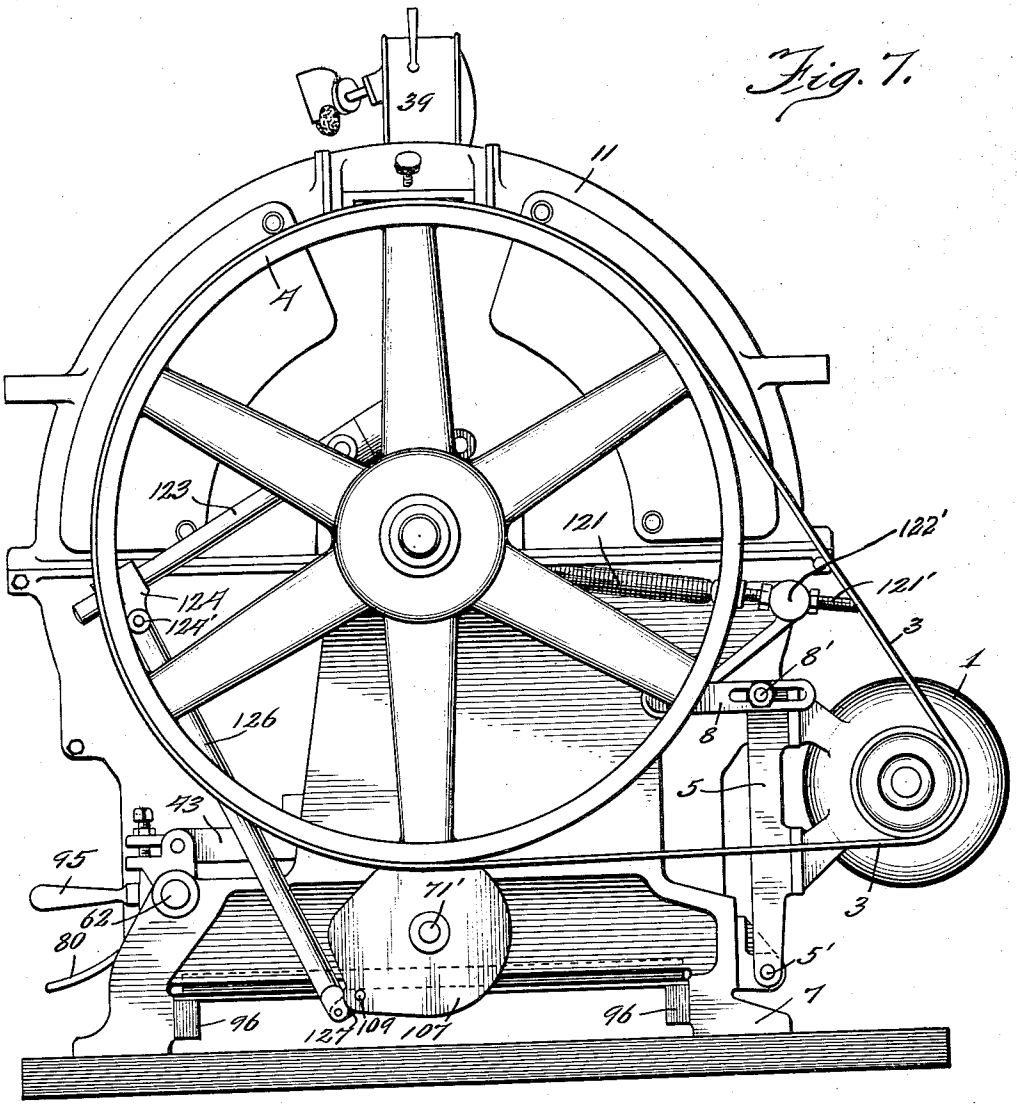
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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Fig. 7.



Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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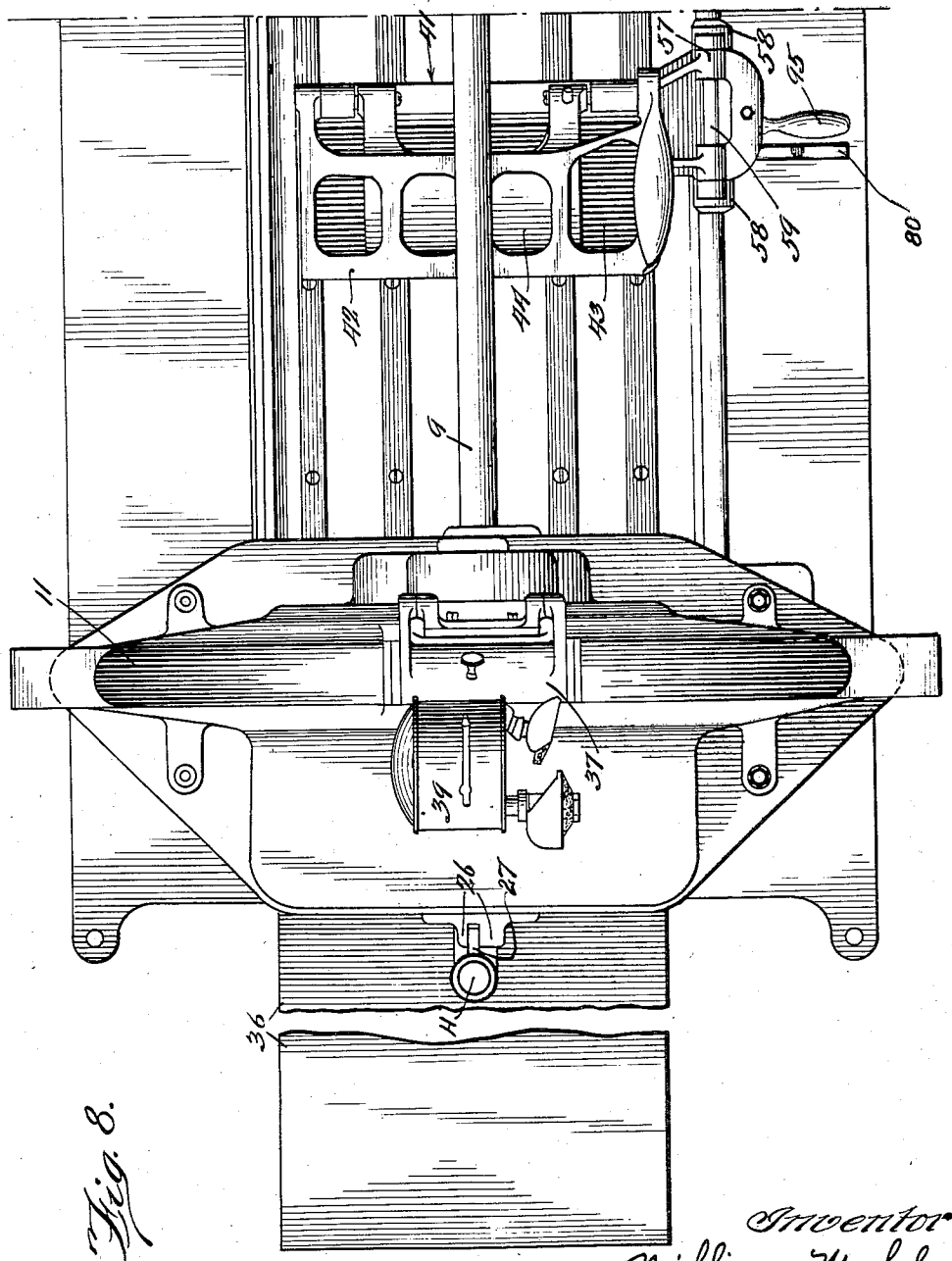


Fig. 8.

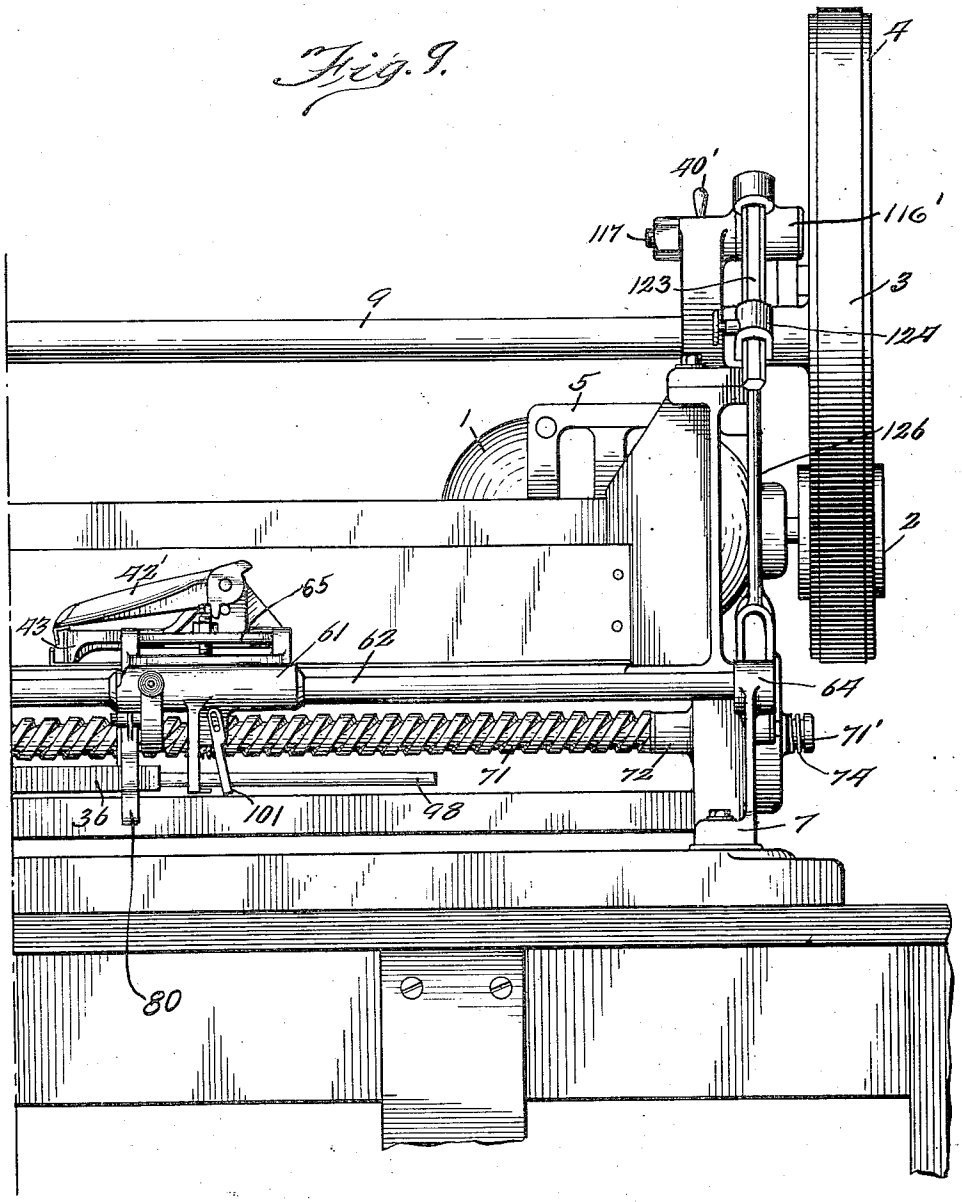
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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Fig. 9.



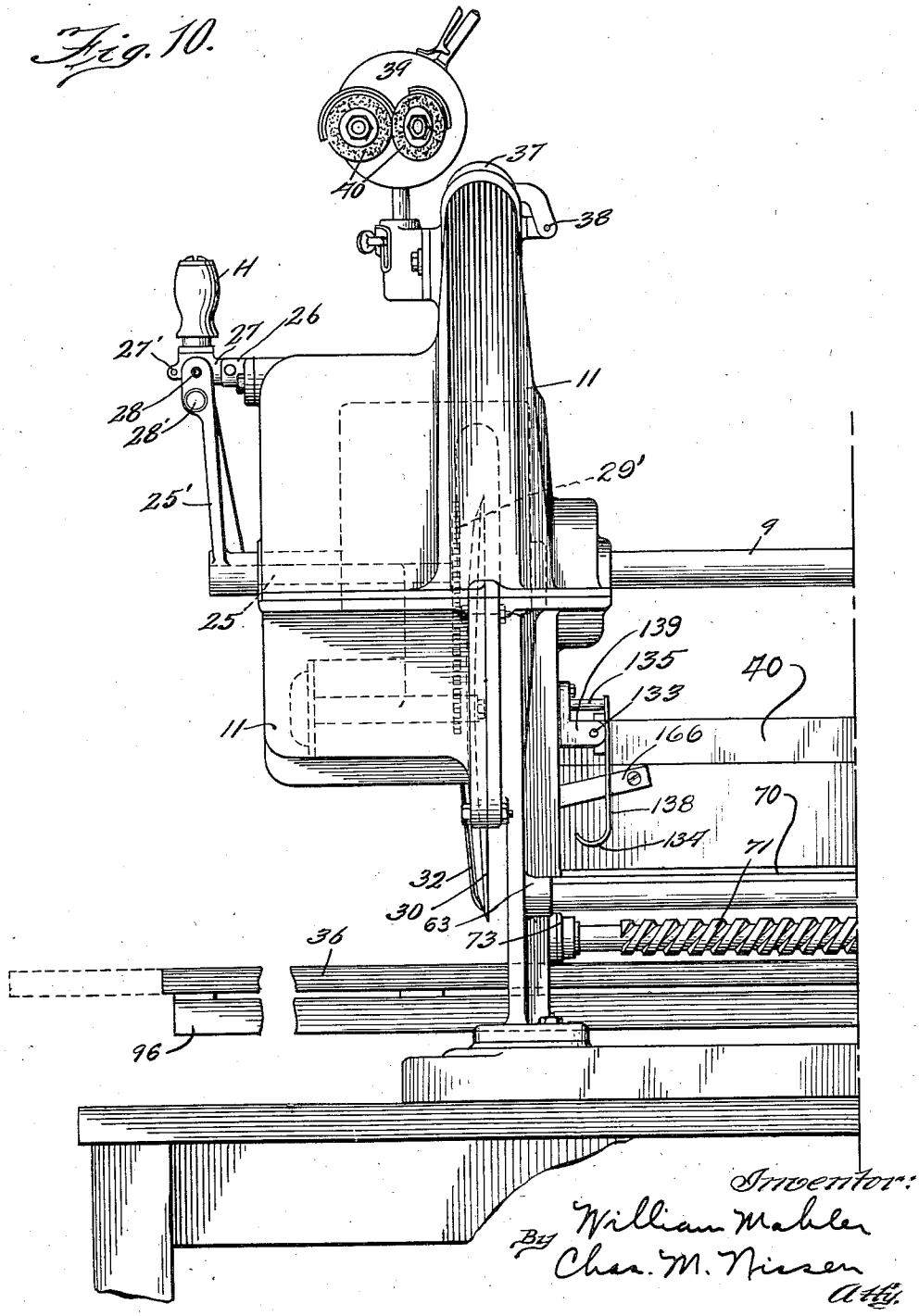
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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Fig. 10.



Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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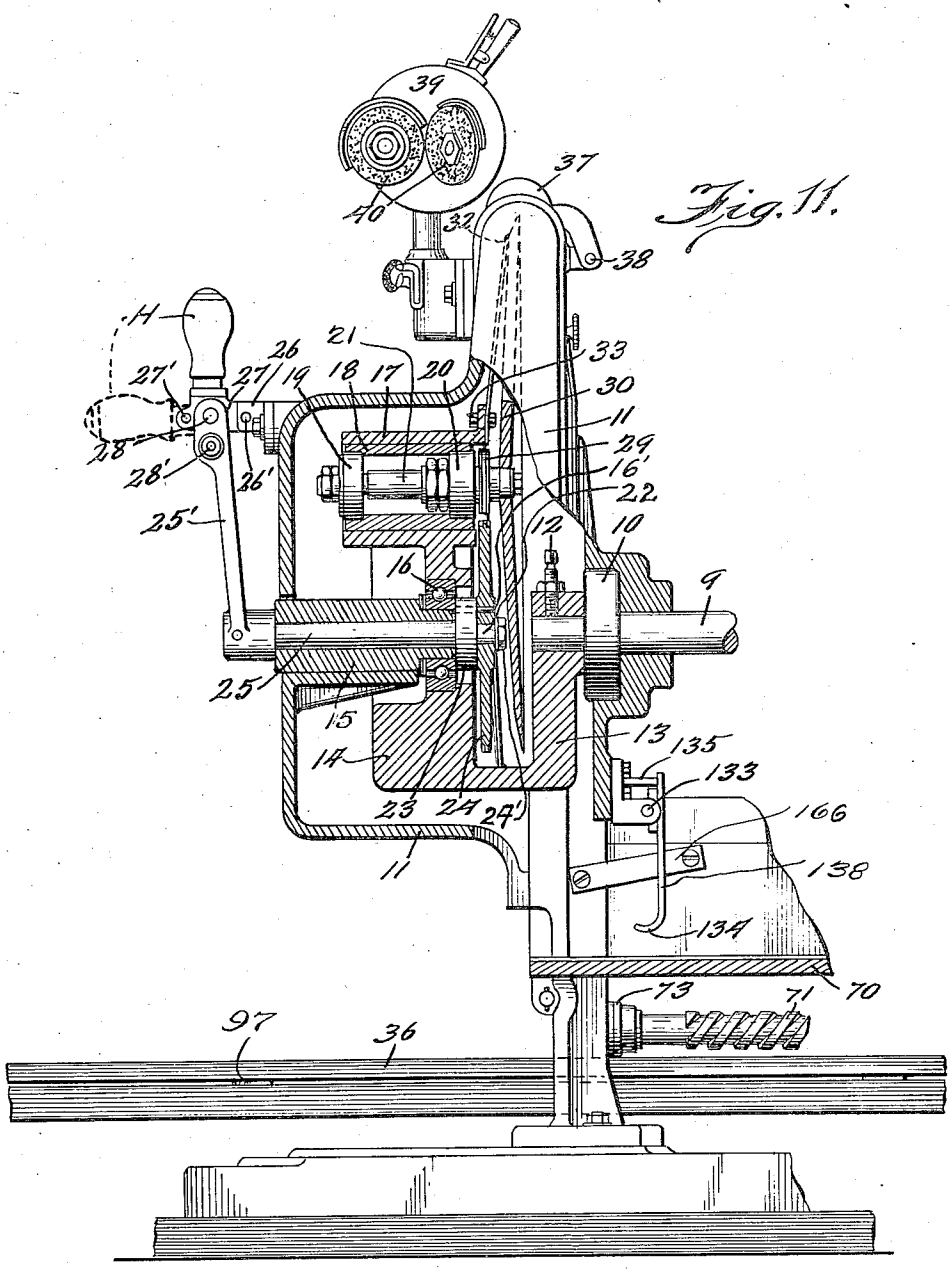


Fig. 11.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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Fig. 12.

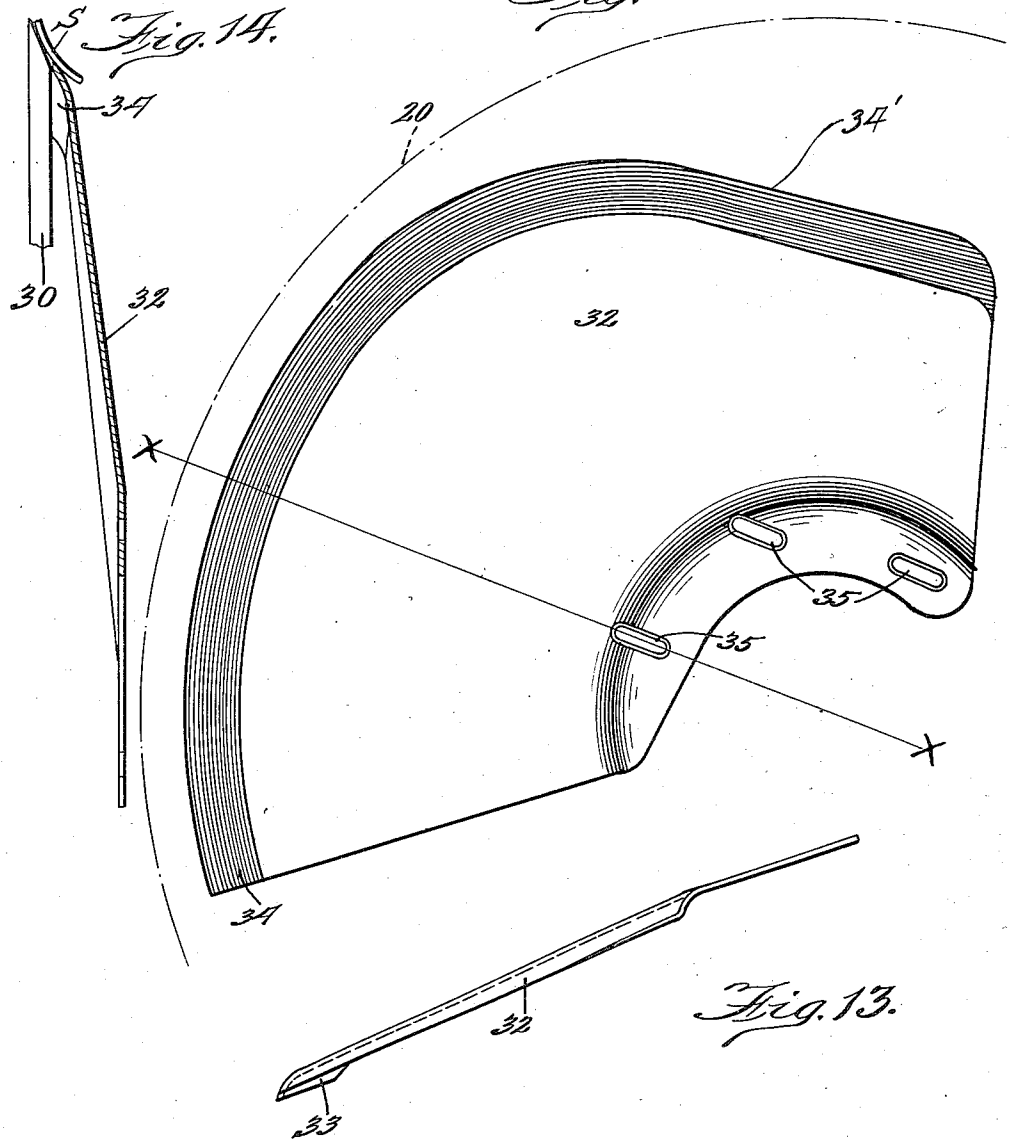


Fig. 14.

Fig. 13.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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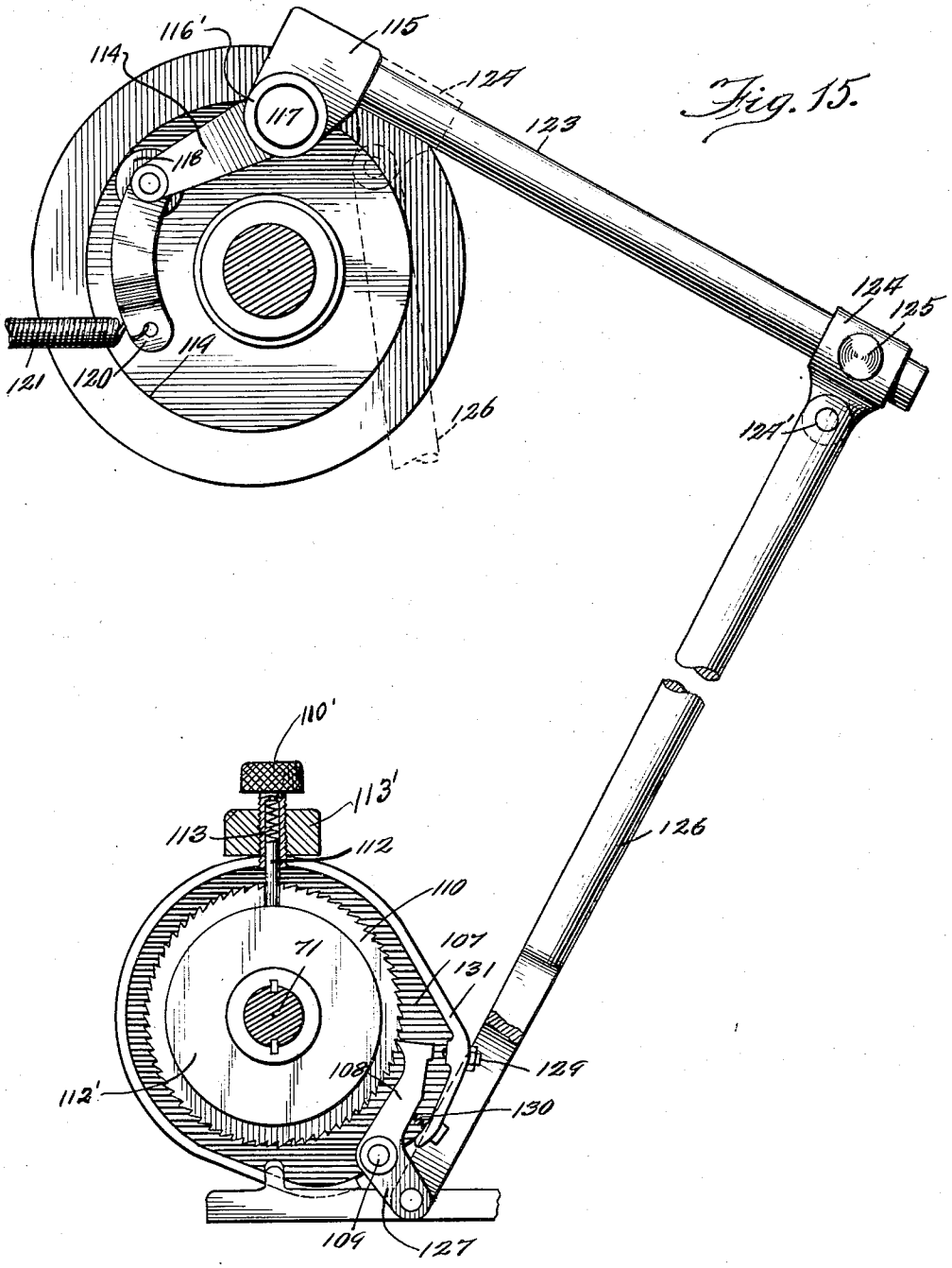


Fig. 15.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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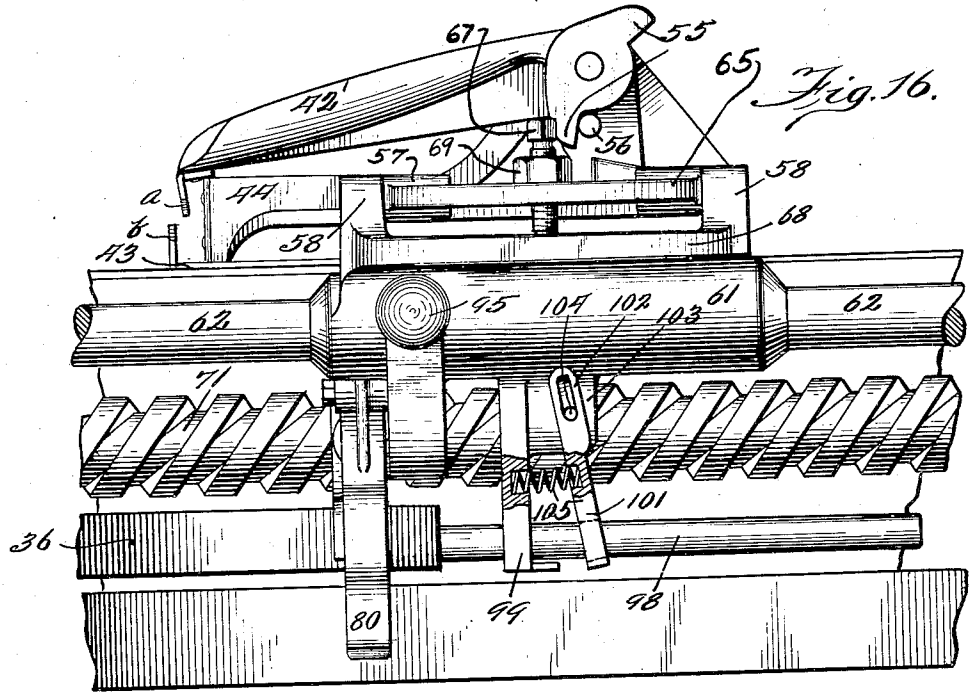


Fig. 16.

