(No Model.) 7 Sheets—Sheet 1.

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MEANS AND MACHINERY FOR GRINDING CUTLERY.

No. 594,699. Patented Nov. 30, 1897.

Fig. 2.

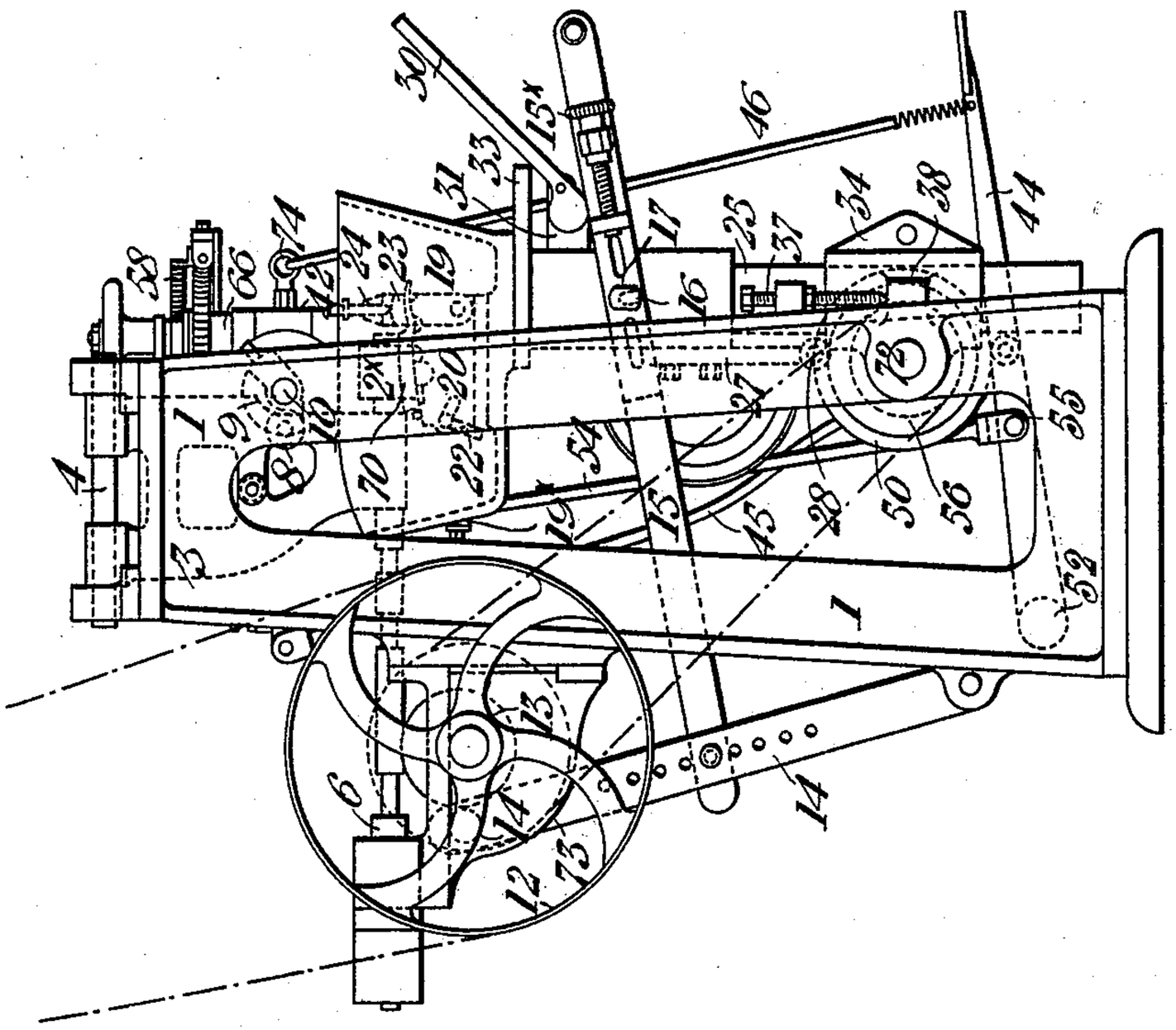
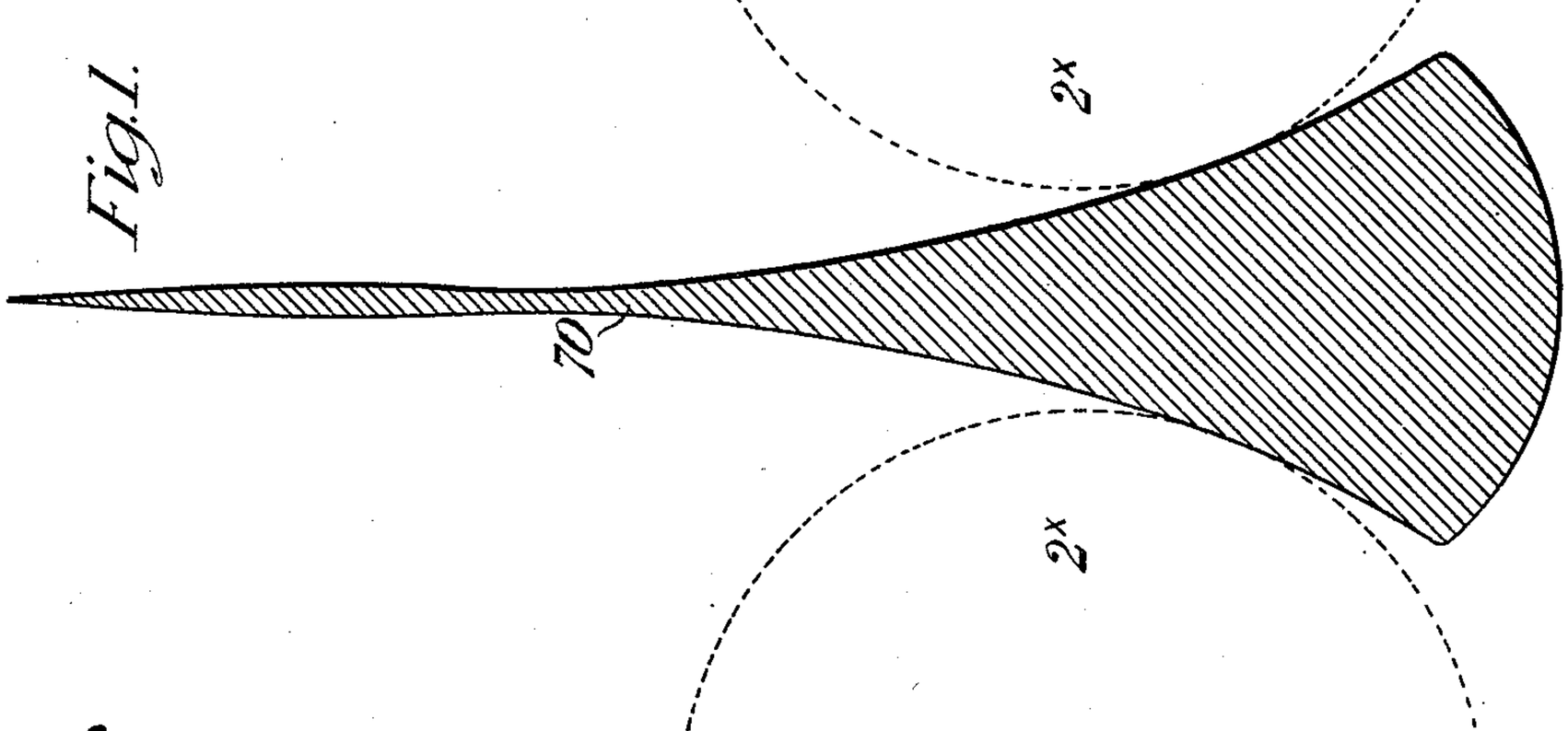


Fig. 1.



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(No Model.) 7 Sheets—Sheet 2.

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Fig. 3.

