

1,010,460.

5 SHEETS—SHEET 1.

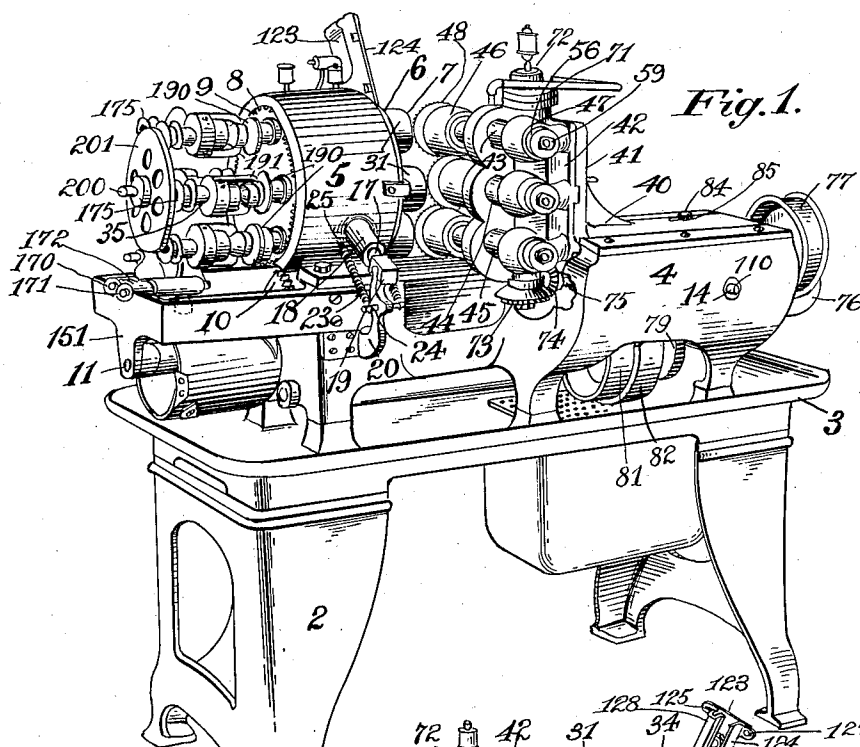
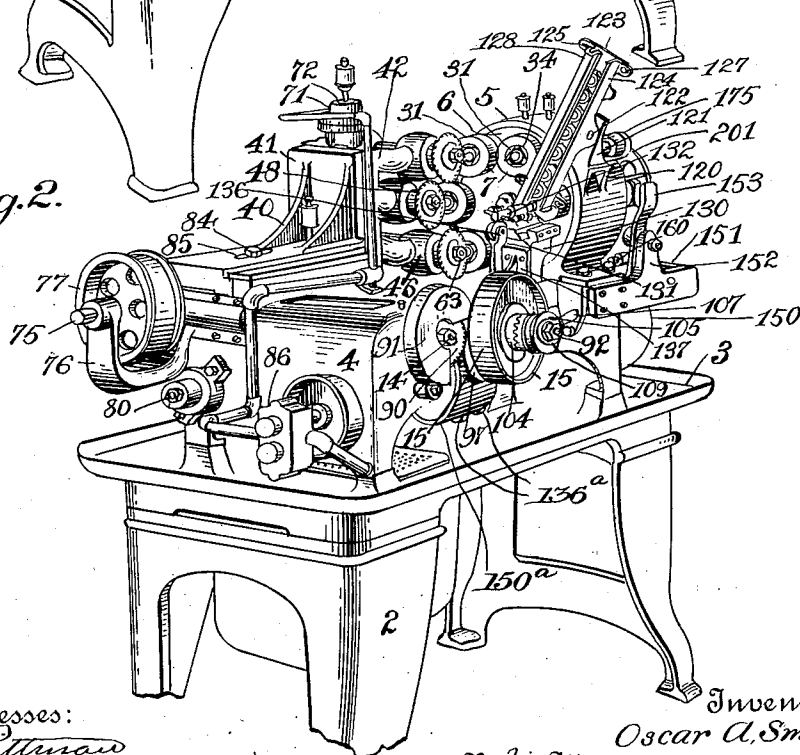


Fig.2.