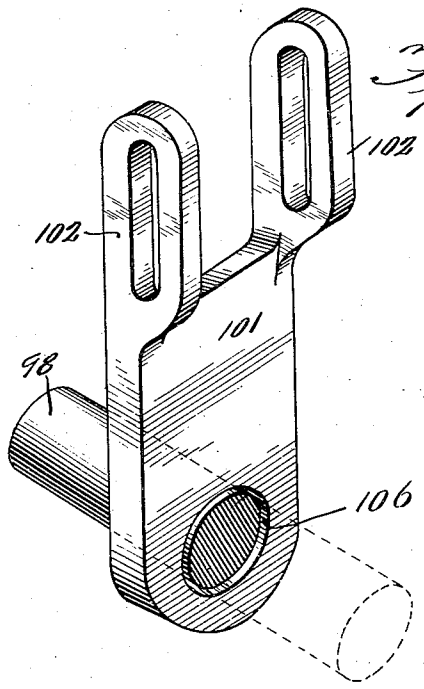


Fig. 17.

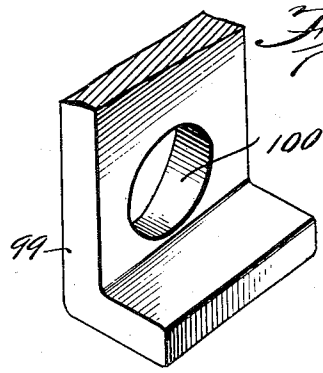


Fig. 18.

Inventor:
William Mahler
By Chas. M. Nissen.
Atty.

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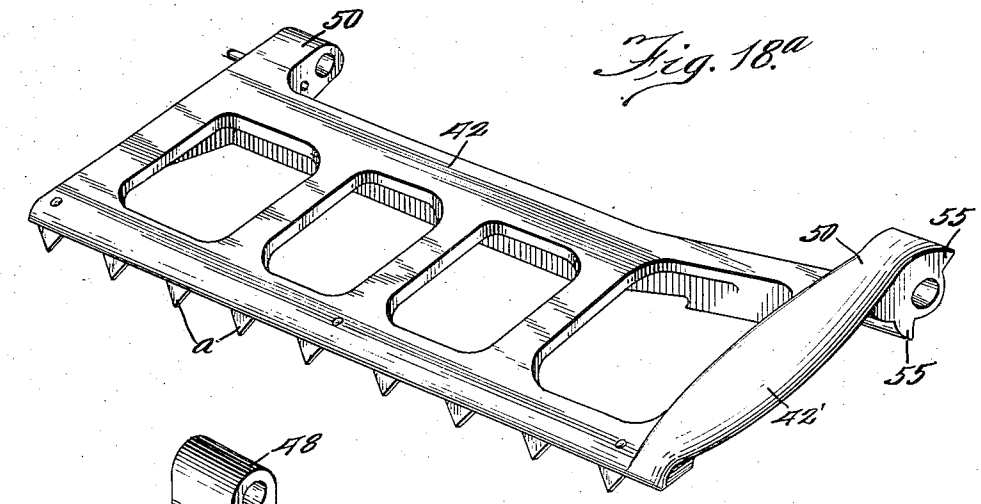


Fig. 18a

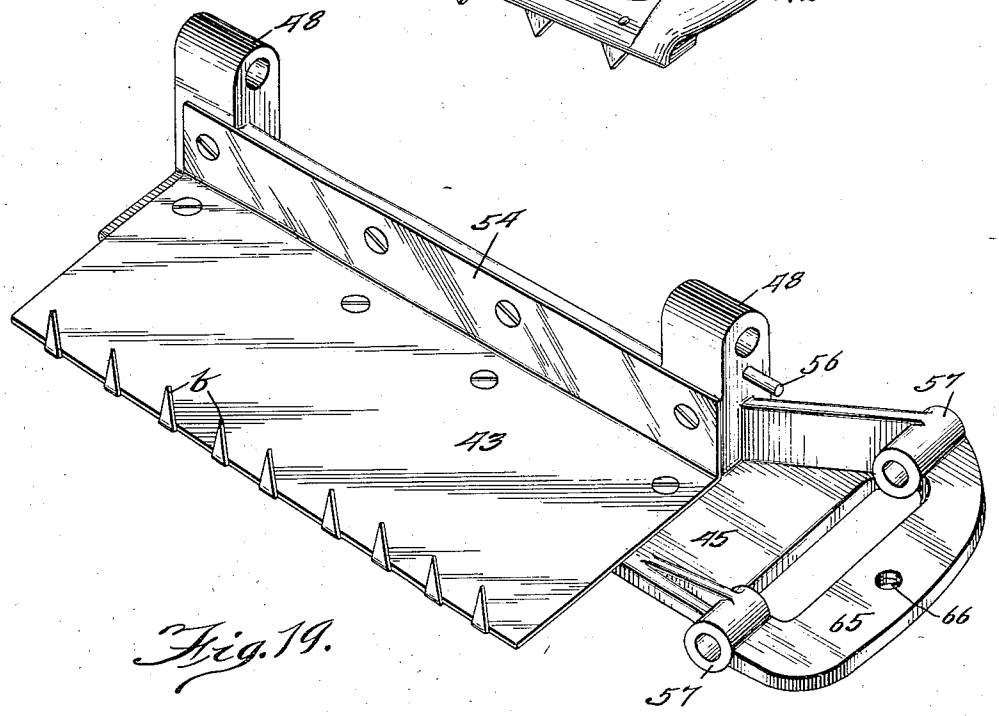


Fig. 19.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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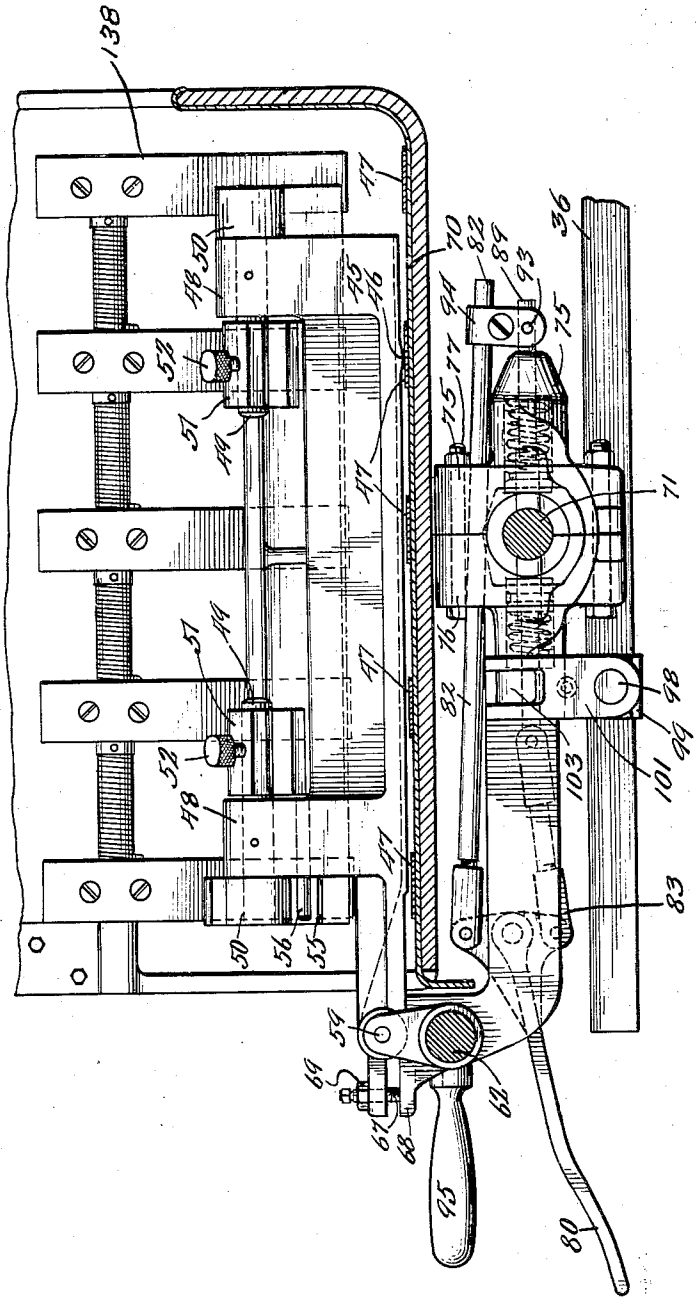


Fig. 20.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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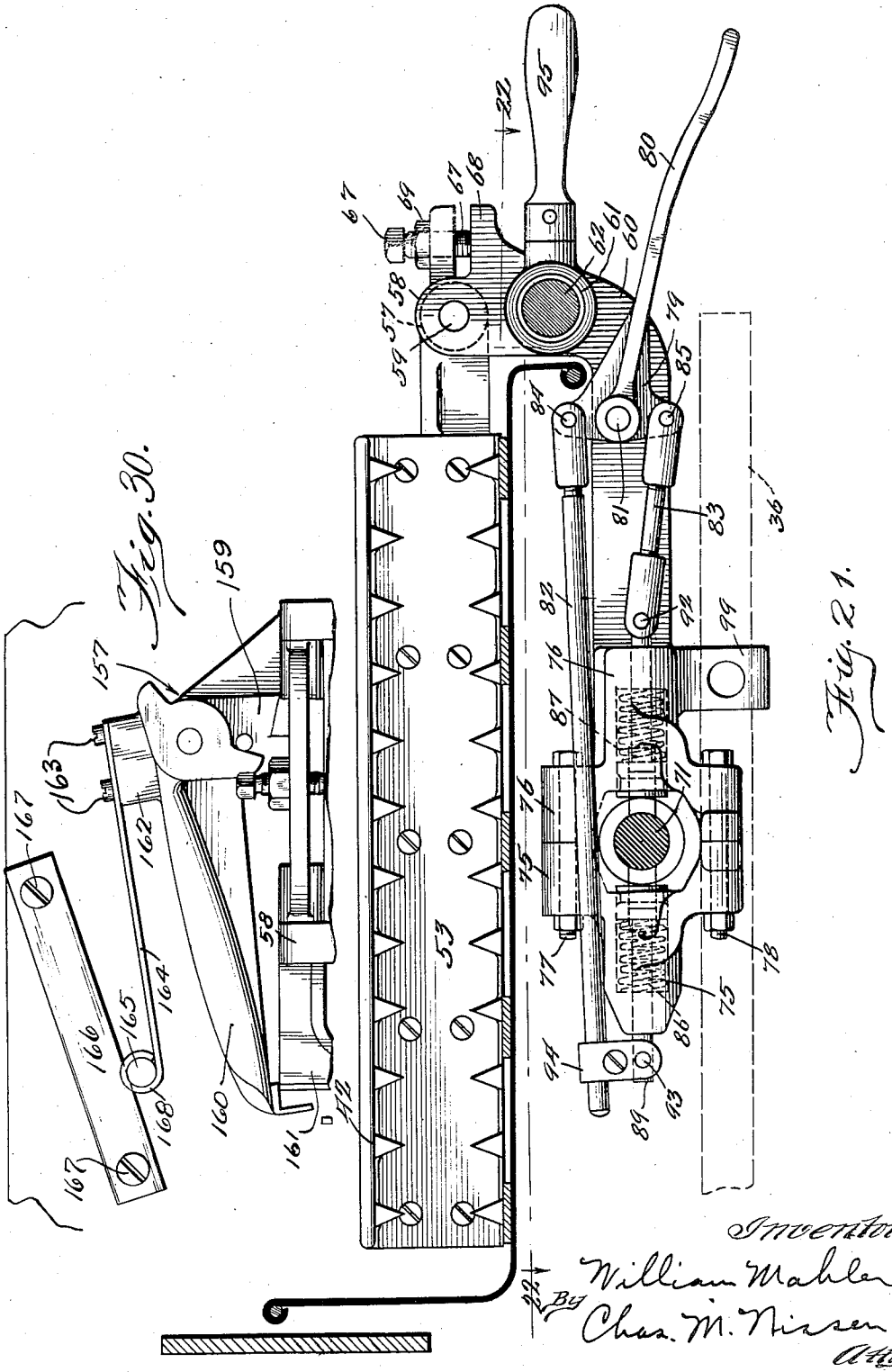


Fig. 21.