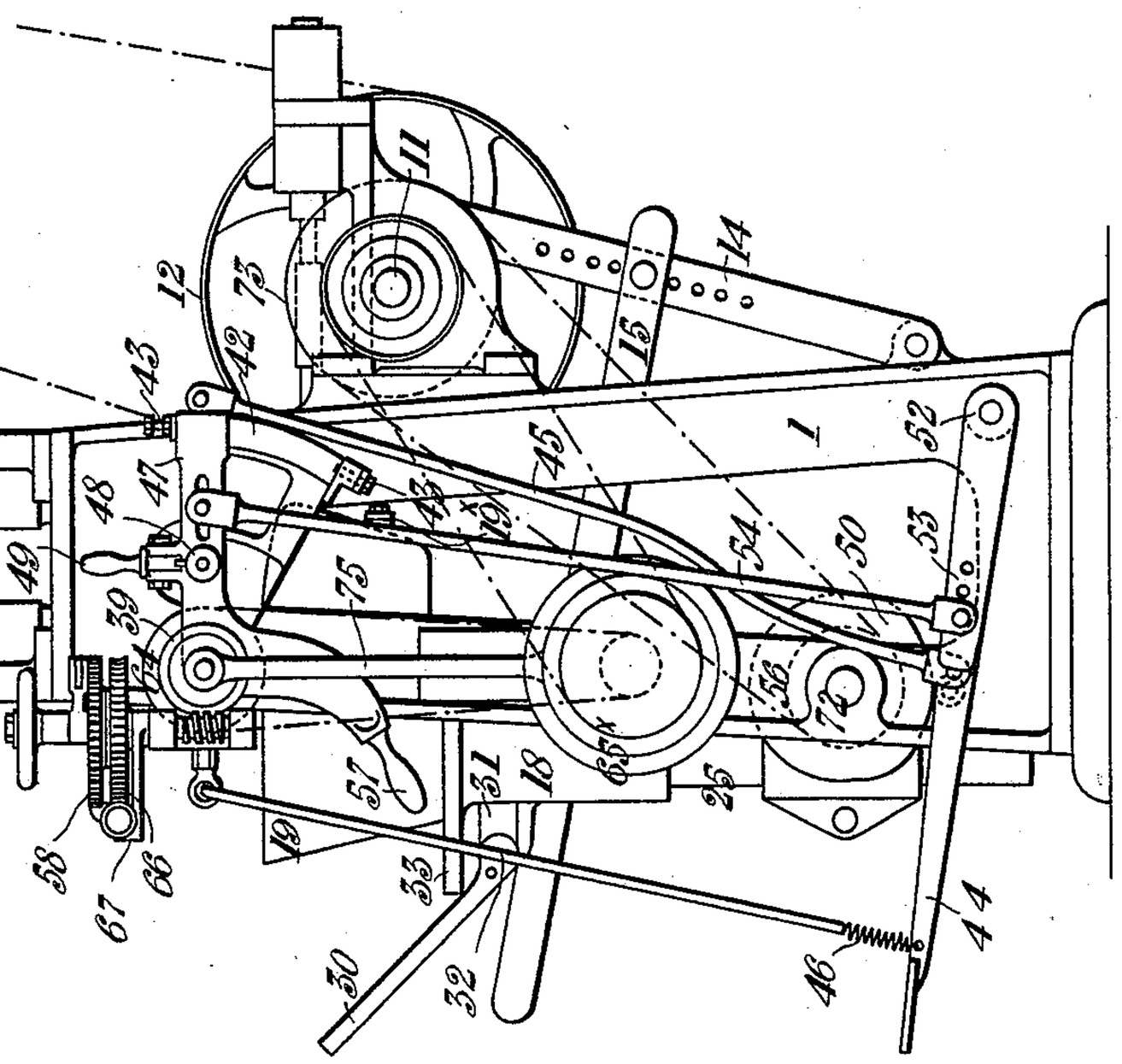
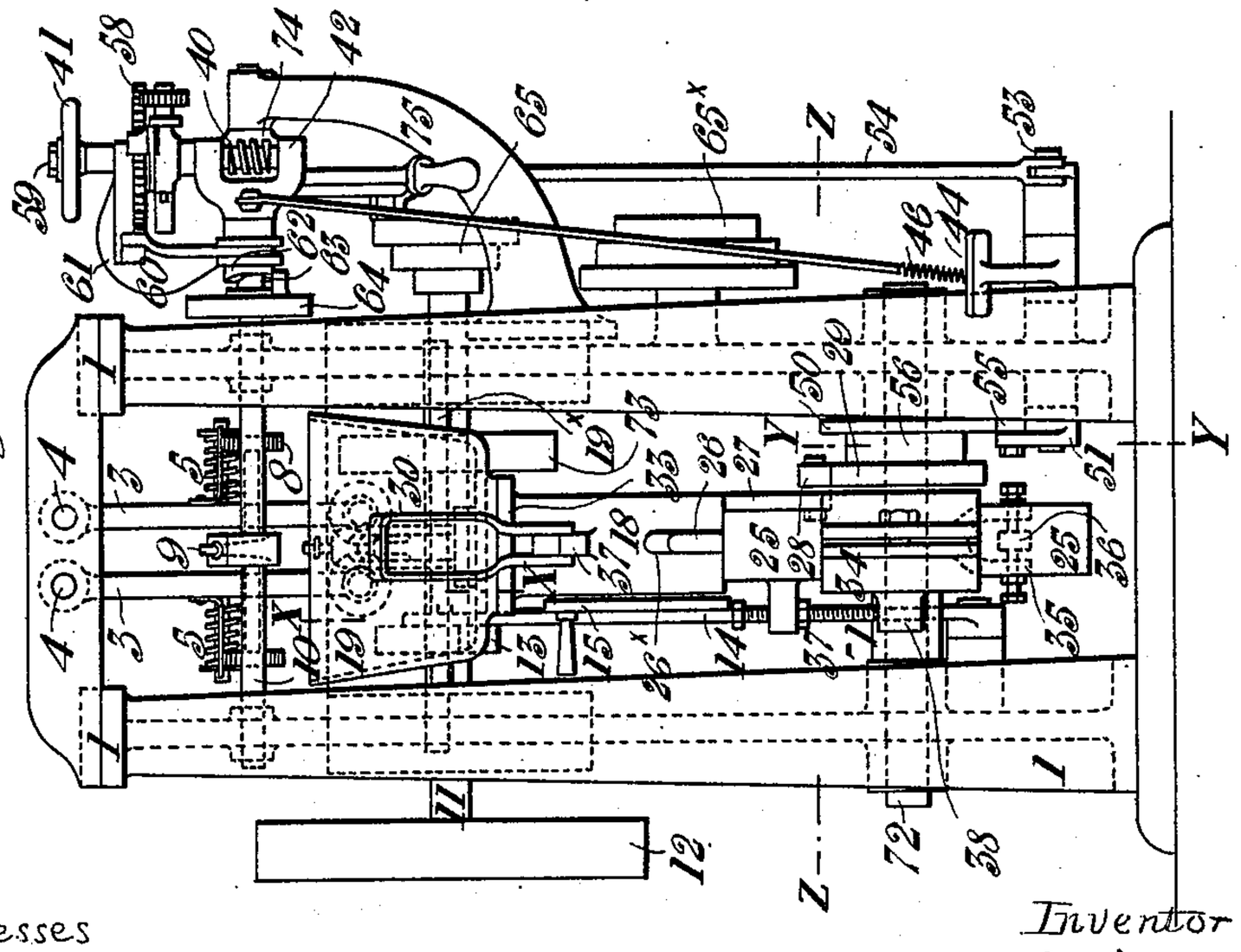


Fig. 4.



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MEANS AND MACHINERY FOR GRINDING CUTLERY.

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Fig. 6.