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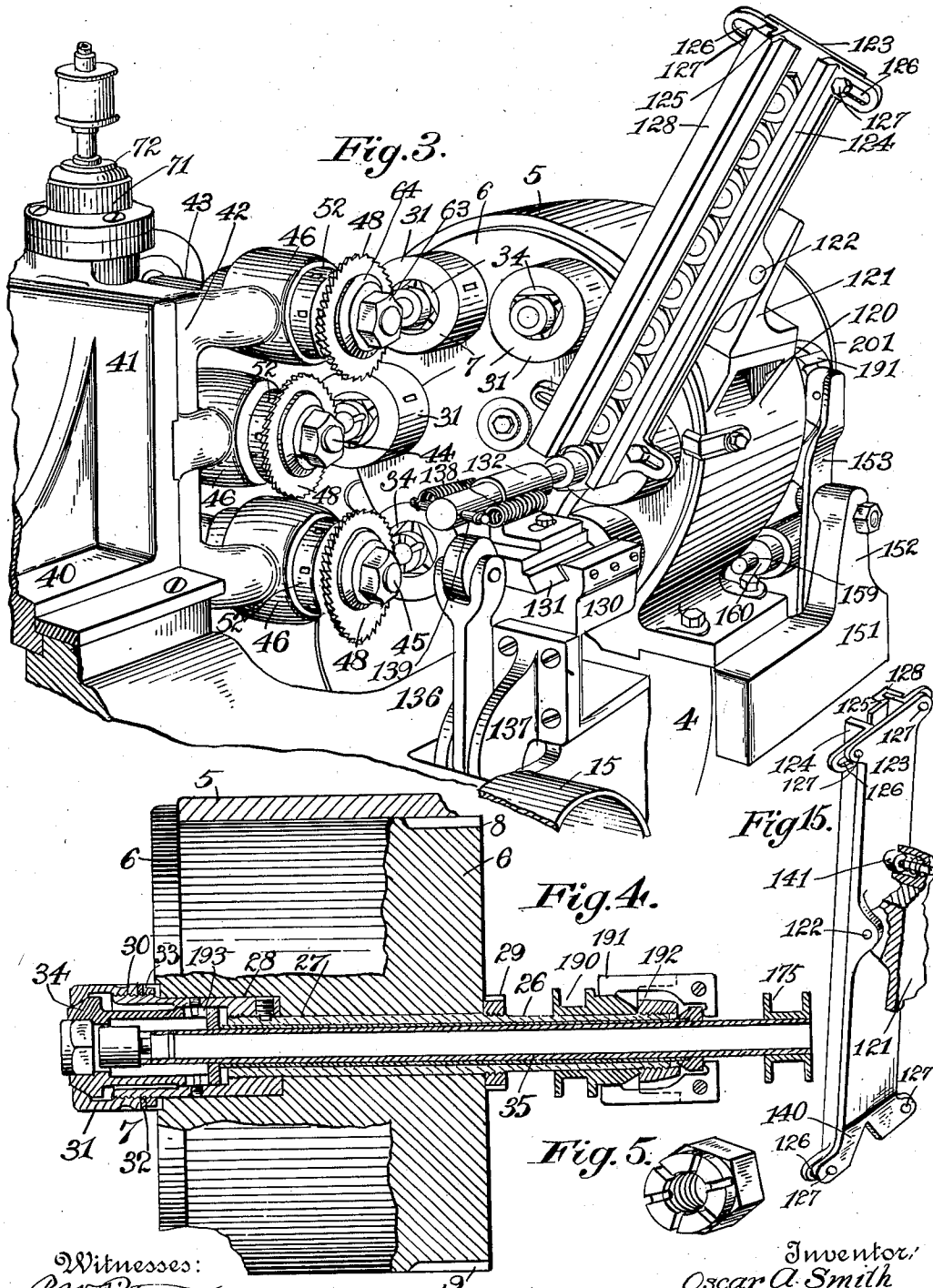
Inventor,
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By his Attorney
C. A. Reed

O. A. SMITH.
 AUTOMATIC NUT CASTELLATING MACHINE.
 APPLICATION FILED DEC. 31, 1910.

1,010,460.

Patented Dec. 5, 1911.

5 SHEETS-SHEET 2.

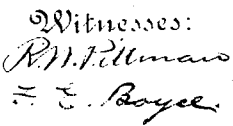


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5 SHEETS—SHEET 3.