Fig. 30.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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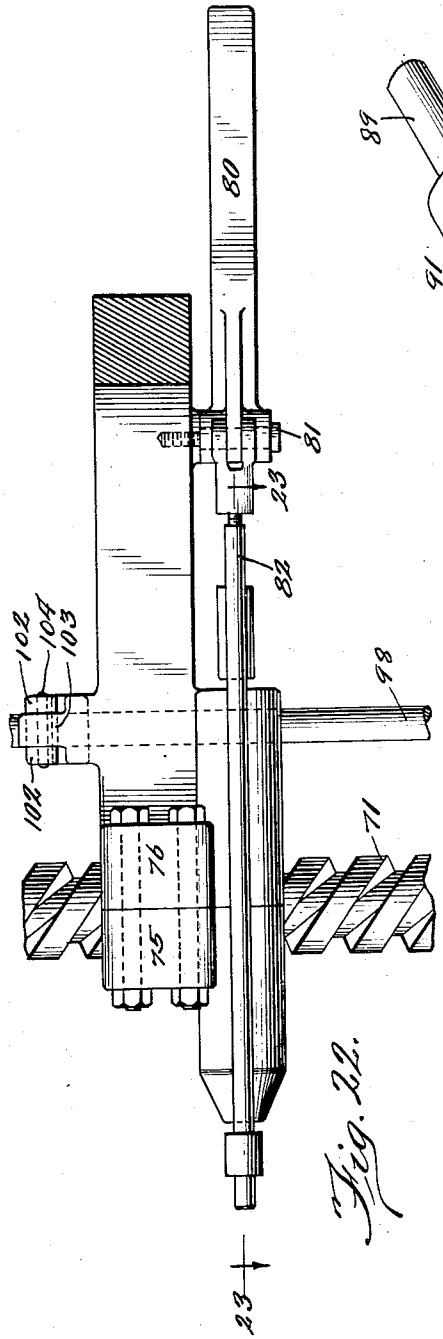


Fig. 22.

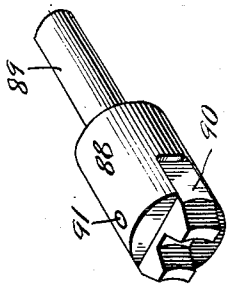


Fig. 24.

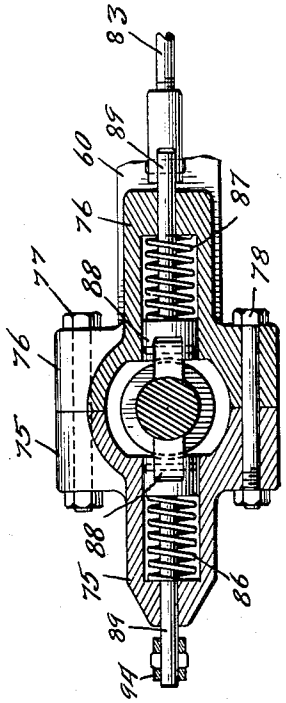


Fig. 23.

Inventor:
William Mahler
By Chas. M. Nissen
Atty

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METHOD OF AND APPARATUS FOR SLICING BACON

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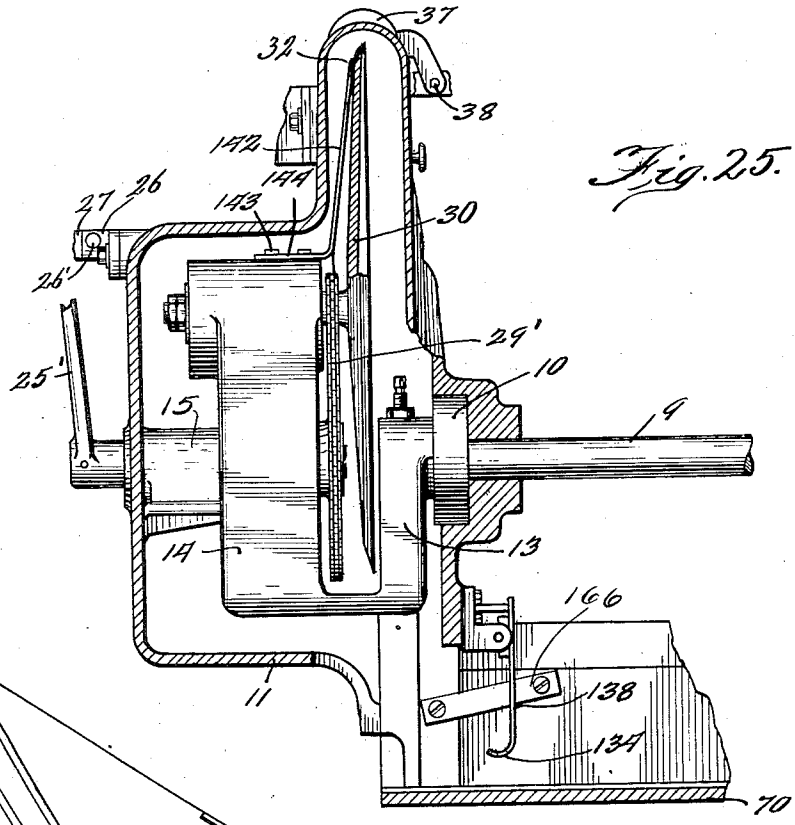


Fig. 25.

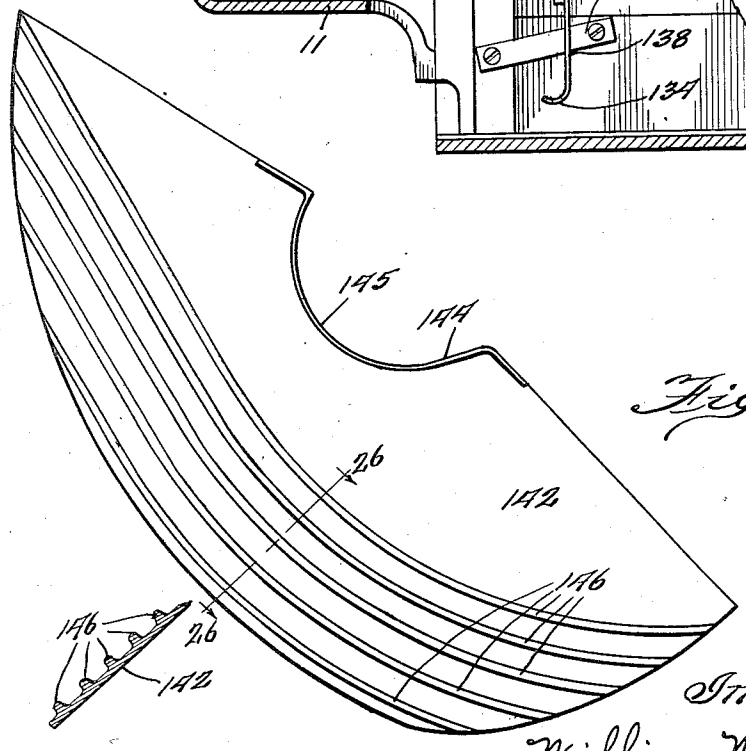


Fig. 26

Fig. 26a

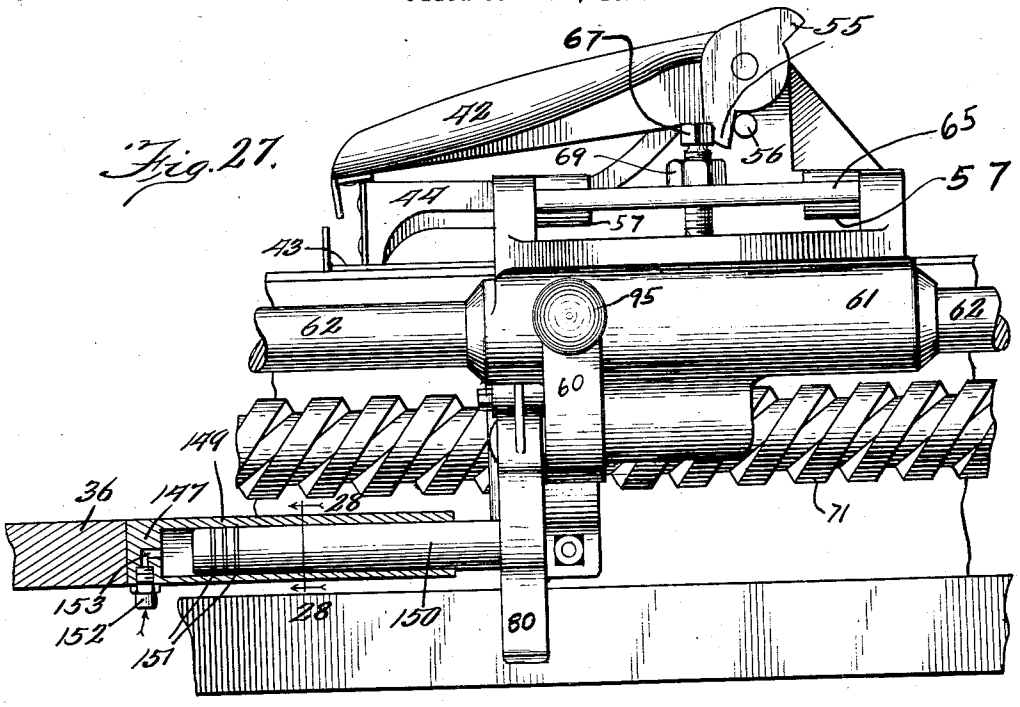
Inventor:
William Mahler
By Chas. M. Nissen
Atty.

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METHOD OF AND APPARATUS FOR SLICING BACON

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Fig. 27.



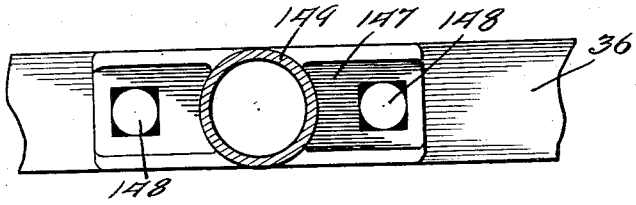


Fig. 28

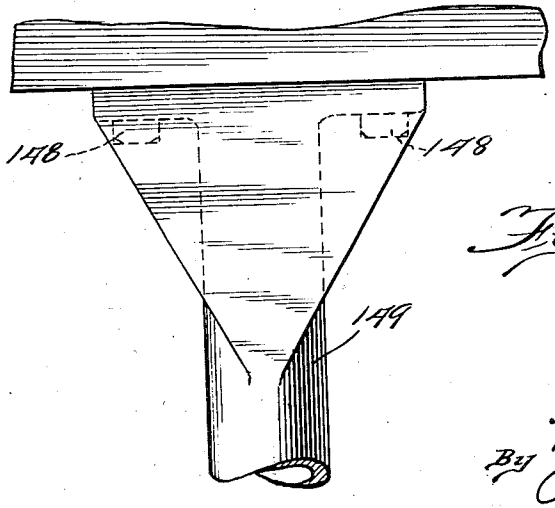


Fig. 29.

Inventor:
William Mahler
By Chas. M. Nissen
Atty.

Patented Oct. 16, 1934

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UNITED STATES PATENT OFFICE

1,976,823

METHOD OF AND APPARATUS FOR SLICING BACON

William Mahler, La Porte, Ind., assignor to U. S. Slicing Machine Company, La Porte, Ind., a corporation of Indiana

Application January 14, 1929, Serial No. 332,525

42 Claims. (Cl. 146—101)

This invention relates to machines for slicing meat and other substances, and more particularly to a machine capable of slicing bacon at high speed and depositing the slices cut in an orderly manner on a receiving surface notwithstanding the rapidity at which the slices are cut.

One object of the invention is to provide a knife movable through the material sliced together with means for engaging the slices as they are being severed to neutralize the throwing effect of the knife on the slices severed.

Another object is to provide a rotary slicing knife rotatable as a whole about an axis spaced from the knife axis, together with means for engaging the slice as it is being severed to neutralize the tangential throwing effect of the rotating knife on the slices severed.

Another object of this invention is to provide a method for slicing bacon which method includes the step of maintaining the slices in extended relation while the same are being thrown onto a support in overlapping relation with each other. The method is particularly applicable to slices which themselves are flexible and not self-sustaining, that is the slices are flexible and have a tendency to curl or flex when they are formed unless there is something to prevent this.

Another object of this invention is to provide a method for slicing bacon and other substances into thin non-self-sustaining slices and includes the step of maintaining the slices in extended relation while the same are being thrown away from the substance, whereby the slices are deposited on a support in flat extended position and successive slices are deposited at the same position. However, the support upon which the slices are deposited moves relative to the cutting plane of the knife and moves each slice a sufficient distance after it is formed so that the next slice which is deposited at the same position as the first slice (but not with respect to the support) will be deposited in overlapping shingled relation with the first slice.

Another object of this invention is to provide a method for high speed slicing of bacon or the like which includes the steps of moving a cutting element rapidly and successively through the bacon at a high rate of speed in one direction only with the cutting element moving through the substance at a uniform speed so as to impart a uniform lateral and longitudinal throwing effect on the slices so that the same will fall flatly on the receiving surface without the action of any intermediate conveying means. This method also includes the step of neutralizing the longitudinal throwing effect to such an extent that the slice moves very little if at all in the direction of movement of the cutting element.

Another object of this invention is to provide a moving slice receiving surface in the path of movement of the slice as it is formed, which surface in the embodiment illustrated is arranged to first engage the bottom or "heel" of the slice, whereby the slice turns about the heel portion as on a pivot into flat extended position on said surface. The receiving surface is arranged preferably closely adjacent the position where the slice is formed so that the slices have little opportunity of curling or buckling as they are thrown onto said surface.