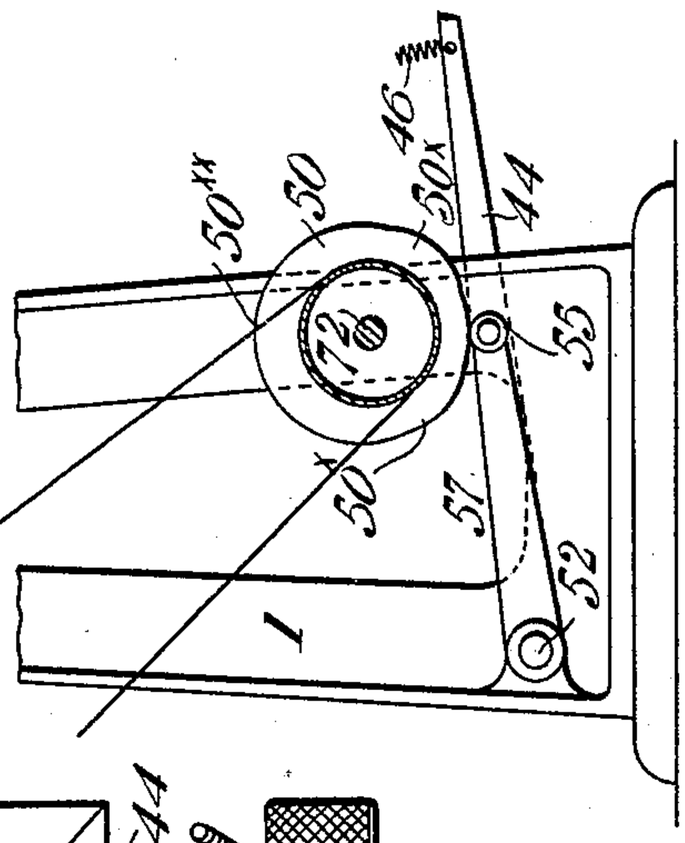

Fig. 7

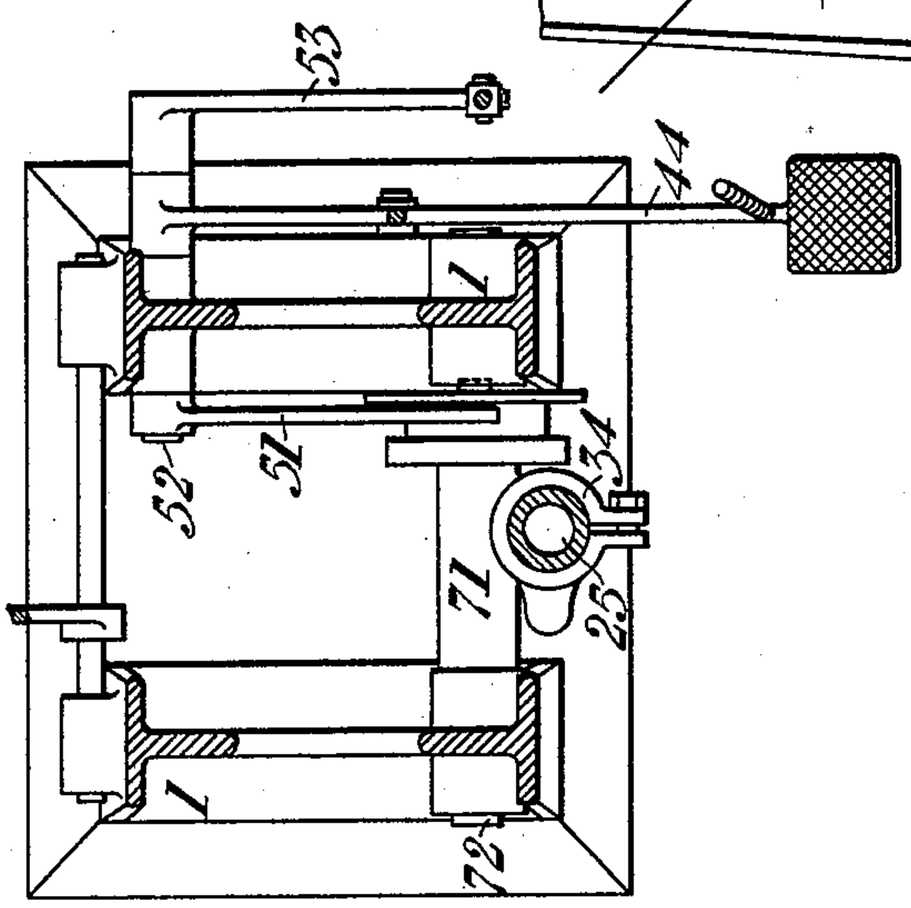

Fig. 5.

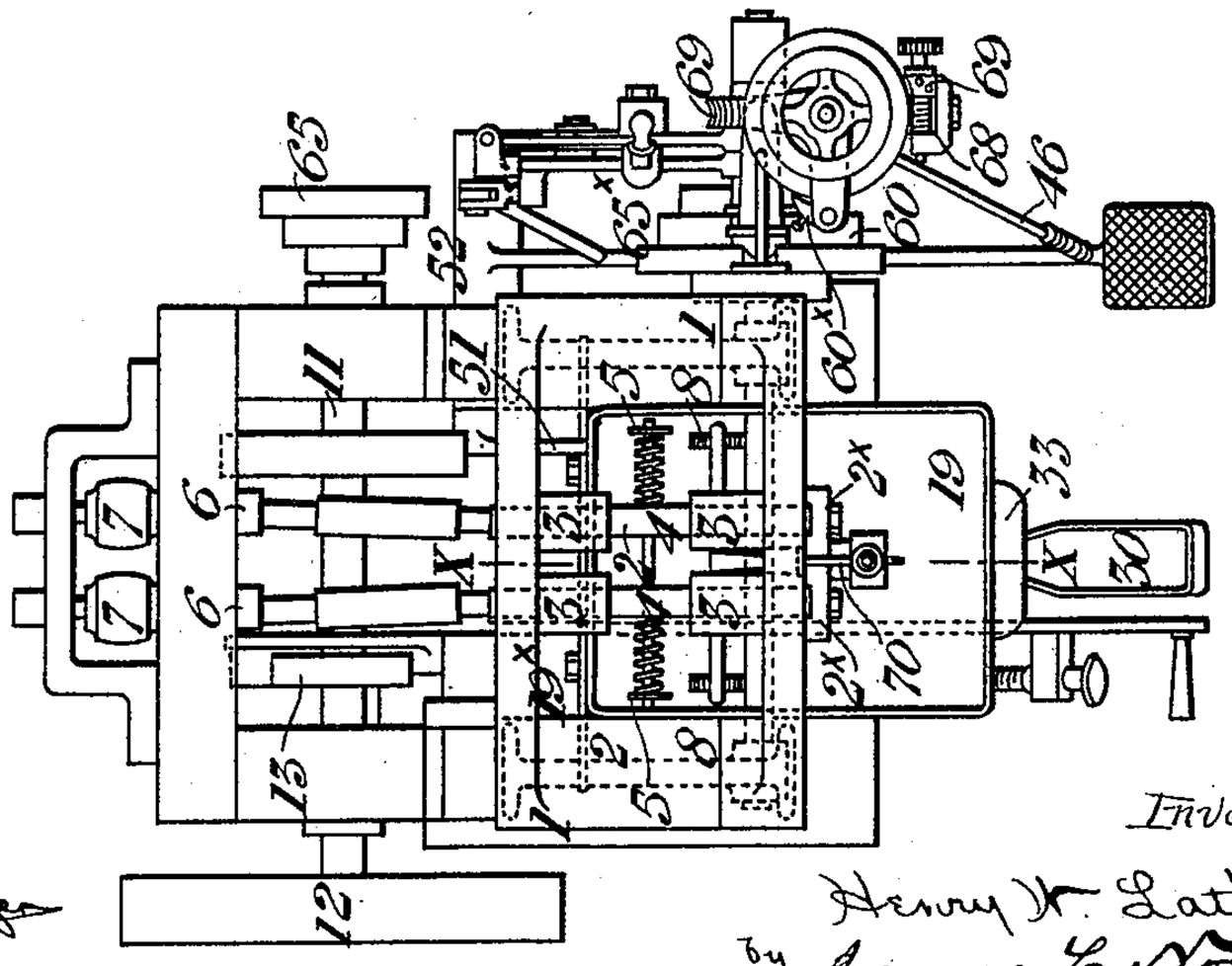

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Fig. 8.