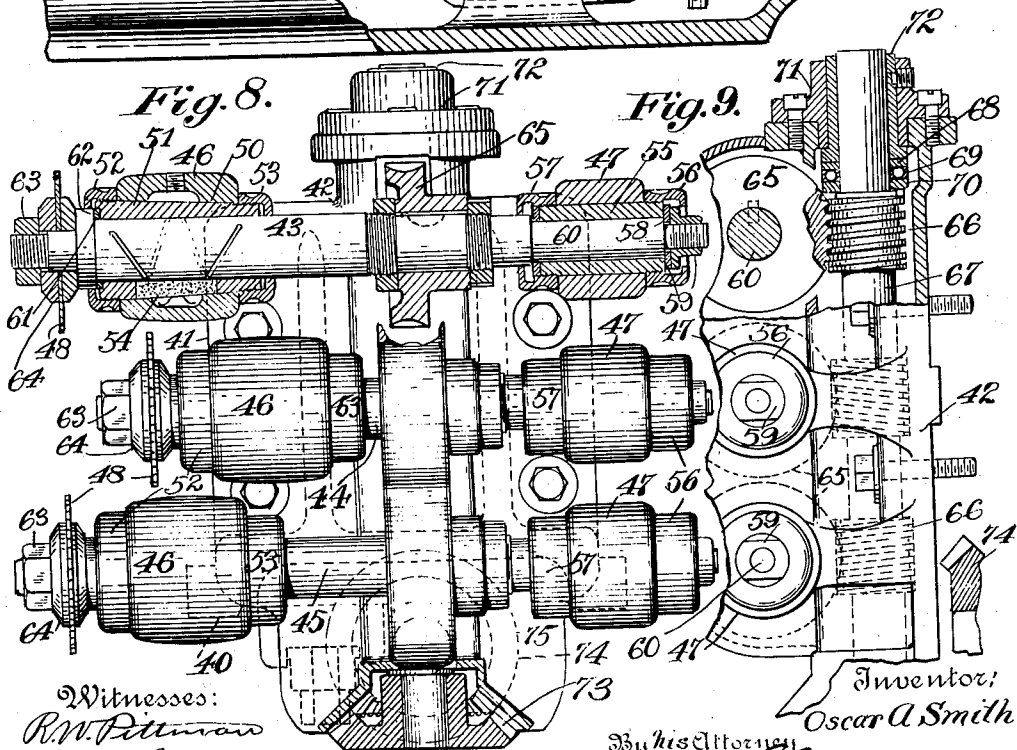
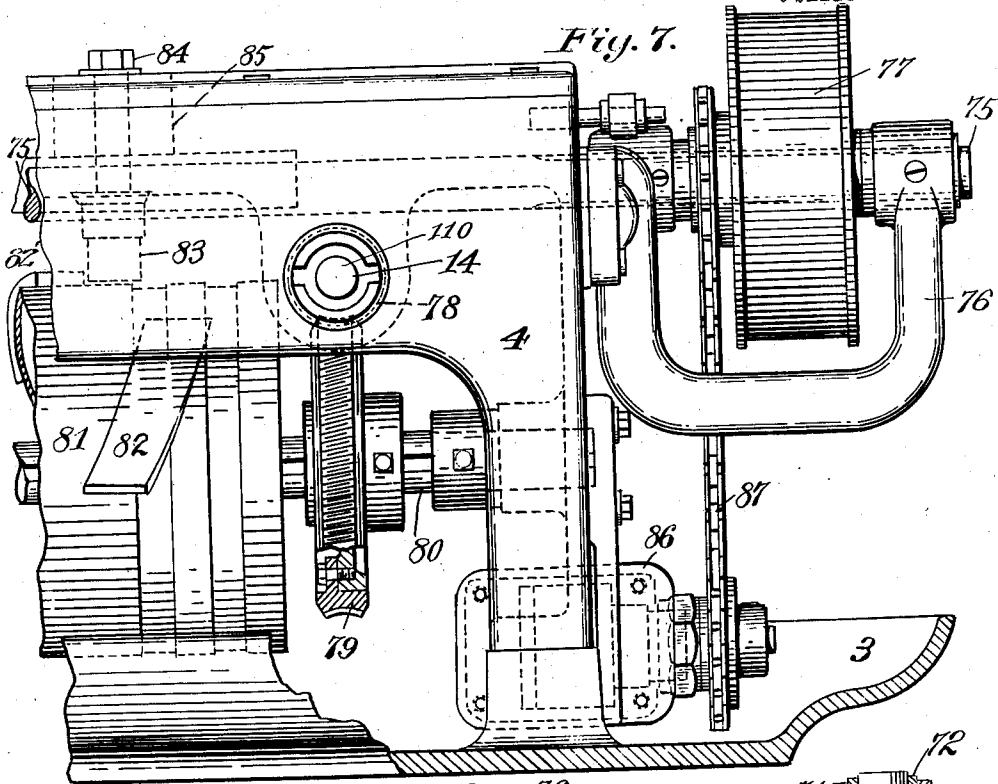
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5 SHEETS-SHEET 4.