Another object is to rotate the knife about an axis eccentric to the axis of rotation of the knife, the direction of rotation of the knife being opposite to that of the direction of rotation about the eccentric axis, and to mount a deflector to rotate with the knife about the eccentric axis, the deflector being positioned to engage the slices as they are being severed in a manner that will neutralize the throwing effect of the deflector.

Another object is to provide a platform or conveyer for receiving the slices, together with mechanism for imparting the proper amount of movement to the conveyer.

Another object is to provide a slidable substance carriage of novel construction for clamping the end of the material.

Another object is to provide novel means for holding the forward end of the material in place.

Another object is to provide an improved driving means for the intermittent feed.

Other objects will appear as the description proceeds.

In the drawings—

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

Fig. 2 is an elevation of the fly-wheel end of the machine drawn to a larger scale than Fig. 1;

Fig. 3 is an end view illustrating the motor mounting;

Fig. 4 is a rear elevation of the motor and mounting;

Fig. 4*a* is an isometric view of an element of the substance carriage;

Fig. 5 is a front elevation of the complete machine;

Fig. 5*a* is a fragmentary sectional view of the means for urging the feed screw 71 to the right;

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

Fig. 7 is an elevation of the right-hand of the machine;

Fig. 8 is a plan view of the knife end of the machine;

Fig. 9 is a front elevation of the fly-wheel end of the machine;

Fig. 10 is an elevation of the knife end of the machine;

Fig. 11 is a front elevation, partly in section, showing details of the knife mounting;

Fig. 12 is an elevational view of the deflector;

Fig. 13 is an edge view of the deflector;

Fig. 14 is a sectional view of the deflector showing its relation with the knife and cut slice;

Fig. 15 is an elevation, partly in section, showing the operating mechanism for the feed screw ratchet;

Fig. 16 is an elevation of the substance clamp;

Figs. 17 and 18 are details of the structure involved in Fig. 16;

Fig. 18*a* is an isometric view of the top grip for the substance clamp;

Fig. 19 is an isometric view of the bottom grip for the substance clamp;

Fig. 20 is an elevation partly in section, looking toward the knife edge of the machine, of the substance clamp showing its connection with the feed screw;

Fig. 21 is an elevation partly in section of the opposite side of the clamp as shown in Fig. 20;

Fig. 22 is a section taken on the line 22—22 of Fig. 21;

Fig. 23 is a sectional view taken on the line 23—23 of Fig. 22 showing the arrangement of the feed nuts;

Fig. 24 is an isometric view of one of the feed nuts and carrying member;

Fig. 25 is an elevation partly in section, partly showing a modified form of deflector associated with the knife;

Fig. 26 is a plan view of the deflector used in Fig. 25;

Fig. 26*a* is a section on the line 26—26 of Fig. 26;

Fig. 27 is an elevation of the substance clamp showing a modified means for connecting the clamp to the slice-receiving platform;

Fig. 28 is a section on the line 28—28 of Fig. 27;

Fig. 29 is a plan view of Fig. 28; and

Fig. 30 shows a modified form of substance clamp.

Referring to Figs. 1, 2, 3 and 4, the driving motor 1 for the machine is mounted on a motor base 5 hinged by means of a pin 5′ carried by ears 6 secured to the rear bracket 7 supported on the base 7′ of the machine. A bolt 8′ on the motor base 5 extends through an elongated slot in an arm 8 pivoted to the bracket 7. The motor pulley 2 drives the fly-wheel 4 of the machine through a belt 3 which may be tightened by swinging the motor base 5 around the pivot 5′ and locking the bracket in place by means of a nut on the bolt 8′.

The fly-wheel 4 is secured to the end of the shaft 9 and the other end of the shaft is journaled in a bearing 10 (Fig. 11) in the knife housing 11. The end of the shaft 9 has secured thereto by means of a screw 12 a member having arms 13 and 14. The longer arm 14 is journaled on a stud 15, secured to the knife housing 11, by means of a bearing 16. The axis of the stud 15 about which the arm 14 rotates is in axial alinement with the shaft 9. The upper end of arm 14 is formed into a hub 17 within which is secured a bushing 18. A bearing 19 having a single row of ball bearings is mounted in one end of the bushing 18 and a bearing 20 having a double row of ball bearings is mounted in the other end of the bushing, the bearings also being held against movement toward each other so that they may serve as thrust bearings. A knife spindle 21 is held in place by nuts and lock nuts, as shown, is rotatably mounted in the bearings 19 and 20 and a disc knife is secured to the end of the spindle. The spindle 25 is rotatable in the stud 15 and has a flange 23 formed near one end and abutting the stud 15. A reduced portion 22 of shaft 25 carries the sprocket 24 and the latter is held rigidly to the spindle 25 by a lock nut 24′ and a pin 16′. A crank 25′ is fixed to one end of shaft 25.

A handle H for rotating the crank 25′ is shown in Fig. 11. This handle is pivoted at 28 to the crank 25′ and has two openings therein. One is shown at 27′ while the other is on the opposite side of the pivot 28 in the part 27 and is adapted to be received between the ears 26 on frame 11 and be secured thereto by a pin 26′ passing through alined openings in the ears and the opening in the member 27, which, in the position shown, registers with the openings in ears 26. When the handle is to be used to rotate shaft 25 the pin 26 is removed and the handle pivoted to the dotted line position shown in Fig. 11 and pin 28′ secures the handle in this position by being inserted in alined openings in the bifurcated end of crank 25′ and the opening 27′ in the handle member. A single pin may be used in place of the pins 26′ and 28′ since either of these latter pins are inoperative when the other is operative.

A sprocket 29 is secured to the spindle 21 and is connected to the sprocket 24 by means of a chain 29′ (Fig. 10). It will be apparent that as the arms 13 and 14 rotate on bearing 16 in unison with the shaft 9 the spindle 21 carrying sprocket 29 and knife 30 will be rotated in its bearings 19 and 20, because the sprocket 24 is held stationary by the locked crank 25′ causing the chain 29′ to pull relatively on the sprocket 29. A knife shield or deflector (Figs. 12, 13 and 14) is secured to the bearing housing 17 by means of bolts or screws 33 (see Fig. 11). The rim or edge portion 34 of the deflector bears against the knife and the edge portion of the deflector intersected by the line x—x of Fig. 12 extends in close proximity to or slightly overlaps the beveled edge portion of the knife. As shown in Fig. 12, a portion of the edge of the deflector may be flattened somewhat at 34′ with respect to the remaining curved edge so as to be spaced further from the edge of the knife than the remaining edge portion of the deflector which is substantially concentric with the knife edge. Assuming that the arm 14 carrying the knife is rotated counterclockwise, as seen in Fig. 6, or forward, as seen in Figs. 11 and 25, the deflector and knife as a whole are rotated counter-clockwise about the axis of the shaft 9, but the knife is rotated clockwise about its spindle 21. A slice of material cut by the knife, as designated by the letter S in Fig. 14, is therefore subject to two oppositely directed frictional forces. The knife shield rotating with the arm 14 in a counter-clockwise direction tends to drag the slice along with it in the same direction. The periphery or edge portion of the knife rotates relatively to the knife shield in the opposite or clockwise direction and tends to drag the slice of material

cut in a direction opposite to the force exerted on the slice by the shield. These two forces tend to neutralize one another and they will be substantially exactly neutralized if the area contacted with by the knife during the cutting operation bears the proper ratio to the area of the slice contacted with by the shield. This ratio may be found by trial and varies with the character of the material to be sliced. While it is desirable to have these two forces neutralize each other, this is not essential for it may be desirable at times to have either the knife or shield have a greater throwing effect and I do not wish to be limited to a device wherein the effects are exactly neutralized.

In order that the knife shield may be properly adjusted, several slots 35 may be provided in the shield 32. These slots are all parallel to the line *x*—*x* designating the portion of the deflector lying closest to the knife edge and the adjustment of the deflector is therefore in the direction of the line *x*—*x*. The same portion of the deflector therefore lies closest to the knife edge throughout its range of adjustment. The cutting operation designated in Fig. 14 takes place, of course, when the knife as a whole has revolved with the arm 14 to its lowermost position opposite that indicated in Fig. 14. When the deflector is properly adjusted the throwing effect on the slice by the deflector is neutralized by the throwing effect of the knife in the opposite direction with the result that only the lateral throwing effect of the deflector remains, that is, throwing effect incident to the wedging relation of the deflector with respect to the knife tending to push the slice laterally from the deflector. The cut slices are therefore thrown clear of all moving parts and are stacked against each other in overlapping relation on the moving platform 36.

The knife housing has a cover 37 pivoted at 38 which may be swung back to expose the knife for sharpening. The sharpener 39 of well-known design is then lowered into position to contact the grind-stones 40 with the knife. The shaft 9 and consequently arm 14 are then rigidly locked in stationary position by means of a pin 37′ slidable in a bearing 128 (Fig. 2) fixed to the end bracket 7, slidable by means of a handle 40′ into a recess 4′ in the fly-wheel 4. Thereafter the handle H is moved into the dotted line position shown in Fig. 11 and locked in place by pin 28′, as previously described. The handle may now be used to rotate the crank 25′ and the disc 30 through the shaft 25, sprockets 24 and 29, and chain 29′. The rotation of the knife while in engagement with the sharpener, sharpens the knife. When this has been done, the sharpener is returned to its original position, the cover 37 is closed and handle H placed in the full line position shown in Fig. 2. The bolt 37′ can then be retracted and the machine is ready to slice the material again. The recess 4′ is so placed in the fly-wheel 4 that the knife is always in its uppermost position to insure proper contact with the grinders.

The substance clamp designated generally by the numeral 41 (Fig. 1) is provided with an upper clamping member 42, a lower clamping member 43 (Figs. 16, 18*a* and 19) and an abutment plate 44 (Fig. 4*a*). The bottom clamping member 43 is carried by a bracket 45 having a riding lug 46 (Fig. 20) at one end for slidably supporting the end of the substance clamp on one of the strips 47 upon which the material slides. The bracket 45 has upstanding perforated lugs 48 within which are pinned hinge pins 49. Perforated lugs 50 straddle the lugs 48 and are hinged on the pins 49. The lugs 51 of plate 44 (Fig. 4*a*) have forked ends and are secured to the inner end of the pins 49 by means of the set screws 52 after the forked ends straddle the pins 49. The upper and lower clamping members 42 and 43 are provided with replaceable teeth *a* and *b*, as shown in Figs. 18*a* and 19, between which the bacon or other material is held with the end thereof abutting the face 53 (Fig. 4*a*) of plate 44 (Fig. 16), the abutting face 53 being spaced a short distance back of the teeth as shown in Fig. 16. This leaves a very short butt end after the material has been sliced as far as possible. However, there is a demand in the trade for longer butt ends and to obtain these, the plate 44 may be removed by loosening screws 52 and the end of the material abutted against the vertical face 54 of the lower clamping member 43. One of the lugs 50 of the top clamping member is provided with stops 55 adapted to abut a pin 56 on the lug 48 to limit the movement of the top clamping member in both directions. A handle 42′ is used to raise the upper clamping member when it is desired to clamp the work between the clamping members 42 and 43.

The bracket 45 has two alined laterally extending perforated lugs 57 interposed between two lugs 58 on a bracket 60 and hinged thereto by pins 59, said bracket also having a sleeve portion 61 slidable on a rod 62 fixed in lugs 63 and 64 (Fig. 5) on the end brackets of the machine. The lugs 57 (Fig. 19) are connected by a web 65 having a threaded perforation 66 through which passes a bolt 67. A nut 69 threaded on bolt 67 is used to lock it in a set position to prevent the clamp from rotating in a counter-clockwise direction, as seen in Fig. 20, while abutment 46 riding on slide 47 limits the rotation in a clockwise direction.

A feed screw 71 is journaled centrally of the machine beneath the substance clamp in a bearing 72 (Figs. 9 and 5) at the fly-wheel end of the machine and in a bearing 73 (Fig. 5) at the knife end of the machine, a spring 74 surrounding the end of the feed screw and abutting the head 71′ thereon (Fig. 9) serving to urge the feed screw toward the bearing 72 and causing friction between arm or plate 107 and ratchet wheel 110 for a purpose later to be described. A spring 155 (Fig. 5*a*) is mounted in a bushing 154 fitted on the bracket 73 at the knife end of the machine. This bushing is closed at one end by a plug 156 against which one end of the spring abuts. The other end thereof abuts the end of shaft 71 urging it toward the right, as viewed in Fig. 10. The bracket or arm 60 (Figs. 20 to 22) extends below the clamp and carries the housing which encloses the half nuts for engaging the feed screw. This housing is formed in two halves 75 and 76 (Fig. 23), the latter being integral with the arm 60 and bolted together by upper and lower bolts 77 and 78. A lever 79 having a handle 80 is pivoted at 81 to the bracket 60. Arms or rods 82 and 83 having adjustable threaded ends are pivoted at 84 and 85 to the lever 79 at opposite sides of the pivot 81. The housing halves 75 and 76 have alined cylindrical recesses within which the cylindrical heads 88 carrying the half nuts 90 are movable toward and away from the feed screw. The half nuts 90 are pinned by means of a pin 91 in a slot in the end of each head 88. The shanks 89 of the heads 88 extend through openings in the ends of the housing halves and one of the shanks is pivoted to the rod 83 at 92 while the other is pivoted at 93 to a clamp 94 carried by the rod 82. Springs

86 and 87 tend to urge the half nuts toward the feed screw and when handle 95 rigid with the bracket 60 is grasped with the fingers lifting up on the handle 80, the half nuts are withdrawn from engagement with the feed screw and the entire clamp may be slid on the rod 62 toward the fly-wheel or loading end of the machine.