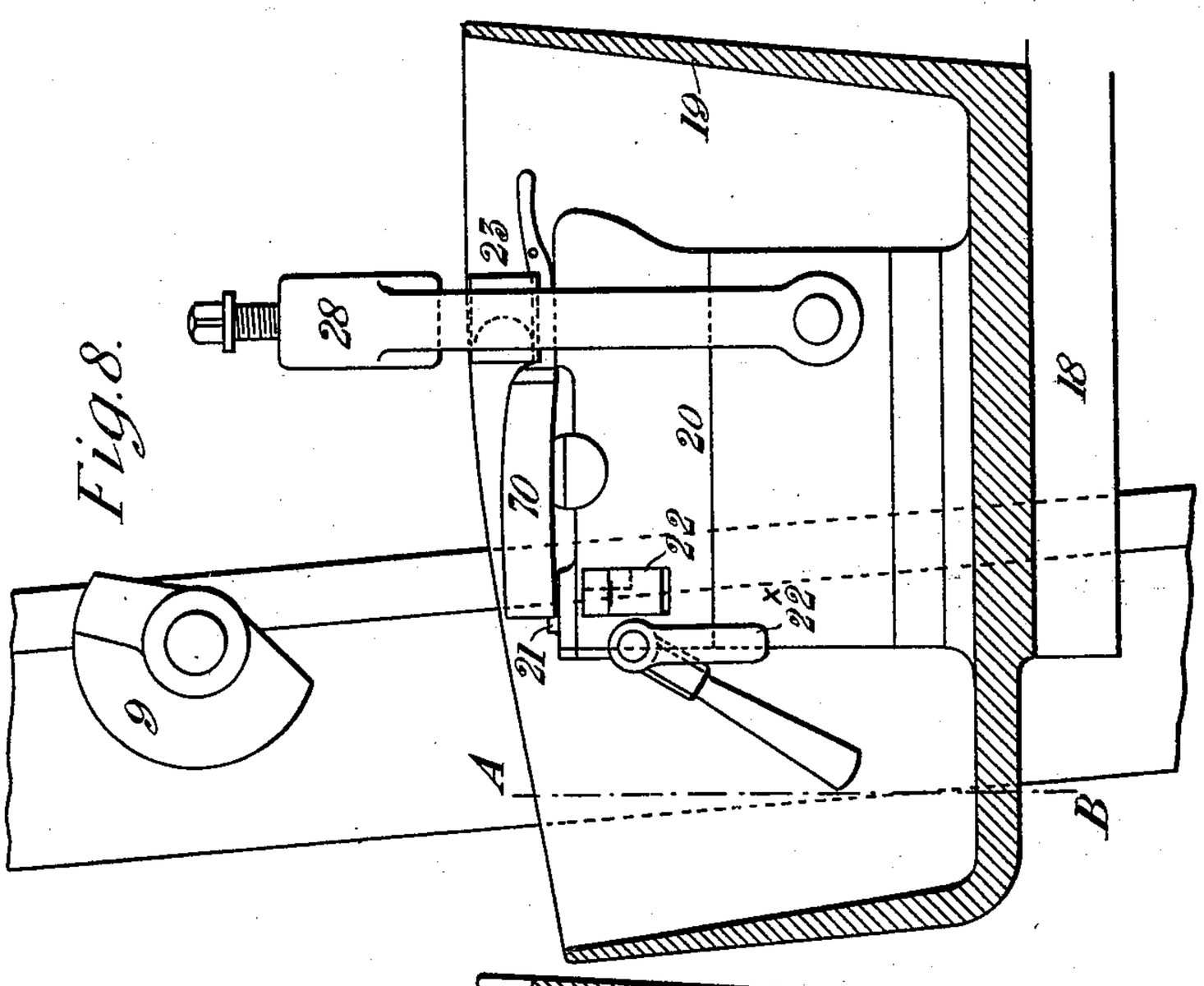
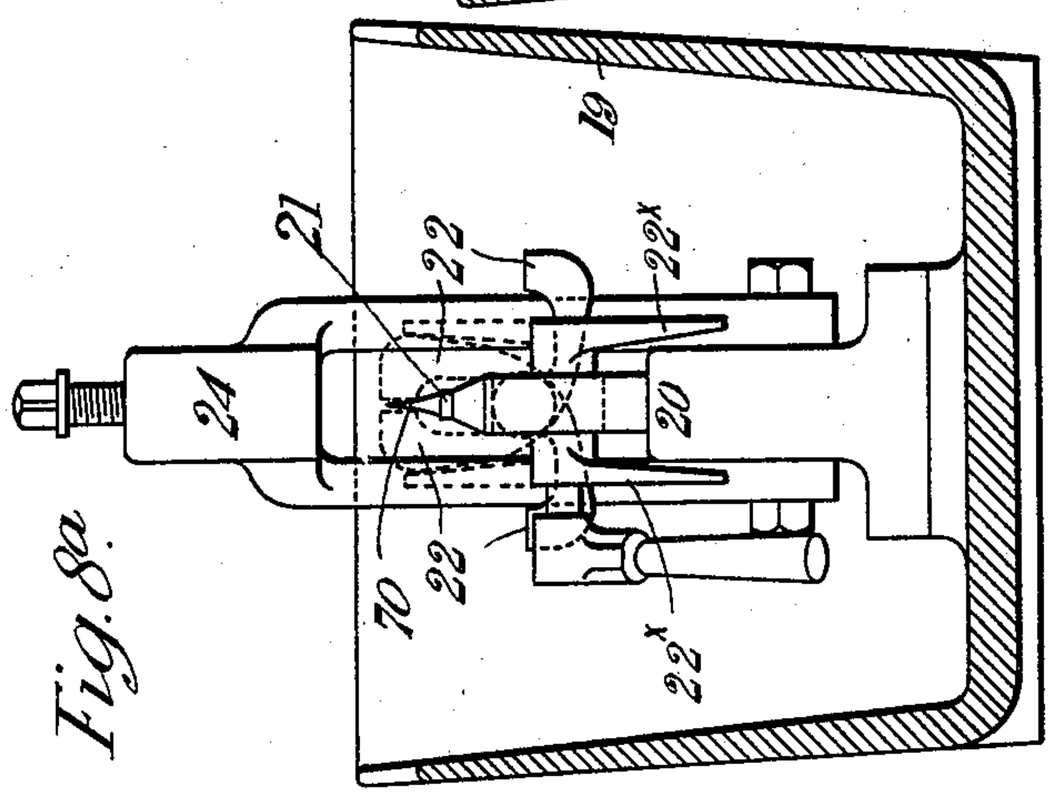


Fig. 8a.



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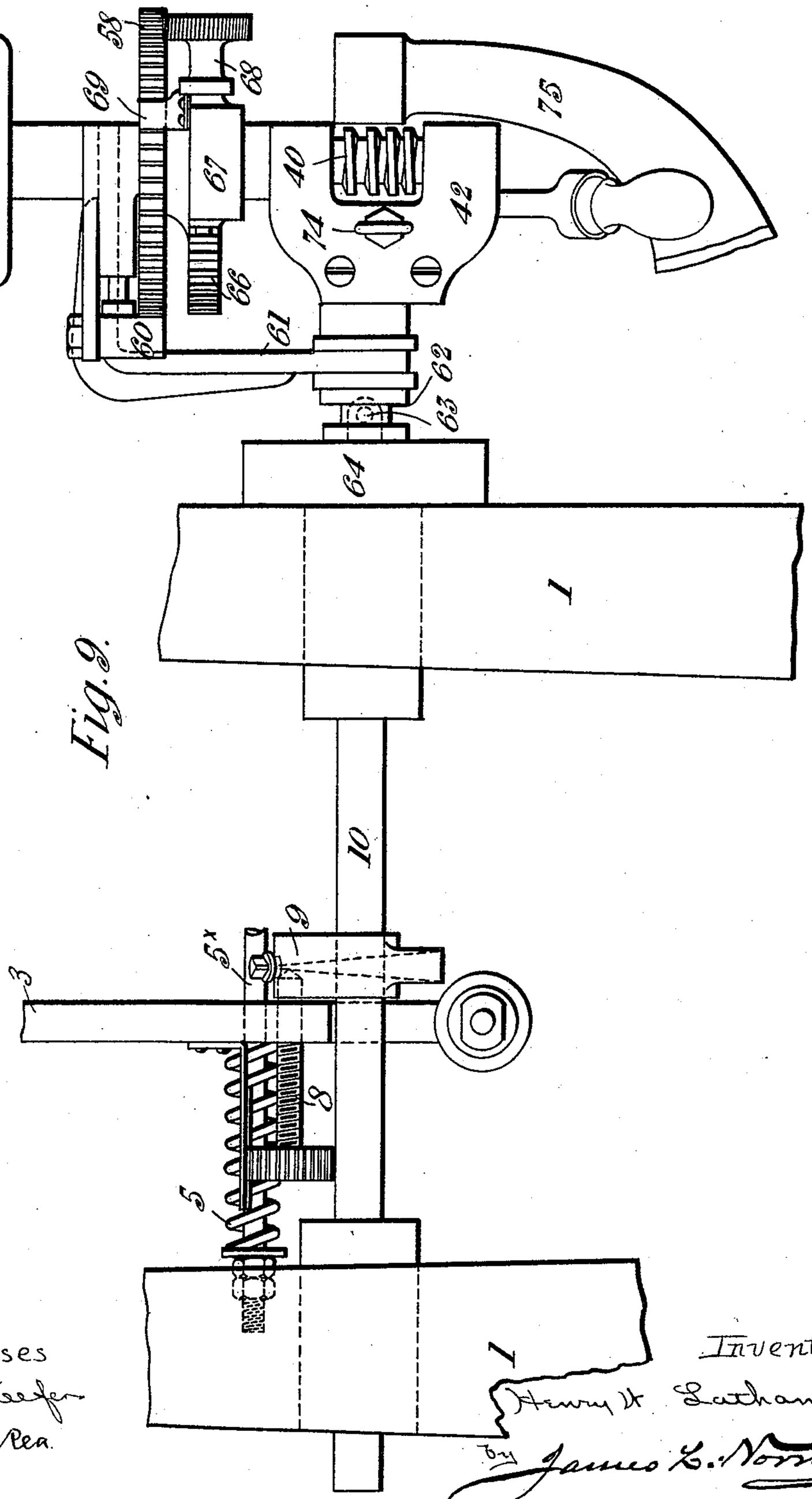