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UNITED STATES PATENT OFFICE.

OSCAR A. SMITH, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL-ACME MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

AUTOMATIC NUT-CASTELLATING MACHINE.

1,010,460.

Specification of Letters Patent.

Patented Dec. 5, 1911.

Application filed December 31, 1910. Serial No. 600,307.

To all whom it may concern:

Be it known that I, OSCAR A. SMITH, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Automatic Nut-Castellating Machines, of which the following is a specification.

This invention relates to metal working machines, and more particularly to machines for automatically slotting blanks, such as nuts or bolts, with any desired number of diametrical slots, which nuts are in the trade usually designated as castellated nuts, and which machine may be therefore properly termed an automatic nut castellating machine, the object of the invention being to provide a machine of this character entirely automatic in its operation, the nuts being placed in a hopper, from which they are automatically fed to and positioned in a carrier therefor, and by means of which latter are revolved into position to have the proper slots cut therein, and in which machine a series of nuts or blanks will be slotted simultaneously but with the slots thereof all located in different angular positions relatively one to another, so that each nut or blank will be, before its ejection from the machine, diametrically slotted a number of times, each time by a different cutting tool, while all of such diametrical slots will be located at the same angle relatively one to another.

A further object of the invention is the provision of an improved slotting mechanism comprising a series of saws so located and mounted that the upward cutting thrust of one saw is counteracted by that of another.

A further object of the invention is the provision of improved feeding and positioning means for the nut blanks; by means of which, in addition to other features of improvement, the magazine may swing clear of the blank if the same has not fully entered into its chuck, so as not to interfere with the operation of the carrier in revolving the blank away from the magazine.

A further object of the invention is the provision of improved means for opening and closing the nut blank chucks and for removing the slotted blanks or nuts from such chucks.

A further object of the invention is the

provision of an improved machine of the character described having a number of improved features all cooperating to provide an improved automatic blank castellating machine, and which features of improvement will be more particularly set forth and described hereinafter.

In the drawings accompanying and forming part of this specification, and which represent the preferred embodiment of this automatic nut slotting machine, Figure 1 is a perspective side view of the machine; Figure 2 is a perspective view of the opposite side thereof; Figure 3 is an enlarged perspective view illustrating the slotting mechanism and the feeding mechanism; Figure 4 is a partly sectional view of the nut blank carrier or turret, or cylinder, and a chuck spindle; Figure 5 is a view of a slotted or castellated nut; Figure 6 is an end view of the machine looking from right to left in Fig. 1, on a relatively large scale, with parts thereof in section; Figure 7 is an enlarged side view of the right hand end of the machine shown in Fig. 1; Figure 8 is a detail view, partly in section, of the slotting saws and the slide supporting the same detached from the machine; Figure 9 is a partly sectional view illustrating the worm shaft for actuating the worm gears carried by the saw spindles, said view also illustrating in a general way the bevel gears for imparting motion to said worm shaft; Figure 10 is a detail view of a portion of the magazine and the means for positioning the nut blanks; Figure 11 is an enlarged perspective view of the left hand end of the machine shown in Fig. 1, illustrating the means for opening and closing the nut blank chucks and for removing the completed product therefrom; Figure 12 is a detail view, partly in section, illustrating the turret locking mechanism; Figure 13 is a cross sectional view of the magazine; Figure 14 is a detail sectional view of the change gear mechanism for changing the speed of the turret and of the sliding saw carrier; Figure 14^a is a detail view of the mechanism shown in Fig. 14, and Figure 15 is a detail perspective view looking toward the rear side of the magazine and its supporting bracket.

Similar characters of reference indicate corresponding parts throughout the figures of the drawings.

This improved nut castellating machine

comprises in a general way a blank or nut carrier comprising a revoluble intermittently actuated turret and means for locking the same in successive positions; slotting mechanism comprising a series of three saws suitably mounted to slide toward and from the nut blanks and driving means for rotating the saws; feeding and positioning mechanism comprising a magazine and means for positioning the nuts successively in the chucks of the turret; driving means for rotating the nut blank carrier and reciprocating the saw carrier toward and from the blanks and for operating the nut blank positioning means, and which driving means includes in the preferred embodiment of the machine, change gear mechanism by means of which the relative speeds of the nut blank carrier and saw slide may be regulated or changed; and mechanism for opening and closing the nut blank chucks and for removing the finished product from its chuck.