When the feed screw 71 is intermittently rotated, the substance clamp is advanced toward the knife pushing the platform 36 along with it to receive additional slices as they are deposited. A pair of slide rails 96, one at each side of the machine, has cross-bars 97 (Fig. 11) slidably supporting the platform 36. A rod 98 extends from the platform 36 and passes loosely through a hole 100 in a bracket 99 which may be integral with the bracket 60 near the feed screw. A second bracket or arm 101 has a pair of slotted ears 102 straddling a lug 103 extending laterally and downwardly from the bracket 60. A pin 104 extends through the slots in ears 102 into the lug 103 and a spring 105 bears at one end against the bottom of a recess in the bracket 99 and at its other end against the bottom of a recess in the arm 101 tending to cant the arm 101 counter-clockwise as seen in Fig. 16. When the substance clamp is moved toward the knife the slant of the arm 101 causes the upper left-hand edge and the lower right-hand edge of the hole 106 to bite or grip the upper and lower portions of the rod 98. When the clamp is fed toward the knife by the feed screw, the rod 98 and platform 36 will therefore move with the carriage. The feed screw, however, rotates only enough to advance the clamp a distance equal to the slice cut while it is desired that the clamp have a greater range of movement to prevent the slices from piling up under the knife. The feed to the platform through the arm 101 permits the platform to move farther than the clamp, because at the end of the rotating impulse imparted to the feed screw the platform can still continue to move forward due to its inertia. The arm 101 then offers no resistance to the passage of rod 98 through it, because the direction of motion of the rod 98 is such that it tends to straighten the arm 101. The slices lie on the platform 36 in overlapping relation and may be removed in stacks with the slices arranged face to face by holding the foremost of a series of slices still while the platform pushes the succeeding slices thereagainst.

The mechanism for imparting motion to the feed screw is best shown in Figs. 2, 7, 9 and 15. An arm or plate 107 is loosely pivoted on the unthreaded end of the feed screw 71 and carries a pawl 108 pivoted at 109, the point of which engages a ratchet 110 keyed to the feed screw. A brake member 112 is slidable in an adjustable member 110' screw-threaded in a projection 113' on the bracket 7. A spring 113 yieldingly urges the member 112 into engagement with a brake drum 112' rigidly mounted on the shaft 71, or if desired, this may be made an integral part of the ratchet wheel 110. This arrangement prevents reverse rotation of the ratchet due to the friction between ratchet 110 and plate 107 caused by the spring 74. A pivot stud 117 (Figs. 2 and 15) is mounted in a bracket 116 and a lever 116' having an arm 114 and a boss 115 is pivoted on the end of the stud 117. A roller 118 on the arm 114 engages a cam groove 119 formed in the hub of the fly-wheel 4. A spring 121 is connected at one end to an arm 120 of arm 114 and is connected at its other end to an adjustable bracket 121' adjustable by means of the bolt 122 passing through a part 122' of the frame to hold the roller in engagement with the cam at all times. The rod 123 has one end thereof secured rigidly in the boss 115 while on the free end thereof is adjustably secured by means of a thumb screw 125, the bracket 124 pivotally connected to the rod 126 at 124'. The lower end of the rod 126 is forked and is pivotally connected to the arm 127 of the pawl 108. Dotted lines show the position of the bracket 124 in one position of adjustment designed to give a slow feeding movement to the feed screw due to the small rocking motion imparted to the rod 126 when the bracket is in this position. A screw 129 threaded through the flange 131 of plate 107 serves as an adjustable stop for the pawl and a light spring 130 urges the point of the pawl into engagement with the ratchet teeth.

Due to the bell crank shape of the pawl 108 and the fact that it is pivotally carried by the plate 107 journaled on the feed screw, the pawl is withdrawn from the ratchet teeth at each downward movement of the rod 126 imparted by the pump handle movement of arm 123. The pawl 108 is therefore less noisy than in the usual arrangement wherein the pawl rides over the teeth on its return movement. Since the plate 107 is loose on the shaft 71, the plate would tend to gain momentum on the down stroke of rod 126 and toward the end of the stroke is apt to be moving faster than the pawl 108. This would cause a counter-clockwise rotation of pawl 108 and it might engage the ratchet prematurely, causing wear and noise. The plate, however, is restrained from thus moving faster than the rod 126 by the slight friction between it and the ratchet 110 caused by the spring 74. On the upward movement of the rod 126 the same friction holds the plate 110 stationary until the pawl engages the ratchet, thus insuring that the feed will always be the same amount on each upward movement of the pawl. This gives a uniform thickness to the slices cut by the knife.

A shaft 133 (Figs. 10 and 11) is secured in a bracket 139 at one end and in the side 140 (Fig. 6) of the substance trough at the other end. A series of clips 138 having curved ends 134 are pivoted on the shaft 133. Springs 136, one for each clip and surrounding the shaft 133, are secured at one end to a collar 141 adjustably secured to the shaft and its other end to a clip 138. The tension of the springs is such that they tend to rotate the clips away from the knife toward the fly-wheel end of the machine or counter-clockwise as seen in Fig. 10. Stops 135 maintain the clips in normal vertical position. The material to be sliced is pushed by the substance clamp 41 between the curved ends 134 of the clips 138 and the bottom 70 of the trough. The top surface of the material engages the curved ends 134 rotating the clips about their pivot 133, thereby increasing the tension on the springs causing them to push more firmly against the material passing through the opening 137 in the knife housing to be cut by the knife.

The deflector shown in Figs. 25 and 26 performs the same function as the deflector first described, but is constructed somewhat differently. The deflector 142 has a flange 144 curved as at 145 to seat over the rounded bearing end of the knife arm 14. The bolts 143 securing the deflector in place may pass through slots in the flange 144 so that the deflector may be adjusted to and from the knife. The deflector 142 is also provided with

ribs 146 to lessen the frictional contact of the deflector with the slices cut.

Figs. 27 to 29 illustrate a modified form of connection between the platform 36 and the substance clamp. A bracket 147 is secured by means of bolts 148 to the end of the platform 36. The bracket is formed into a cylinder 149 within which is inserted a piston or plunger 150 secured to the bracket 60 slidable on rod 62. Rings 151 form an air-tight connection between the plunger 150 and walls of the cylinder 149. A one-way valve 152 permits air to enter the end of cylinder 149 through a passage 153, but prevents the escape of the air in the opposite direction. While the clamp is being fed toward the knife the plunger 150 transmits the motion to the platform 36 through the air trapped at the end of the plunger. The rings 151 on the plunger 150 form an air-tight connection between the plunger 150 and the walls of the cylinder 149. Therefore, when the substance conveyor, which includes the screw conveyor 71 and the substance clamp, moves at a higher rate of speed, the plunger 150 will also operate at greater speed, causing a greater momentum or force to the movement of the slice conveyor or platform 36. As the substance feeding conveyor is set to cut slices of different thicknesses the plunger 150 causes the slice receiving conveyor 36 to move a greater distance to receive the thicker slices in overlapping relationship. The slice conveyor or platform 36, therefore, is provided with means for varying its movement so as to vary the amount of overlapping of the slices on the slice conveyor 36. Both of the conveyors, the feed screw 71 and clamp and the slice receiving platform 36, therefore, are provided with means variable relatively to each other so that when the speed of the movement of the substance conveyor 71 is changed to vary the thickness of the slice, the movement of the second conveyor 36 is changed to vary the amount of the overlapping of the slices on the slice conveyor 36 so as to secure the best shingling of the slices on the slice receiver or platform 36. When the clamp has stopped with the feed screw the platform 36 can by reason of its inertia continue to move as in the first form of the invention, because the air can pass through valve 152. The structure shown in Fig. 16 also causes the slice receiving platform or conveyor 36 to move relatively to the movement of the substance feeding conveyor, which latter conveyor is also the feed screw 71 and the substance clamp.

The top surface of the top clamping member 42 slopes upwardly and when the curved ends 134 of the clips 138 ride up this sloping surface the added rotation of the clips increase the resistance of springs 136, thereby exerting additional pressure on clamping member 42 at a time when the added clamping effect is most needed, that is when the clips no longer hold the material in place against the bottom of the trough.

The operation of the device is as follows:

The substance to be sliced is placed on the support 70 and one end thereof is placed so as to be gripped by the upper and lower jaws 42 and 43 of the clamp 41. The motor transmits rotation to the shaft 9 and consequently to the knife 30 which rotates about its own axis and also axis 25, each movement about the axis 25 cutting a slice from the material which is advanced step-by-step toward the knife by the feed screw 71. The rotation of the fly-wheel actuates the feeding mechanism for the feed screw during the non-cutting stroke of the knife to advance the work to a position where the next slice can be cut therefrom. The rotation of the feed screw moves the clamp and work and also the platform 36 so that room will be made thereon for the next slice cut from the material. The platform 36 moves slightly more than the material to be cut so as not to crowd the slices on the platform. Obviously other substances such as bread, cheese, fish, and the like, may be sliced by a machine embodying this invention without departing from the scope of the subjoined claims.

In Fig. 30 I have shown a modification of the means for producing an added pressure on the upper clamping member so as to grip the butt end more firmly as it becomes shorter. The clamp designated generally as 157 in this instance has the lower clamping member 159, upper clamping member 160, and the abutment plate 161 similar to the corresponding parts 43, 42 and 44 shown in Fig. 16. But in this instance the upper clamping member carries a boss 162 on the end thereof adjacent the upstanding wall of the trough, and this boss has one end of a spring 164 fastened thereto by means of screws 163. At the other end of the spring is a curled portion 168 embracing a pin 165 adapted to engage the cam 166 secured as shown in Figs. 5, 6, 10, 11, 25 and 30 to the substance trough. The clamp shown in Fig. 30 is adapted to be substituted bodily for clamp 41, or only the clamping member 160 and attached parts may be substituted for clamping member 42 if desired, as the remaining parts of the clamps are identical. In operation, the clamp is advanced toward the knife step-by-step until the pin 165 strikes cam 166 which deflects the spring downwardly so as to increase the clamping pressure of the upper clamping member. It is understood that the spring clips 138 may or may not be used in this form of device, there being nothing to interfere with their use as the spring is to one side of clamping member 160 and at times it might be found advisable to dispense with their use.

Machines constructed according to the present invention are operated at extremely high speeds as compared with the speeds which the machines shown in the prior art are operated. The machine described operates at approximately 400 R. P. M. and does efficient slicing at that speed. A reciprocating type of knife cannot be operated at over 100 oscillations per minute and generally operates at approximately 50 to 100 oscillations per minute. This is due to the fact that reciprocating elements which have to be stopped and started require a considerable amount of energy to overcome the inertia effects of the moving knife and its support.

By using a rotating knife which also rotates about an eccentric axis in a circular path, a more uniform movement of the slicing knife results. The fact that the knife is counterbalanced overcomes any of the centrifugal force which might resist the rotation of the knife or cause it to vibrate the entire machine, as would be the case with a reciprocating knife operated at high speeds which must have its direction reversed periodically. Of course, vibration of the machine results in uneven slices being cut and also makes the machine very undesirable. Therefore the rotating type of knife is a valuable improvement over the reciprocating knife and especially in the combination used in this application.

The method which is embraced in this invention is one which includes the steps of maintain-

ing the slice in substantially extended position so that the same will be deposited flatly on the slice receiving surface after the same is formed so that the slices will be arranged in overlapping relation with respect to each other in order to facilitate packing and do away with the necessity of overlapping the slices by hand. The principal feature of this invention is the elimination of any intermediate mechanism of a complicated character for transferring the slices onto the slice receiving surface. The method is for the purpose of discharging the slices directly onto the slice receiving surface after the slices are formed and without using any intermediate holding mechanism for actually holding the slices as they are being moved from the knife onto the slice receiving surface.

The slabs or substance is carried along toward the cutting plane of the knife and at the knife position, a cutting element is provided which passes through the substance at a uniform speed. This cutting element is the knife 30, and since the knife is power driven at a uniform speed and moves only in a single direction, it is possible to impart to all parts of the slices a substantially uniform lateral throwing effect, that is to the left as viewed in Fig. 11, and a longitudinal throwing effect, that is one which is substantially parallel to the cutting plane. All portions of the slices, therefore, move outwardly away from the knife at substantially the same speed, and therefore as gravity pulls each slice or as the throwing force acting on the slice moves the same into engagement with the support 36, the slice contacts with the support throughout its entire length substantially at the same instant and one end does not strike appreciably before the other end thereof. In order that the longitudinal throwing effect will not be too great so as to displace the slice too far from the place at which the same is formed, and thus increase the chances of the slices curling or buckling, I have provided means already described for neutralizing the throwing effect of the knife, preferably so as to prevent all longitudinal throwing effect or at least to prevent any more than a very small amount of throwing effect in a longitudinal direction, which is parallel to the cutting plane of the knife and in the direction of the length of the slice. This is accomplished in the present invention by means of the shield 32, the action of which has already been described. This shield which contacts with substantially all portions of the slice just after the knife contacts with the same holds the slices out of any substantial engagement with the knife edge and moves in a direction opposite to the direction in which the knife is moving as it engages the slice. Since the slice is held out of any appreciable amount of engagement with the cutting edge of the knife, and since the knife and shield are moving in opposite directions with respect to each other, the throwing effect on the slice in a longitudinal direction is substantially neutralized or is neutralized to such an extent that the slices which are cut are thrown outwardly from the cutting plane of the knife substantially in prolongation of the slab of bacon which is being sliced.

The shield acts to throw the slice outwardly and also downwardly and preferably with the lower or "heel" portion of the slice striking the conveyer first. The surface of the conveyer is parallel with the surface which supports the substance and consequently the entire lower edge of the slice strikes the slice receiving support 36 substantially at the same time and the rest of the slice pivots about the lower edge into flat extended position on the support or conveyer. Each successive slice is deposited at the same position with respect to the cutting plane of the knife but since the substance support 36 moves laterally, each slice is moved out of that position after it is formed, and the successive slices are deposited in overlapping relation with respect to each other.