Fig. 9.

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MEANS AND MACHINERY FOR GRINDING CUTLERY.

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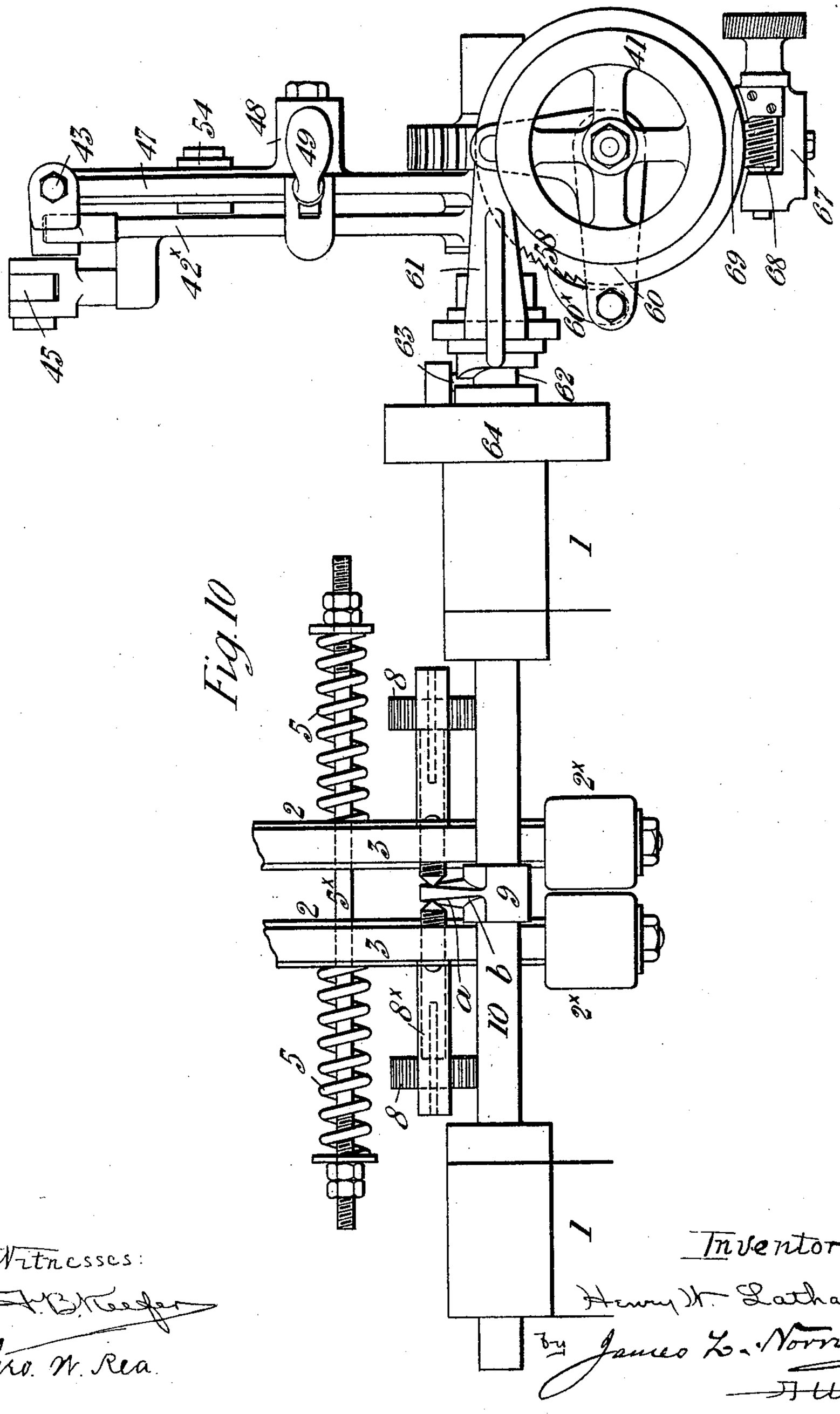

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(No Model.) 7 Sheets—Sheet 7.

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MEANS AND MACHINERY FOR GRINDING CUTLERY.

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Fig. 11.