This improved machine is mounted upon a suitable base 2 comprising the usual oil pan and supports or standards 3, and to this base is bolted a suitable bed 4 on which, at one end, is housed in a circular casing 5 a cylinder or turret 6, forming a part of the blank carrier. This cylinder carries the work spindles 7, each of which is provided with a suitable chuck, six spindles being shown in the present instance mounted in the rotary cylinder. This cylinder is provided at one end with a gear disk 8 having its gear teeth 9 disposed in sets spaced apart and by means of which the rotary nut blank carrier is intermittently rotated, this being accomplished by means of a fan gear 10 mounted on a shaft 11 supported at one end in the bed of the machine and at its opposite end in a bracket 15 hereinafter referred to, and which shaft is rotated by means of a worm wheel 12, (left hand), in mesh with a worm 13 carried by a shaft 14 supported transversely of the bed and carrying a change gear more fully described hereinafter, on its outer end, which is driven from a pulley 15 mounted on a stud 92.

From the foregoing it will be observed that on each rotation of the fan gear it will engage one set of teeth of the nut blank carrier and rotate the same a predetermined distance, this distance according with the distance between the axes of a pair of work spindles.

The cylinder is provided with a series of tapered sockets 16, and these sockets are spaced at equal distances apart around the cylinder, one being located between the successive work spindles. For locking the cylinder at its several stations a spring actuated plunger 17 is provided, this plunger being carried in a sleeve 18 projecting from the cylinder casing at one side of the machine and has a tapered end adapted to fit the

tapered sockets 16. The outer end of this plunger is forked, as at 19, for the reception of an actuating lever 20 pivotally supported on a bracket 21 secured to the side of the bed of the machine, the opposite end of this lever being engaged by a cam roller 22 carried on the shaft 11 and by means of which the locking plunger will be withdrawn so as to release the cylinder to permit it to be revolved one station. A spring 23, having one end secured to a pin 24 of the lever 20 and the opposite end secured to a pin or projection 25 on the casing, tends to hold the plunger in its cylinder locking position.

Each of the work carrying spindles 26, shown as six in number and carried by the revolving cylinder, is shown in the present instance as made in two pieces, 27 and 28, screwed or welded together for convenience of manufacture. In the present instance, see Fig. 4, they are shown as screwed together, and each is forced into the cylinder and held in place by a collar nut 29. The outer end of the portion 28 of the spindle having the larger diameter is provided with a thread 30 for the reception of a threaded nose piece or chuck cap 31, back of which is a lock washer 32 and adjusting collar 33. By this means the cap or nose piece is adjustable longitudinally of the spindle and held in any desired position by the lock washer 32 and adjusting collar 33. This adjustment is essential, as it is vital that the caps of all the spindles be the same distance from the face of the cylinder, and to also compensate for wear of the chucks and caps or nose pieces. Within the cap of each spindle are the spring formed gripping jaws 34 forming the chuck for receiving and holding the nut blank during the slotting operation, which jaws are opened and closed by mechanism located at the rear end of the spindle. Within each of the work carrying spindles is located an extractor 35 adapted to force out the completed product at the proper time, and which extractor is shown in the form of a tube and is operated from the rear end of the spindle by means hereinafter described.

Supported on the bed opposite to the cylinder for sliding movement toward and from the cylinder, is a compound slide 40, compounded for convenience in manufacture and assembling. On the upright or knee portion 41 of this slide 40 is tongued and bolted the saw spindle head 42 for supporting three saw spindles 43, 44 and 45 spaced apart so that they will be in alignment with the three work spindles nearest to the saws, when the spindles are in working position. Six bearings are carried by this head, two, as 46 and 47, for each saw spindle, thus forming what may be considered three front bearings 46 and three

rear bearings 47. These bearings are so spaced apart laterally that the saws 48 carried thereby will be on a center line with opposite work spindles in the blank carrying cylinder when the locking bolt 17 is in any one of its sockets. The upper and lower spindles 43 and 45 are of the same length, but the intermediate spindle 44 is somewhat shorter than its companion spindles so that its saw will be located centrally of the middle spindle, the exact length being determined by the circular spacing of the work spindles in the cylinder. As each of the three spindles and its bearings are the same a description of one of them will be sufficient.