The method therefore essentially comprises the moving of the substance along a predetermined path, slicing successive slices therefrom at a uniform high rate of speed while at the same time providing means for holding the slice in extended position so that when it strikes the conveyer, it will lie flatly thereon and permit the "shingling" of the slices in order to save a great amount of hand labor which would otherwise be necessary, for slices of this nature are extremely sticky and have a tendency to curl and adhere to each other, thus making it difficult to "shingle" the same by hand. Gravity acts on the slice to bring the slice into contact with the conveyer but this movement of the slice toward the conveyer is usually assisted by the action of the deflector 32 although even if the slice were thrown so as to maintain the same in a plane which is parallel to the cutting plane, gravity would bring the slice into contact with the conveyer and the lateral movement of the slice would cause the remaining portion of the slice to pivot about the lower edge thereof into flat extended position on the conveyer.

When applicant speaks of "high speed" for a slicing machine, he is referring to a machine which operates at over 100 revolutions per minute, and not to the slower reciprocating type machines or those machines which are hand operated and are used for the purpose of slicing bread and the like at a speed which is not over 100 revolutions per minute, and the claims are to be so considered when reference is made to "high speed" slicing or to moving the slicing knife at a high speed.

The copending applications Serial No. 332,790, Serial No. 418,835 and Serial No. 431,706, assigned to the present assignee, also disclose slicing machines of a similar construction and operation, but the broad claims relating to the common subject matter of said applications are included in this application.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus fully disclosed an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a slicing machine, a rotary knife, means for rotating said knife around an axis eccentric to the axis of said knife, means for rotating said knife around its own axis in a direction opposite to its direction around said eccentric axis, a shield rotatable with said knife around said eccentric axis, said shield having a portion positioned adjacent the edge of said knife to engage the slices as they are being severed by said knife, and means for adjusting said shield radially with respect to said knife.

2. In a slicing machine, an arm, means for

rotating said arm, a slicing knife rotatably mounted on said arm spaced from the axis of rotation of said arm, means for rotating said knife around its own axis in a direction opposite to the direction of rotation of said arm, a shield carried by said arm, said shield having a portion positioned adjacent the edge of said knife to engage the slices as they are being severed by said knife, and means for adjusting said shield radially of said knife comprising a plurality of securing means carried by said arm each of which passes through one of a plurality of parallel slots in said shield.

3. In a slicing machine, a slicing knife, a rod extending longitudinally of said machine, a bracket slidable on said rod, a substance clamp pivoted at one end on said bracket on an axis longitudinally of said rod and having the other end slidably supported on a portion of said machine, and adjustable means for limiting the pivotal movement of said clamp.

4. In a slicing machine, a knife, a substance clamp, means for imparting step-by-step movement to said clamp, a slice-receiving platform, and means connecting said clamp and platform for imparting said movement to said platform and for continuing to move said platform after said clamp stops during said step-by-step movement.

5. In a slicing machine, a slicing knife, a clamp slidable to and from the plane of said knife, means for imparting step-by-step movement to said clamp, a slice-receiving platform, a pivoted arm on said clamp, a rod on said platform extending through an orifice in said arm, and means tending to rotate said arm to engage an upper and lower edge of said orifice with said rod when said clamp is moved toward said knife.

6. In a slicing machine, a slicing knife, a substance clamp slidable to and from the plane of said knife, means for imparting step-by-step movement to said clamp, a slice-receiving platform, a cylinder secured to said platform, a plunger slidable in said cylinder and secured to said clamp, and a one-way air valve for the admission of air into the end of said cylinder.

7. In a slicing machine, a slicing knife, a substance clamp, a feed screw beneath said clamp positioned parallel to the axis of said knife, a rod at one side of the machine parallel to the axis of said knife, a bracket slidable on said rod and having a portion extended beneath said clamp, means securing said clamp to said bracket, a handle extending from said bracket, oppositely disposed feed nuts slidably carried by said bracket, springs urging said nuts into engagement with said screw, a lever pivoted to said bracket and having a handle portion beneath said first-named handle, and a pair of arms each of which is pivoted at one end to one of said nuts and pivoted at their other ends to said lever.

8. In a slicing machine, the combination with a support, of a knife, a shield for said knife, means to move the substance toward the plane of said knife, said slicing knife and shield moving so as to have substantially equal tendencies to throw the slices in opposite directions as they are cut from the substance.

9. In a slicing machine, the combination with a knife, of a support for the substance to be sliced, means to move the substance toward the knife, and a shield for the knife moving into engagement with the slice at the same time but in the opposite direction to the movement of the cutting edge of the knife at relative speeds which substantially neutralize the tendency of the knife to carry the slice along therewith by holding the slice away from the surface of the knife adjacent the cutting edge thereof, the knife and shield moving at different speeds.

10. A slice receiver for slicing machines, comprising a slice support, an actuating member, yielding means for holding said support and said operating member away from each other a predetermined distance while said parts are at rest, and means for moving said operating member to actuate said platform and compress said yielding means, said yielding means thereafter expanding beyond its original dimensions to hold said support and operating means in different positions relatively to each other than before said operating member was actuated to move said platform.

11. In a slicing machine the combination with a slicing knife, of a substance support, means for feeding the substance towards the cutting plane of said knife, a slice receiving platform, interengaging means between said platform and feeding means, comprising a cylinder, a plunger operable in said cylinder, said plunger being attached to said support and said cylinder being attached to said feeding means, and a valve communicating with the interior of said cylinder to permit air to move into said cylinder when said cylinder moves in one direction.

12. In a slicing machine, the combination with a slicing knife, of a substance clamp, means for feeding said substance clamp towards the cutting plane of said knife, a slice receiver, a rod on said slice receiver, a member having an opening pivoted to a bracket which also has operative engagement with said clamp, said pivotal connection for said member being a lost motion connection, said rod being arranged in said opening, a spring for moving said member in one direction to tilt the same about its pivot and cause engagement of the edges of said opening with said rod, and feeding means for feeding said clamp towards the cutting plane of said knife, said clamp feeding said support through the intermediary of said rod and member and said member permitting excess movement of said support by its own inertia after said member becomes inoperative for the purposes set forth.

13. In a slicing machine, the combination with an arm, of a knife mounted on said arm, driving mechanism for said arm to move said knife continuously in one direction only at a substantially uniform high rate of speed through the material to be cut, means associated with said knife for engaging the slices as they are being severed to move the slices out of engagement with the surface of the knife adjacent the cutting edge thereof, and means for moving said knife and said means associated with said knife at relative speeds substantially neutralizing the entire throwing effect of said knife on the slices as they are being severed.

14. A slicing machine comprising a substance support, a slicing knife movable to cut a substance on said support and movable to a position below the supporting surface of said substance support, means for driving said knife continuously in one direction only along a closed path at a relatively uniform high rate of speed, a slice receiver positioned adjacent the cutting plane of said knife and in a position to directly receive the slices as they are formed, the slice receiving surface thereof being below the lowermost point in the path of travel of said knife and

moving through the cutting plane of said knife as such receiver is fed to receive the slices from the knife, and means associated with said knife having sufficient frictional contact with the slice during the formation thereof for substantially neutralizing the throwing effect thereof on said slice in the direction of movement of said knife through the substance and for turning the slice broad side down onto said slice receiver.

15. In a slicing machine, the combination with a slicing knife, of a substance support, means for feeding the substance towards the cutting plane of said knife, a slice receiving platform, interengaging means between said platform and feeding means comprising a cylinder, a plunger movable in said cylinder, and a valve communicating between the interior of said cylinder and the atmosphere, said plunger being attached to said support and said cylinder being attached to said feeding means, said valve being constructed to permit the air to enter the cylinder but not to leave the same so that as the air is compressed within the cylinder the air forms a yielding means which acts after the feeding of said support to get an additional movement to said platform and said valve permitting the air to enter said cylinder after the compressed air has expanded to prevent the formation of any material amount of suction in said cylinder.

16. In a slicing machine, the combination with a slicing knife mounted for rotative movement on an axis, of an arm upon which said knife is rotatably mounted, a pivot for said arm eccentric to the axis of rotation of said knife, means for moving said arm about its pivot at a relatively high uniform rate of speed continuously in one direction, means for rotating said knife about its axis, and a slice deflector arranged adjacent the edge of said knife and having spaced projections thereon, said deflector being arranged with the edge thereof closely adjacent the cutting edge of said knife to substantially neutralize the entire throwing effect of said knife on the slices as they are cut from the substance being sliced and being mounted on the end of said arm remote from the pivotal axis thereof with said projections extending substantially in the direction of rotative movement of said deflector.

17. In a slicing machine for slicing meat and the like, the combination with a rotary knife, of means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its direction about said eccentric axis, a movable conveyer for receiving successive slices as they are formed, and means for moving said conveyer to position different portions thereof in position to receive the successive slices, means operable during the formation of the slice for neutralizing the tangential throwing effect of said knife on the slice as it is severed by said knife and for turning the slices through a substantial angle broad side down onto said conveyer.

18. In a machine for slicing meat and the like, the combination with a rotary knife, means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its direction about said eccentric axis, and a shield rotatable with said knife about said eccentric axis having a portion positioned closely adjacent the edge of said knife to engage the slices as they are being severed by said knife, whereby the slice is engaged by said shield substantially at the same time that the cutting edge of the knife engages said slice to hold the slice away from the cutting edge thereof and thereby substantially prevent the slice from being moved along with the knife as the latter passes through the substance and to immediately turn the slice broad side down onto a support.

19. In a machine for slicing meat and the like, the combination with a rotary knife, means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and also about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its direction about said eccentric axis, a shield rotatable with said knife about said eccentric axis having a portion positioned closely adjacent the edge of said knife to engage the slices as they are being severed by said knife whereby the slice is engaged by said shield substantially at the same time that the cutting edge of the knife engages said slice to hold the slice away from the cutting edge thereof and thereby substantially prevent the slice from being moved along with the knife as the latter passes through the substance and to immediately turn the slice broad side down onto a support, means for feeding material to be cut into the path of movement of said knife, and a movable slice receiving platform arranged partially beneath said knife and in close proximity thereto for receiving the slices as they are formed in overlapping relation with each other.

20. In a machine for slicing meat and the like, the combination with a rotary knife, of means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its movement about said eccentric axis, a shield rotatable with said knife about said eccentric axis, a movable slice receiving member for receiving slices as they are formed by said knife, said shield having a portion thereof positioned adjacent the edge of said knife to engage the slices as they are being severed by said knife to neutralize substantially the entire throwing effect of said knife and turn the slices broad side down onto said slice receiving member, and means for adjusting said shield with respect to the cutting edge of said knife whereby the operator may adjust the same in proper relation to the edge of the knife to secure proper deflection of the slice and proper neutralization of the throwing effect which the knife has on the slice as will compensate for changes in the diameter of the knife.

21. In a slicing machine of the class described, the combination with a rotary knife, of means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its movement about said eccentric axis, a movable slice receiver for receiving successive slices as they are formed in overlapping relation to each other, and a shield rotatable with said knife about said eccentric axis, said shield having a portion thereof positioned adjacent the edge of said knife to engage the slices as they are being severed by said knife, said shield being arranged closely adjacent the cutting edge of the knife and in a position to

force the slices outwardly away from the surface of the knife which lies next to the cutting edge thereof, whereby to prevent the slice from being dragged along with the knife by its engagement with the surface thereof and to turn the slice through a substantial angle broad side down onto said slice receiver.

22. In a machine for slicing meat and the like, the combination with a rotary knife, of means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its movement about said eccentric axis, a movable slice receiving member, and a shield rotatable with said knife about said eccentric axis, said shield having a portion thereof positioned closely adjacent the edge of said knife to engage the slices as they are being severed by said knife and hold said slices substantially entirely free from the surface of the knife which lies adjacent the cutting edge thereof so that the slice is not carried along with the knife, said shield having a plurality of ribs thereon for engaging the slices as they are being severed and being positioned adjacent that cutting edge of the knife which lies farthest away from said eccentric axis and extending somewhat toward the edge of the knife which first engages the substance while lying closely adjacent the cutting edge of the knife so as to turn the slices with their broad sides down onto said slice receiving member without a substantial amount of lateral throwing effect on the slices in the direction of knife movement.

23. A slicing machine comprising a rotary knife, a support, a substance clamp comprising a plurality of clamping members adapted to be moved toward said knife, and means for increasing the clamping pressure of said clamp during its movement toward the knife comprising a yielding member on one of said clamping members, and a cam located adjacent the path of travel of said yielding member to flex the same during a considerable portion of the latter part of the movement of the clamping members toward the knife in a direction to increase the clamping pressure of said members during that portion of its travel.

24. A slicing machine comprising an arm, a slicing knife rotatably mounted on said arm for bodily movement therewith but having its axis of rotation spaced from the axis of rotation of said arm, means for rotating said arm uniformly and continuously in one direction to move said knife bodily in a closed substantially circular path, means for rotating said knife about its own axis, and a shield carried by said arm, said shield having a portion thereof positioned closely adjacent the edge of said knife to engage the slices as they are formed to hold the slices out of any substantial engagement with the surface of the knife adjacent the cutting edge thereof, and to turn the slices through a substantial angle broad side down onto a receiving surface.