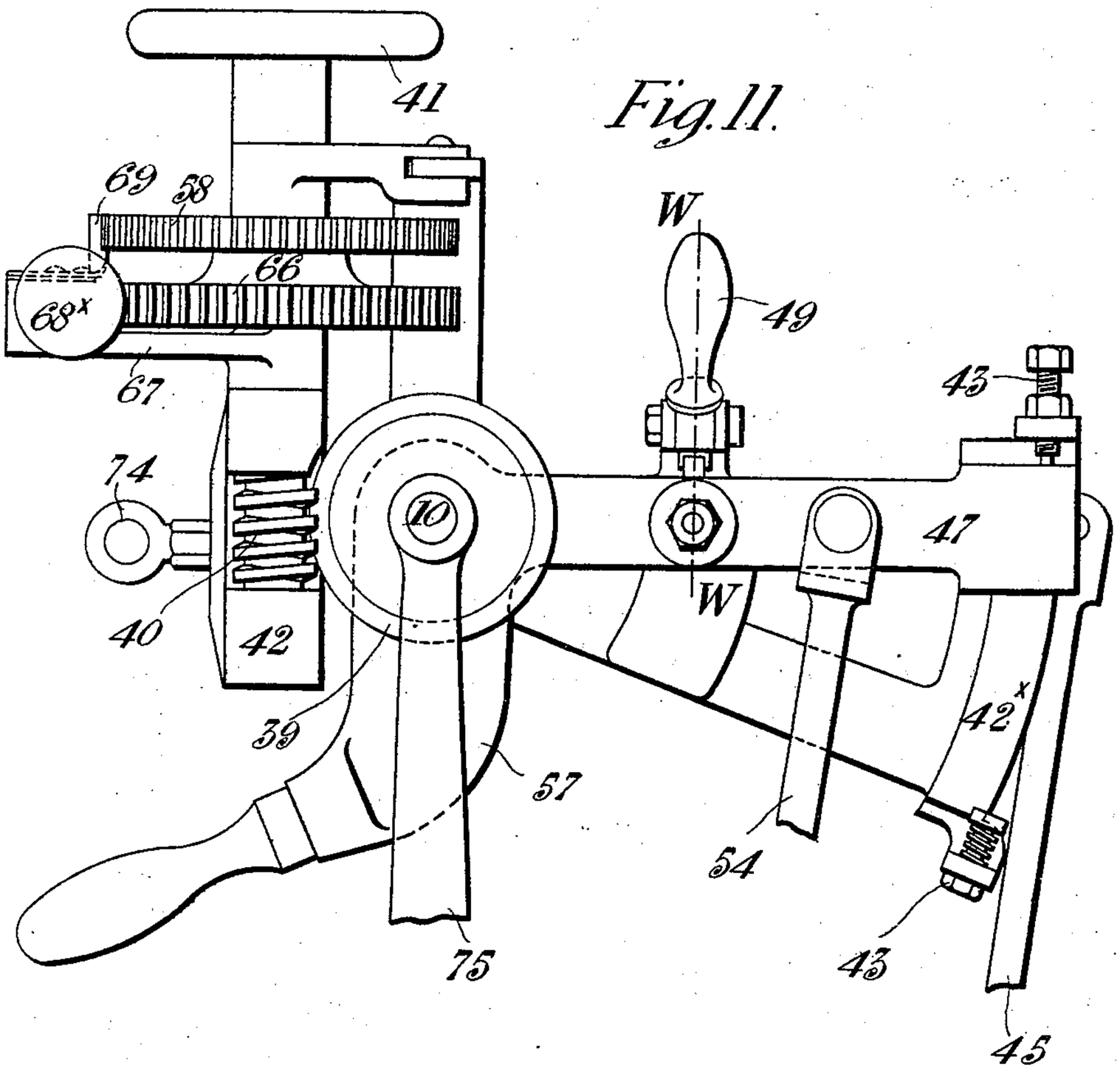
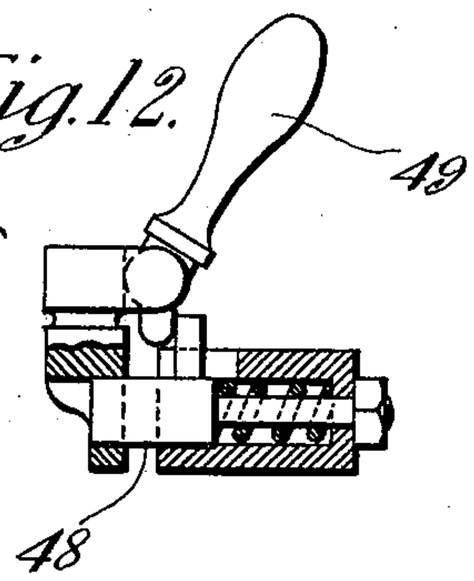


Fig. 12.



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UNITED STATES PATENT OFFICE.

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MEANS AND MACHINERY FOR GRINDING CUTLERY.

SPECIFICATION forming part of Letters Patent No. 594,699, dated November 30, 1897.

Application filed June 5, 1897. Serial No. 639,580. (No model.)

To all whom it may concern:

Be it known that I, HENRY WILKINSON LATHAM, a citizen of England, residing at Oakley Works, Kings Road, Chelsea, London, England, have invented certain new and useful Improvements in the Means and Machinery for Grinding Cutlery, of which the following is a specification.

This invention relates to improved means and machinery for grinding cutlery, more particularly for grinding hollow-ground razors; and it consists, mainly, in the provision of means whereby the blade, instead of being made of more or less uniform small thickness from about the middle of the width of the blade to the cutting edge, is first reduced to a certain small thickness at about the middle, is then swelled or thickened again up to a certain point toward the edge, from which point it then gradually decreases in thickness again down to the cutting edge, as shown in the section at Figure 1 of the accompanying drawings.

The object of this construction is to afford a certain amount of support to the edge by thickening the part behind it, while at the same time affording the blade the necessary amount of elasticity in the direction of its width by means of thinner middle part thereof. For producing this form of blade I employ machinery the main features of which consist, first, in carrying the blade with its edge uppermost by a support to which is imparted both a to-and-fro motion in the direction of the length of the blade and an up-and-down motion in the direction of its width, and, secondly, in acting upon the blade during such motion by means of a pair of grinding-wheels so arranged and actuated that their distance apart is varied in relation to the up-and-down motion of the blade in such manner that they approach nearest to each other when grinding the extreme edge—that is, when the blade is in its lowest position—then gradually separate as the blade rises up to a certain point, so as to produce the swelled or thickened part, and then approach gradually again to produce the thinner middle part. Simultaneously with this peculiar motion the grinding-wheels are also gradually approached toward each other as the blade becomes thinner by the grinding action. The spindles of the grinding-rollers are for this purpose mounted in bearings that besides having a simultaneous motion to and from each other can also have each an independent motion imparted to them, the object being to enable each spindle and grinding-wheel to be adjusted separately as may be required in consequence of any inequalities in the wear of the grinding-wheels.

All the above-described movements are made to take place automatically, and the combined approach of the grinding-wheels is made to cease automatically at a certain point determined by the desired thickness of the blade when finished. It will be obvious that the machinery can be variously constructed for carrying out these main features of the grinding process.

On the accompanying drawings is shown the construction which I prefer to employ.

Fig. 1 shows a section of a blade as ground by this machine. Figs. 2 and 3 show two opposite side elevations. Fig. 4 shows a front elevation. Fig. 5 shows a plan. Fig. 6 shows a part section on line Y Y, Fig. 4; Fig. 7, a sectional plan on line Z Z, Fig. 4. Figs. 8 and 8^a are enlarged part sections taken at right angles to each other on line X X, Fig. 4. Figs. 9, 10, and 11 show, respectively, enlarged elevation, plan, and side view of the mechanism for regulating the action of the grinding-wheels; and Fig. 12, a section on line W W, Fig. 11.

Within an upright frame 1 are mounted two horizontal spindles 2 2, that have the grinding-wheels $2^\times$ $2^\times$ fixed at one end and that are carried in bearings on swinging brackets 3 3, suspended at their upper end from centers 4 4 on the frame of the machine, the swinging frames being acted upon by springs 5 5, that tend to move them, and consequently the grinding-wheels $2^\times$ $2^\times$, toward each other, the springs being carried by a rod $5^\times$, that passes loose through openings in the brackets 3 3. The spindles 2 2 have their other ends connected by means of universal couplings 6 6 to short shafts carrying pulleys 7 7, by which rotary motion is imparted to the spindles and grinding-wheels. Between the two swinging brackets 3 3 above the grinding-wheels is arranged a double-

faced cam 9, mounted on a shaft 10, to which a regulated reciprocating rotary motion is imparted, as will be presently described, and against the opposite faces of this cam bear the ends of two opposite screws 8 8, screwing through the brackets 3 3 and having toothed heads, which screws govern the approach of the brackets and grinding-rollers toward each other, such approach being determined on the one hand by the thickness of the part of the cam 9 which is for the time being situated between the screws and on the other hand by the extent to which the screws are screwed forward through the bracket; also, by turning the one or the other screw more or less the advance of the corresponding grinding-wheel can be regulated independently of the other one.

The razor 70 or other blade to be ground is carried with its edge upward by a head 18, carrying a trough 19, containing a bed 20 with end stop 21 and centering-clips 22, the blade being secured by its tang by means of a round-topped shoe 23 and a pivoted stirrup-clamp 24. For centering the blade before clamping the tang the clips 22 are turned up on their pivot, so as to hold the blade between them, as shown in dotted lines at Fig. 8^a, after which the taper-jaws $22^\times$ $22^\times$ are turned up by their handle, so as to insure the correct position of the clips and blade. The tang having then been fixed by the stirrup-clamp 24, the jaws are turned down, and the clips drop away from the blade. The tubular head 18, carrying these parts, slides up and down on a column 25, on which it is guided by a key 26 on the column working in a slot $26^\times$ in the head, the up-and-down motion being effected by an adjustable arm 27, projecting downward and carrying an antifriction-roller 28, which bears upon an eccentric 29, loose upon a tubular cross-piece 71, to which the pillar 25 is adjustably secured by a clamping-sleeve 34. The cross-piece 71 can rock on a shaft 72, carried by the framing 1.

The vertical movement of the head 18 and parts carried thereby can be stopped in the highest position by depressing a lever 30, pivoted to a lug 31 on the column 25, projecting through a slot in head 18, which lever has a cam-shaped end 32, that when turned upward acts as a stop and support to a projection 33 on the head 18.