The front bearing 46 of each spindle has a tapered interior surface 50 for the reception of bronze tapered split bearing members or bushings 51 adjustable for circular tension by adjusting collars 52 and 53 turned on to the threaded extended ends of the bushings 51. Each bearing is also provided with an oil chamber 54 having a wick. The forward end of each tapered bearing has an annular recess for the reception of a thrust washer 61, which is thus housed in back of a shoulder 62 formed on the spindle. In each rear bearing 47 is located a bronze solid straight bushing 55 having the extended ends provided with threads for the reception of adjusting nuts 56 and 57. A thrust washer 58 is located at the outer end of the spindle to rest against such outer end and is maintained in position by a nut 59 turned on to the threaded end of the spindle 60. The saw is clamped on the spindle by means of a nut 63 and collars 64 between the shoulder and the nut 63.

From the foregoing it will be seen that when the spindles are in place and it is desired to loosen or tighten, or in other words, to take up or loosen the spindles, it is only necessary to manipulate the tension nuts 56 and 57 in the proper direction; that is to say, if the spindles have too much endwise movement or play the thrust cap 57 is loosened and thrust cap 56 is screwed up against its bearing, thus drawing the bushing 55 against thrust washer 58 and so taking up the play. If the tension is too tight the opposite movement will effect the loosening thereof. To take up the circular tension at the forward end of the saw spindles, the adjusting caps or nuts 52 and 53 are manipulated in the same way, but the bushings being tapered on their periphery and split, and the bearings being tapered on their interior to correspond with such tapered bushings, the action of the adjusting caps results in forcing the bushings against the periphery of the spindles, thus loosening or tightening the tension of the bushings on the spindles.

For rotating the saws each spindle is pro-

vided with a bronze worm gear 65 in mesh with a worm 66 carried by a vertically located shaft 67 journaled in the saw head 42. On a suitable shoulder on the upper end of this worm shaft is placed a thrust washer 68, ball retainer 69 to relieve the friction, and a thrust washer 70, and in contact with this thrust washer 70 and housed and held in place by a thrust cap 71 is a top bearing 72, which takes the vertical or upward thrust of the worm shaft 67 when the saws are in action. To lessen the thrust of this worm shaft when the saws are in action the upper and lower saws are formed and driven so that they cut downward, thus requiring right hand threads on the worm shaft for engagement with the upper and lower gears 65 carried by the upper and lower saw spindles, which thus causes the worm shaft to thrust upward against the top bearing or bushing 72, while the intermediate or center saw is formed and driven so as to cut upward, for which purpose the intermediate worm on the worm shaft is formed left handed, which thus relieves the upward thrust of the worm shaft against the top bearing or bushing 72 when the saws are in action, so that the thrust of one of the saws upward and against this bushing is counteracted or counterbalanced by the thrust of the intermediate saw so that the thrust bushing 72 receives the thrust of only one saw spindle.

On the lower end of the worm shaft is fastened a bevel gear 73 which meshes with a bevel gear 74, see Figs. 1 and 9, fastened to a shaft 75 having a suitable bearing at one end in the saw slide hereinbefore referred to. The opposite end of this shaft has a bearing in the bed 4 and also in a bracket 76 fastened to said bed 4, and on the outer end of this shaft, between the two last mentioned bearings, is fastened a driving pulley 77, by means of a sliding key or keys, which thus permit the saw slide to have a sliding movement together with endwise movement of the shaft 75 for imparting rotary movement to the saw spindles, while the driving pulley 77 has simply a rotary movement, without any endwise movement with its shaft.

To reciprocate the saw slide toward and from the revoluble turret and the work carried thereby, the transverse shaft 14 carries a worm 78, (right hand), in mesh with a worm wheel 79 secured to a shaft 80 journaled in suitable bearings of the bed 4 and parallel with the direction of movement of the saw slide. On this shaft 80 is keyed a cam drum 81, on the periphery of which is fastened a suitable cam 82 so formed on its outer edge that when it is set to come in contact with a roller 83 depending from the saw slide it will carry such slide forward toward the blank spindles in the turret the

required distance necessary to slot the blank the proper depth. A second cam 82', see dotted lines Fig. 6 and also Fig. 7, is so placed on this drum that when the saws have cut the required depth the saw slide will be returned to its initial position, and it will be observed that the saw slide is offset from direct alinement relatively to the revoluble turret or cylinder so as to bring the saws on the spindles in center position with the work spindles carried by this cylinder on the left or lock-bolt side of the machine. The roller with which the cam carried by the drum 81 engages is carried by a stud supported by a slide strip adjustable lengthwise of the saw slide by means of a bolt 84 working in an elongated slot 85 of the saw slide, and by means of which devices the cam engaging roller may be adjusted.