25. In a slicing machine, the combination with an arm, of means for rotating said arm uniformly and continuously in one direction in a closed substantially circular path and about its own axis, a slicing knife rotatably mounted on said arm and spaced from the axis of rotation of said arm, means for moving said knife about its own axis in a direction opposite to the direction of rotation of said arm, means operable during the formation of the slice to hold the slice out of engagement with any substantial portion of the knife to substantially neutralize the entire tangential throwing effect of the knife on the slices of the material severed by said knife and to hold the slice out of any substantial contact with said knife, means for feeding material to be cut into the path of movement of said knife, and a movable slice receiving platform adacent said knife for receiving successive slices in overlapping relation with each other.

26. In a slicing machine, the combination with a rotary knife, of means for rotating said knife uniformly and continuously in one direction in a closed substantially circular path and about an axis eccentric to the axis of said knife, means for rotating said knife about its own axis in a direction opposite to its movement about said eccentric axis, a shield rotatable with said knife about said eccentric axis, said shield having a portion positioned adjacent the edge of said knife to engage the slices as they are being severed by said knife and to hold the slices out of any substantial contact with the knife, means for feeding material to be cut into the path of movement of said knife, and a movable slice receiving platform adjacent said knife and arranged at a substantial angle to the cutting plane thereof for receiving successive slices as they are formed in overlapping relation with each other.

27. In a meat slicing machine or the like, the combination with a knife continuously moving in a circular path at a substantially uniform relatively high rate of speed and in one direction only, of slice deflecting means associated with the cutting edge of said knife and moving with the knife about the axis of rotation thereof and in unison therewith, the said deflecting means having a portion lying closely adjacent the cutting edge of said knife for engaging the slice to hold the slice out of any substantial contact with said knife except closely adjacent the cutting edge thereof and for turning the slice through a substantial angle in the direction of a slice receiving surface and away from the knife, whereby the slice is prevented from being carried along in the direction of movement of said knife to any appreciable extent and the slice is deflected laterally away from the knife broad side down onto a receiving surface.

28. In a slicing machine, the combination with a slicing knife, of a slice receiver having the supporting surface thereof extending at a substantial angle to the cutting plane of said knife, means for moving said slice receiver to position different portions thereof in slice receiving position adjacent said knife, said slice receiver being located closely adjacent the position where the slices are formed, means for moving said slicing knife continuously at a uniform high rate of speed always in the same direction along a closed path so that the knife periodically returns into slicing position, means for feeding a substance into slicing position, means for determining the thickness of the slice to be formed, and means associated with said knife for turning all portions of the slice as it is formed outwardly away from the knife through a substantial angle toward and against said slice receiver while at the same time holding the slice out of any substantial amount of contact with the surface of said knife adjacent the cutting edge thereof whereby the movement of the slice in the direction of travel of said knife along its path is substantially prevented so

that the slice is thrown outwardly and downwardly broad side down onto said slice receiver.

29. In a slicing machine for slicing and shingling thin slices of meat, the combination with a knife moving uniformly at a relatively high rate of speed in one direction only along a circular closed path to move the cutting edge thereof periodically into and out of slicing position, of a movable slice receiver having the slice receiving surface thereof lying closely adjacent the path of movement of said knife at the position in which the slices are formed so as to be in a position to receive the slices as they are formed, means for moving said slice receiver, means for feeding a substance toward the cutting plane of said knife with the under side thereof at said cutting plane lying closely adjacent said slice receiver and substantially parallel therewith, means for holding the slices out of any substantial engagement with the knife as the same are being formed and for moving the same outwardly and downwardly directly against said slice receiver in a direction to cause the lower edges of said slices to strike the surface of said receiver first, whereafter said edges act substantially as pivots about which the remaining portions of the slices turn as the same continue their general movement, whereby each slice is laid flatly on the slice receiver or in flat overlapping relation with a previously laid slice on said receiver.

30. In a slicing machine for slicing and shingling thin slices of meat from a substance, the combination with a knife moving uniformly at a relatively high rate of speed in one direction only along a circular closed path to move the cutting edge thereof periodically into and out of slicing position, of a movable slice receiver having the slice receiving surface thereof lying closely adjacent the path of movement of said knife and substantially parallel to the line formed by the intersection of the plane of the knife and the plane of the lower side of the substance being sliced, means for moving said slice receiver, means for feeding a substance toward the cutting plane of said knife with the under side thereof at said cutting plane lying closely adjacent said slice receiver and substantially parallel therewith, means for throwing the slices in a general direction outwardly away from the knife substantially perpendicular to the end of the substance being sliced, and for applying to all portions of the slices as they are being formed substantially equal lineal and lateral forces, whereby the slices are thrown outwardly away from the substance in extended position directly onto said slice receiving surface, in a manner to cause portions of said slices, substantially along their entire length, to simultaneously strike the surface of said receiver, whereby each slice is laid flatly on the slice receiver or in flat overlapping relation with a previously laid slice on said receiver.

31. The method of slicing bacon slabs and the like comprising the steps of moving a slab of bacon along a predetermined path toward slice forming position, rapidly forming successive thin slices at said position and moving all portions of said slices outwardly away from that end of said slab from which the slices are formed with substantially equal force to maintain the slices in extended relation while they are being thrown away from said slab, and simultaneously substantially eliminating all tendency of the slices to move in the direction of their length, providing a moving receiving surface having a portion moving closely adjacent said slice forming position for receiving slices as they are formed, and for moving each slice away from slice forming position after it is deposited on said surface, arranging the path of movement of said surface so that said surface first engages the lower edges of said slices as the latter are thrown outwardly from said slab, whereby the slices as they continue their movement after engaging said surface, pivot about their retarded bottom edges and fall broad side down flatly against the slice receiving surface or a previous slice deposited on said surface.

32. The method of slicing bacon slabs and the like comprising the steps of moving a slab of bacon along a predetermined path toward slice forming position, rapidly forming successive thin slices at said position and moving all portions of said slices outwardly away from that end of said slab from which the slices are formed with substantially equal force to maintain the slices in extended relation while they are being thrown away from said slab, and simultaneously substantially eliminating all tendency of the slices to move in the direction of their length, providing a moving receiving surface having a portion adapted to move closely adjacent said slice forming position for receiving slices as they are formed, and for moving each slice away from slice forming position after it is deposited thereon, arranging the path of movement of said surface so that said surface first engages the edge of a slice as the latter is thrown outwardly from said slab, whereby the slices as they continue their movement after engaging said surface, pivot about their retarded edge and fall broad side down flatly against the slice receiving surface or a previous slice deposited on said surface.

33. The method of slicing bacon slabs and the like comprising the steps of moving a slab of bacon along a predetermined path toward slice forming position, rapidly forming successive thin slices at said position and moving all portions of said slices outwardly away from that end of said slab from which the slices are formed with equal force to maintain the slice in extended position while it is being thrown away from said slab, and simultaneously substantially eliminating all tendency of the slices to move in the direction of their length, arresting the movement of the lower edge only of each slice as the same is thrown away from that slab, whereby the said edge acts substantially as a pivot about which the slice turns, arresting the pivotal movement of the slice after it has been turned to a predetermined position in flat extended position, and thereafter moving each slice away from said slab in a direction substantially parallel with its broad side but not sufficient to clear the next slice as it is deposited, whereby the slices are arranged in flat overlapping relation with each other.

34. A method for high speed slicing and stacking of slices comprising moving the substance to be sliced along a predetermined path, rapidly producing transverse cuts in said substance one at a time at a uniform high rate of speed at a given position in said path to sever successive slices from the substance, exerting a substantially uniform force on all portions of each slice both in the direction in which the cut is taken and also in the direction in which the slices are thrown away from the substance with the force which acts in the direction of the cut parallel to the broad face of the slice being relatively small to prevent any substantial movement of the slice

under this force in a direction parallel to its broad face, arresting the movement of one edge of each slice first so that the slice turns about that edge as a pivot, subsequently entirely arresting the pivotal movement of each slice in flat extended relation, moving the slice substantially parallel to the broad side thereof to another position not sufficiently removed from its first position to clear the next slice, whereby successive slices are arranged in overlapping relation with each other.

35. A method for high speed slicing and stacking of slices comprising the moving of the substance to be sliced along a predetermined path, at a uniform rate, rapidly producing transverse cuts in said substance one at a time at a uniform high rate of speed at a given position in said path to cause successive slices to be formed, moving all portions of each slice outwardly away from the end of the substance as it is formed in flat extended position in a general direction substantially perpendicular to the cutting plane of said knife onto a slice receiving surface without the use of intermediate holding means for holding the slices as they are being moved onto the slice receiving surface, maintaining the slices in extended relation while they are being transferred directly onto the slice receiving surface, and moving the slices after they are on the slice receiving surface in a direction substantially parallel to their broad sides to another position removed from the position at which they are deposited whereby each successive slice is deposited in a different position along said slice receiving surface.

36. A slicing machine comprising a slicing knife, a substance advancing means intermittently operated for advancing the substance to be sliced toward the cutting plane of said knife, a slice receiving platform for moving the slices away from the knife after the same are formed, and means moving in timed relation with said substance advancing means for actuating said platform, means for adjusting the substance advancing means to feed the substance different amounts between periods of rest therefor, the time interval for feeding the substance between periods of rest being substantially the same for different amounts which the substance is advanced between periods of rest, whereby the substance advancing means and consequently said platform moving means move at greater speeds for greater amounts of feed, said platform moving means being automatically releasable at the end of each movement of the substance advancing means to permit the inertia of said platform to carry the same a greater distance than the same is moved by its moving means, and said platform being free to move said additional distance after released from its moving means, the amount of overrun of the platform being substantially proportional to the speed to which the substance is advanced by its moving means, whereby when thicker slices are being cut the spacing of the slices on said platform is correspondingly increased.

37. A device as set forth in claim 36, in which the platform moving means is directly connected to the substance advancing means.

38. In a slicing machine, the combination with a slicing knife, of a slice receiver having means for moving said slice receiver to position different portions thereof in slice receiving position adjacent said knife, said slice receiver being located closely adjacent the position where slices are formed, means for moving said slicing knife continuously at a uniform high rate of speed always in the same direction along a closed path, so that the knife periodically returns to slicing position, means for feeding a substance into slicing position, means for determining the thickness of the slice to be formed, and means associated with said knife for throwing all portions of the slice outwardly away from the knife onto said slice receiver while at the same time holding the slice out of any substantial amount of contact with the surface of said knife adjacent the cutting edge thereof, and maintaining the slice in extended relation, whereby the movement of the slice in the direction of travel of said knife along its path is substantially prevented, so that the slice is thrown outwardly broad side down on to said slice receiver.

39. In a slicing machine, the combination with a slicing knife, of a slice receiver having means for moving said slice receiver to position different portions thereof in slice receiving position adjacent said knife, said slice receiver being located closely adjacent the position where slices are formed, means for moving said slicing knife continuously at a uniform high rate of speed always in the same direction along a closed path, so that the knife periodically returns to slicing position, means for feeding a substance into slicing position, means for determining the thickness of the slice to be formed, means for moving said knife about an axis in one direction only, the cutting edge of said knife being eccentric to said axis, and means associated with said knife for throwing all portions of the slice outwardly away from the knife onto said slice receiver while at the same time holding the slice out of any substantial amount of contact with the surface of said knife adjacent the cutting edge thereof, and maintaining the slice in extended relation, whereby the movement of the slice in the direction of travel of said knife along its path is substantially prevented, so that the slice is thrown outwardly broad side down on to said slice receiver.

40. In a slicing machine the combination with a slicing knife, of a substance supporting conveyor for moving the substance toward the cutting plane of said knife, a conveyor for moving the slices away from the slice receiving position after the same are formed, driving means for both of said conveyors, means for moving said knife at a substantially uniform high rate of speed in a closed substantially circular path in one direction only to sever successive slices from the substance as the same is advanced toward said cutting plane, means associated with the knife for engaging the slices as they are formed to hold the same out of substantial contact with said knife to substantially neutralize the movement of the slices in the direction of knife movement, deflecting the same directly as they are formed in flat extended position on said second conveyor, means for selectively varying the movement of said first conveyor to vary the thickness of the slices formed by said knife, and means for varying the movement of the other conveyor for varying the amount of overlapping of the slices thereon, said last two mentioned means being variable relatively of each other so that when the speed of movement of the first conveyor is changed to vary the thickness of the slice the speed of movement of the second conveyor is changed to vary the amount of overlapping of the slices to secure the best shingling of the slices on the slice receiving conveyor.

41. In a slicing machine, the combination with a substance supporting conveyor having the sup-

porting surface thereof movable in one direction to feed substance, a slicing knife carried by a rotatable element and eccentrically mounted on said rotatable element, said knife rotated about its own axis as well as the axis of said rotatable element, power means for driving said rotatable element at a high rate of speed, a second conveyor having the supporting surface thereof arranged in a position to receive slices directly as they are formed by said knife and being movable in a direction away from the cutting plane of said knife so that the slices will be received in overlapping relation with each other, means associated with said knife for directing the slices onto said second conveyor with the broad sides facing downwardly, means for driving one of said conveyors, and interconnecting means between said conveyors for driving the other of said conveyors through said driven conveyor when the driven conveyor is driven by said driving means.

42. In a slicing machine, the combination with a substance supporting conveyor having the supporting surface thereof movable in one direction to feed substance, a slicing knife carried by a rotatable element and eccentrically mounted on said rotatable element, means for rotating said element at a relatively high speed, said knife rotating about its own axis as well as the axis of said rotatable element, a second conveyor having the supporting surface thereof arranged in a position to receive slices directly as they are formed by said knife and being movable in a direction away from the cutting plane of said knife at a speed such that the slices will be received in overlapping relation with each other, means associated with said knife for directing the slices onto said second conveyor with the broad sides facing downwardly, means for driving one of said conveyors intermittently, and interconnecting means between said conveyors for driving the other of said conveyors through said driven conveyor when the driven conveyor is driven by said driving means.

WILLIAM MAHLER.