The position of the column 25, and consequently also of the head 18 and parts carried thereby, is accurately adjustable in a horizontal direction by means of a forked piece 35, fixed to the cross-piece 71, carrying set-screws bearing against a lug 36, projecting from the column 25, so that by means of the screws the column can be shifted slightly around in one direction or the other in the clamping-sleeve 34 when this has been loosened. The column 25 is also vertically adjustable in the sleeve 34 by means of a screw 37, carried by a lateral lug on the column and bearing against a block 38 on the sleeve 34. By this adjustment the column, with the entire head and blade-carrier, can be raised up as the grinding-wheels wear smaller.

The column 25, with the head 18 and parts carried thereby, receive a rocking motion, so as to impart a longitudinal to-and-fro motion to the blade between the grinding-rollers, such motion being effected by means of an eccentric 13 on the driving-shaft 11 acting on a roller on a rocking lever 14, connected by an adjustable bar 15 with the head 18, the latter being for this purpose provided with a pin 17, over which fits a notch 16 on the bar 15. The latter is made in two parts and is provided with a screw-adjustment $15^\times$ for lengthening and shortening it, and thus accurately regulating the position of the head 18 and blade 70 in a horizontal direction relatively to the grinding-rollers. By lifting the bar 15 so that its notch 16 is disengaged from the stud 17 the reciprocating motion of the column and head will be stopped, and this will fall back until a cross-bar $19^\times$ on the trough 19 comes in contact with the upright of the frame 1.

The driving-shaft 11 receives motion from a belt-pulley 12 and imparts such motion by pulley 73 and belt to a pulley 56, loose on the tubular cross-piece 71. The pulley 56 is formed in one with the before-mentioned eccentric 29, through which the head 18 and parts carried thereby receive their vertical up-and-down motion. While the blade 70 is thus carried vertically up and down between the grinding-wheels, these are simultaneously moved to a slight extent alternately to and from each other with a motion that synchronizes with the said up-and-down motion, and by these combined motions the desired form of the blade tapering in thickness toward the cutting edge is produced. The said movement of the grinding-wheels to and from each other and at the same time their gradual advance toward each other as the grinding proceeds is effected by means of the cam 9 by the following mechanism:

The two-faced cam 9 is mounted on a shaft 10, on which is fixed a worm-wheel 39, gearing with a worm 40, which is carried by a bracket 42, mounted loose on a shaft 10. The cam 9 gradually diminishes in thickness from the point *a* to the point *b*, so that as it turns in the direction from *b* to *a* it will allow the screws 8 8, and consequently the swinging brackets 3 3 and grinding-wheels $2^\times$ $2^\times$, to be moved toward each other by the springs 5 5, which motion will take place during the time that the blade 70 is moving downward between the wheels $2^\times$ $2^\times$ from the position shown at Fig. 1 to the position in which the extreme edge of the blade is between the wheels $2^\times$ $2^\times$, and it will be seen that the configuration of the cross-section of the blade will be accurately determined by the configuration given to the faces of the templet-cam 9, in combination with the eccentric cam 50, as will be

presently explained. On the return motion of the cam, which will take place simultaneously with the upward motion of the blade 70, the grinding-rollers will be moved apart again. This reciprocating motion of the cam synchronously with the up-and-down motion of the blade-carrier and blade is effected as follows: The bracket 42, which, as before stated, is mounted loose on the shaft 10, carries a quadrant-arm $42^{\times}$, which is connected by a rod 45 to a treadle-lever 44, mounted loose on a shaft 52, which is also connected at its front part by a spring connecting-rod 46 to an eye 74, projecting from the front side of the bracket 42, so that this spring connection tends to keep the lever 44, and consequently the bracket 42 $42^{\times}$, in the raised position. (Shown at Figs. 3 and 11.) When in this position, the bracket 42, which, as before stated, is geared to the shaft 10 by the worm 40 and worm-wheel 39, will hold the shaft 10 and cam 9 in a position in which the part *a* of the latter is situated between the screws 8 8 of brackets 3 3, so as to hold the grinding-wheels $2^{\times}$ $2^{\times}$ such a distance apart that the blank to be ground can be introduced between them onto the support 20. Loosely pivoted on shaft 10 is also the arm 47, lying close against the quadrant $42^{\times}$, against which it can work up and down between adjustable stops 43. When in the highest position, (shown at Figs. 3 and 11,) the arm 47 is locked, together with $42^{\times}$, by means of a spring-bolt 48, controlled by a hand-lever 49. The arm 47 is connected by a rod 54 to a lever-arm 53, fixed to the outer end of the shaft 52, on which the treadle 44 works, and on the inner end of the shaft is fixed another lever-arm 51, having a roller 55, which, when the arm 47 is locked together with the quadrant $42^{\times}$, is kept by the action of spring-rod 46 up against the periphery of a cam or eccentric 50, formed in one with the before-described eccentric 29, which imparts the up-and-down motion to the head 18, the cams 29 and 50 being formed in one with the intervening belt-pulley 56, which is driven from the shaft 11. It will be seen from the above arrangement that when arm 47 is locked to bracket and quadrant 42 $42^{\times}$ the cam 50 in imparting motion to arm 51 and through this and arm 53 and rod 54 to arm 47, bracket 42, and shaft 10 will cause cam 9 to perform the before-described to-and-fro motion for moving the grinding-wheels to and from each other.

It will be seen that the eccentric-cam 50 has two bulges at $50^{\times}$ $50^{\times}$, one on each side of its shortest radius. These are provided in order to produce the before-described swell on the blade behind the cutting edge. (Shown at Fig. 1.) Thus assuming the eccentric-cam 50 to be in the position shown at Fig. 6, in which the roller 55 of lever 51 is in contact with its shortest radius, and consequently the cam 9 is in position for holding the grinding-wheels the greatest distance apart at the thickest parts of the blade, as at Fig. 1, then on the cam 50 revolving the one bulge $50^{\times}$ will cause the grinding-wheels to approach each other, so as to grind the hollows behind the swell of the blade, after which, as the bulge $50^{\times}$ recedes from lever 51, the grinding-rollers will first be moved slightly apart again, so as to produce the swell on the blade, and as the radius of the cam again increases toward the highest point $50^{\times\times}$ the grinding-rollers will be made to approach again, so as to grind the part of the blade from the swell to the edge. As the cam 50 performs the second half of its revolution the reverse action of the grinding-wheels will be produced by the second bulge 50* of the cam.

If the arm 47 is disengaged from the quadrant $42^{\times}$ by the withdrawal of the locking-bolt 48, the arm, together with the levers 51 and 53, connected thereto, will drop by gravity until the arm 47 comes against the lower stop 43 on $42^{\times}$. As the roller 55 will thus drop away from the cam 50, no motion will be imparted to these levers by the cam and consequently the to-and-fro motion of the cam 9 will cease, and this will remain in the position in which it keeps the grinding-wheels the greatest distance apart. When it is desired to put the above-described mechanism into action again, the arm 47 is raised up by means of a hand-lever 57, attached thereto, at the same time that quadrant $42^{\times}$ is depressed by treadle-lever 44, until the locking-bolt 48 engages with the quadrant $42^{\times}$ again.

It will be seen that in addition to the throwing out of gear of roller 55 by the disconnection of arm 47 from quadrant $42^{\times}$ the to-and-fro motion of the cam 9 can also be stopped by the depression of the treadle-lever 44 in opposition to the spring-rod 46, as by such depression the rod 45 will pull downward quadrant $42^{\times}$ and will consequently depress lever 51 and roller 55.