20 A suitable oil pump 86 is shown in the present improvement, driven from the pulley 77 by means of a sprocket chain 87.

On one end of the shaft 14 is located a suitable change gear 90 covered by a suitable housing 91. At one side of this gear, and secured to the bed 4, is a stud 92, on which stud a bracket 93 is supported for swinging movement, and this bracket has a pair of arms 94 and 95 located at right angles to each other, the arm 94 having an elongated slot 94', see Fig. 14^a, for the reception of a bolt 96 projecting into the bed 4, whereby this bracket may be adjusted. The other arm 95 carries a stud on which a gear 97 is located in position to mesh with a gear 98 keyed firmly to an extension of a bushing 99 loosely mounted on the stud 92. The gear 97 is in mesh with the change gear 90 carried on the end of the shaft 14, and when this gear 90 is changed to a larger or smaller gear the gear 97 can be swung into position to mesh therewith by means of the elongated slotted arm hereinbefore referred to.

On this loosely mounted bushing 99 is the pulley 15 hereinbefore referred to, which is also loosely mounted to rotate freely without endwise or lateral movement, suitable thrust washers 101, 102, the latter held in place by a lock nut 103, being used to permit the pulley to rotate freely and without end or lateral movement. To the outer side of this pulley 15 is bolted a clutch member 104, which overhangs the lock nut 103, and which clutch member just clears the bushing 99. Firmly keyed to the outer end of this bushing 99 so as to rotate therewith is a companion clutch member 105, but shiftable longitudinally of such bushing to engage with the clutch member 104 thereby to impart motion from the loosely mounted driving pulley 15 to the bushing 99 and thereby to the system of gears and thus to the transverse shaft 14. This clutch member is grooved, as at 106, to receive a forked hand lever 107 pivotally

connected, as at 108, to a bracket 109 supported on the outer end of the stud 92.

From the foregoing it will be observed that gears of any desired number of teeth may be placed on the transverse shaft 14 and by swinging the bracket arm 93 the gear carried by this bracket will be brought into mesh with the gear carried by the shaft 14, thus getting any desired speed for the travel of the saw slide and the rotation of the turret. This change gear mechanism forms an uninterrupted drive from the driving pulley 15 to the shaft 14, and when the clutch members are out of engagement the pulley continues to rotate while the rest of the transmission remains stationary. This system of transmission is very effective when adjusting or setting up the machine or changing the speed of the saw slide. The opposite end of the shaft 14 projects beyond the bed 4, as at 110, for the reception of a suitable handle by means of which this shaft 14 may be turned by hand.

For feeding the nut blanks to the rotary turret carrying the fixed and non-rotatable blank carrying spindles a magazine is provided. Secured to the casing for the turret is a boss 120 to which is bolted by suitable elongated slots and bolts a supporting bracket 121, to which is pivotally connected the magazine, as at 122. This magazine comprises the main plate 123, which is pivotally connected as at 122, as stated, to the bracket 121, and a pair of adjustable side plates 124 and 125, each having at its upper and lower ends an elongated slot 126 which, by means of bolts 127, may be adjusted toward and from each other on the main plate 123 to receive any desired size of nut blank. The side plate 125 has a top strip 128, which strip is machined to the required size determined by the thickness of the blank or work to be cut or slotted. In the present instance this top strip is shown adjustable, see Fig. 13, toward and from the work, this adjustment being obtained by means of slots and bolts, the latter projecting into the adjustable side plate 125. The side strips 124 and 125 are adjustable to the required width of work and into position so that the work will be placed directly in a lateral line with the middle spindle of the cylinder on the opposite side from the saw spindles hereinbefore described and vertically in line with the adjusting stop hereinafter described.

On the bed 4, below the magazine, is bolted a bracket 130, on which is mounted a slide 131 carrying a plunger 132 in alinement with the lower work blank of the magazine, and which blank is supported by an adjustable stop 133, see Fig. 10, shaped to accord with the periphery of the blank. This adjustable stop is fastened to a stem 134 carried by an arm secured by a set screw to the bracket 130, so that this adjustable

stop may be raised and lowered at will to permit the centering of the work with the middle spindle at the right of the saw spindles.