In addition to the above-described to-and-fro motion of the templet-cam 9 this also receives a gradual forward motion in the direction from *b* to *a*—that is to say, from the thinner to the thicker part—in order to gradually bring the grinding-wheels $2^{\times}$ $2^{\times}$ together as the blade 70 becomes thinner by grinding. This motion is effected automatically as follows: The driving-shaft 11 imparts motion by belts and speed-pulleys 65 and $65^{\times}$ to a pulley 64, mounted loose on the shaft 10 of the cam 9. This pulley carries a roller 63, running in a cam-groove 62, the boss of which can slide longitudinally on shaft 10 and which is connected to a cranked arm 61, pivoted to an elbow-lever 60, mounted loose on the spindle of the worm 40. The lever 60 carries a spring-pawl $60^{\times}$, which engages with a ratchet-wheel 58, fixed on the spindle of worm 40. Thus at each revolution of the pulley 64 and roller 63 the latter in imparting an outward motion to the cam 62 and arm 61 causes the elbow-lever 60 and pawl $60^{\times}$ to turn the wheel 58 through a distance of one or more teeth and consequently

to partially rotate the worm 40. This in its turn rotates the worm-wheel 39 through a corresponding distance, and thereby turns shaft 10 and cam 9 to a slight extent in the direction from *b* to *a* at the same time that the cam is receiving its before-described to-and-fro motion by means of the bracket 42 and quadrant 42×. This gradual advance of the grinding-wheels toward each other requires to be stopped at a certain predetermined point in order to insure that the blade shall only be ground down to a certain degree of thinness. This is effected automatically as follows: On the worm-spindle, below the ratchet-wheel 58, is fixed a worm-wheel 66, and below this there is mounted loose on the spindle a bracket 67, carrying a worm 68, gearing with the worm-wheel 66. On the bracket 67 is fixed a shroud 69, which covers a few of the teeth of the ratchet-wheel 58. The bracket 67, with its shroud, is in the first instance adjusted by hand by means of the worm 68 into such an angular position relatively to the pawl 60× that by the time the blade has been ground down to the required degree of thinness by the gradual advance of the cam 9 the parts of the ratchet-wheel covered by the shroud 69 will have been brought around underneath the pawl 60×, so that the shroud will then raise the pawl out of gear with the ratchet-wheel, and the farther advance of the cam will be stopped. The grinding being thus completed the attendant turns the worm-spindle 40 by means of the hand-wheel 41, so as to turn the shaft 10 and worm 9 in the contrary direction to the advance—*i. e.*, in the direction from *a* to *b*—thereby separating the grinding-wheels to their greatest distance apart, so that the finished blade can be removed and a fresh blank introduced. The outer end of the cam-shaft 10 is supported by a bracket 75.

The screws 88 of the brackets 33 are secured in the position to which they have been adjusted by spring-catches 8× 8×, engaging with their milled heads.

If in the course of grinding the grinding-wheels 2× 2× should become untrue, they can be ground true by being brought into contact with each other while running by turning the hand-wheel 41.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim—

1. In a machine for grinding cutlery, the combination with a pair of grinding-wheels, of means for moving the blade to be ground longitudinally and transversely between the grinding-wheels, means for moving said wheels toward and from each other synchronously with the transverse movement of the blade, and mechanism for controlling the to-and-fro movement of the wheels in such manner as to cause them to approach nearest each other when grinding the extreme edge of the blade, then gradually separate to form a swelled or thickened portion back of the edge, and then gradually approach each other again to form a thin portion between the swell and back of the blade, substantially as described.

2. In a machine for grinding cutlery, the combination with two swinging brackets 2 carrying grinding-wheels and provided with adjusting-screws 8, of a two-faced templet-cam 9 oscillating between and in contact with said screws, said cam being of tapering thickness whereby when it is turned in one direction it moves the grinding-wheels apart, and springs for moving said plate toward each other when the templet-cam is turned in the opposite direction, substantially as described and for the purpose specified.

3. In a machine for grinding cutlery, the combination with two swinging brackets carrying grinding-wheels and springs for moving said brackets toward each other, of a cam of tapering thickness oscillating between said brackets to cause the grinding-wheels to move toward and from each other, and means for simultaneously imparting a gradual and continuous rotary motion to said cam in a direction from its thick part toward its thin part, whereby the grinding-wheels are caused to gradually approach nearer to each other during their described to-and-fro movement, substantially as described and for the purpose specified.

4. In a machine for grinding cutlery, a templet-cam of tapering thickness mounted between studs on two brackets carrying the grinding-wheels, said cam being mounted on a spindle receiving a reciprocating rotary motion by means of an arm receiving motion from a revolving cam or eccentric to which is connected a second cam or eccentric that imparts an up-and-down motion to a device carrying the blade to be ground by the said grinding-wheels whereby the motion of the said cam is made to synchronize with that of the blade-carrying device, substantially as described.

5. In a machine for grinding blades, the combination of a reciprocating templet-cam such as 9 for imparting a to-and-fro motion to the grinding-wheels, with an eccentric-cam such as 50 having bulges such as 50× which influence the motion of cam 9 so as to cause the grinding-wheels to produce a swell on the blade behind the cutting edge, substantially as described.

6. In a machine for grinding blades, the combination with a pair of grinding-wheels 2× 2× carried by swinging brackets 2, 2, of reciprocating templet-cam 9, adjustable screws 8, 8, carried by the brackets, in contact with the said cam, a worm-wheel 39 fixed on the shaft of cam 9 engaged with a worm 40 rotatable by hand, carried by a bracket 42 loose on the cam-shaft and having a quadrant-arm 42× connected by a rod 45 to a lever receiving a reciprocating motion through an eccentric-cam 50 and lever 51, so that while the templet-cam and its shaft receive a recipro-

cating rotary motion by means of the quadrant 42 and cam 50, the cam-shaft 10 and templet-cam 9 can be independently rotated by means of the worm 40 and worm-wheel 39, substantially as described.

7. The combination with the templet-cam 9, bracket 42, worm 40 and worm-wheel 39, a ratchet-wheel 58 fixed on the axis of the worm-wheel, and a lever 60 carrying a pawl $60^{\times}$ gearing with the ratchet-wheel, such lever and pawl being actuated by suitable means so as to effect the gradual rotation of the worm 40 whereby the worm-wheel 39, shaft 10, and templet-cam 9 are gradually rotated in the direction for allowing the grinding-wheels $2^{\times}$ $2^{\times}$ to approach each other at the same time that they are moved to and fro, substantially as described.

8. In combination with the ratchet-wheel 58 and pawl $60^{\times}$, a worm-wheel 66 fixed on the axis of worm 40, and a bracket 67 loose on the said axis, carrying a worm 68 gearing with the worm-wheel 66, and a shroud 69 covering some of the teeth of the ratchet-wheel, so that when by the rotation of the ratchet-wheel, the shroud passes under the pawl $60^{\times}$, this is disengaged from the ratchet-wheel 58, substantially as and for the purposes described.

9. In combination with the bracket 42 and quadrant $42^{\times}$ carried by the shaft of the templet-cam 9, a lever-arm 47 mounted loose on the said shaft and bracket but capable of being locked with the quadrant-arm $42^{\times}$ by a spring-bolt, which arm is connected by a rod 54 and lever 53 to a lever 51 bearing with a roller against a revolving cam or eccentric 50, so that when the arm is locked with the quadrant $42^{\times}$, a spring-rod 46, connected to bracket 42 keeps the lever 51 and roller 55 in contact with the cam 50 so as to receive a to-and-fro motion therefrom, which is imparted to the bracket 42, shaft 10 and cam 9 while when arm 47 is disconnected from quadrant $42^{\times}$ such motion ceases, substantially as described.

10. In a machine for grinding blades, the combination with the grinding-wheels $2^{\times}$ $2^{\times}$ receiving a motion to and from each other by means of a reciprocating two-faced templet-cam 9, of a blade-support consisting of a tubular head 18 receiving an up-and-down motion upon a column 25 by means of a revolving cam or eccentric 29, while at the same time the column and head receive a rocking motion upon an axis 71, by means of a lever 14, and detachable connecting-rod 15 from an eccentric 13, the cam or eccentric 29, imparting the said up-and-down motion to the head 18 being connected to a cam or eccentric 50 that imparts the to-and-fro motion to the said templet-cam 9 whereby the synchronism of these two motions is obtained, substantially as described.

11. In a machine for grinding cutlery, the combination with a pair of grinding-wheels, of means for moving the blade to be ground longitudinally and transversely between the grinding-wheels, means for moving the said wheels toward each other as the edge of the blade recedes from between them in a transverse direction, and from each other as the edge of the blade advances between them, and means for gradually bringing the wheels nearer together simultaneously with the said to-and-fro motion, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of May, A. D. 1897.

H. WILKINSON LATHAM.

Witnesses:

OLIVER IMRAY.

JNO. P. M. MILLARD.