To reciprocate the slide 131 a crotch lever 136 is pivotally connected to the slide. The lower end of this lever is pivotally supported by a crotch bracket 137 bolted to the bracket 130. On the lower end of this lever, at right angles thereto, is a stud 136'' and roller 136', which comes into contact at the proper time with a pair of cams 136^a, see Fig. 10 mounted on the periphery of a cam drum 150^a carried by the shaft 11, this being the same shaft that carries the fan gear for rotating the turret, and by this mechanism the slide 131 and the plunger carried thereby are reciprocated back and forth to force the lower nut blank from the magazine into the chuck of the work carrying spindle. Tension springs 138 are secured to the plunger at each side thereof by means of pins 139, the opposite ends of which springs are fastened to the slide 131, these springs allowing the plunger to cushion against the work blanks thereby relieving the strain on the lever 136 caused by variation of the blanks to be cut. The magazine being thus adjusted to the required width and thickness of the work blanks and in alinement with the grips or chucks and work blanks in the cylinder, and the adjusting stop 133 being set so that the bottom work blank is properly positioned, the plunger being forced forward will force the lower work blank into the chuck or grip of one of the work spindles. The rear side, at the lower end, of this magazine is tapered, as at 140, see Fig. 15, and carried at the upper end of the bracket 121 is a spring pressed plunger 141 in position to engage the rear side of the pivoted magazine, the purpose of this being to return the magazine to its proper position when the lower end of the magazine is shifted away from the work carrying spindle, which operation occurs when a blank has not fully entered into the grip or chuck. When such blank has not fully entered into the grip or chuck the tapered lower rear end of the magazine permits the blank to swing the lower end of the magazine on its pivot 122 away from the chuck as the turret commences to revolve with the partially entered blank, thus freeing the blank from the magazine and preventing injury to the mechanism, which would otherwise occur if the blank could not release itself from the magazine. As soon as the blank has been released from the magazine the spring pressed plunger 141 returns the magazine to its normal position. Thus there is provided a magazine which is adjustable for various sizes of nut blanks, both depthwise and crosswise of the blank, and is also adjustable to permit the blanks to automatically release

themselves from the magazine in case such blanks have not fully entered the chucks of the work spindles.

For manipulating the blank carrying chucks and extracting the nut blanks when the same have been slotted suitable operating mechanism has been provided. On the shaft 11 carrying the fan gear is located a cam drum 150, on the periphery of which are fastened cams for operating all of the levers necessary to perform the operations of shifting the extractor tubes and opening and closing the work grips or chucks. The end of this shaft 11 is supported by a U-shaped bracket 151 bolted to the end of the bed 4. This bracket 151 is provided with an extended bearing 152, to which is pivotally secured on the magazine side of the bed a lever 153 having a stud or roller effective to operate the clutch mechanism on the rear end of each work spindle, thereby to close the chucks before each work spindle is successively rotated away from the magazine. This lever 153 is operated by means of a cam 154 on the cam drum 150, and said lever operates on the middle spindle directly after the plunger 132 has forced a work blank into position in the chuck or grip. On this bracket 151 is also pivoted another lever 155, designated as the clutch opening lever, its function being to open or release the grip or chuck to permit the extractor to force out the work blank. This lever is also operated from the cam 154 on the cam drum 150. The upper end of this lever is U-shaped or formed as a crotch, as at 156, to receive a roller 157 carried by a stud projecting from a sleeve 158 bolted to a sliding rod 159 suitably supported by brackets carried by the bed of the machine, one of which brackets, as 160, is shown, see Fig. 11. Secured to this rod 159 is a dog or stud 161 having a bronze shoe which is in contact with the clutch mechanism on the rear end of the work spindle. Thus the swinging of the crotch lever 155 shifts the rod 159 and thereby the dog 161 to operate on the clutch mechanism carried at the rear end of the work spindles and release the checks or grips when the turret has been revolved or indexed to that station intermediate the saws and the magazine.

On the bracket 151 are secured two parallel rods or studs 170 and 171, on which is mounted a slide 172 having a bronze shoe 173 extending into a groove 174 of a spool 175 on the end of the extractor or extracting tube 35. Projecting from the lower side of this slide 172 is a stud 172^a and roller 172^b which latter is shifted by means of proper cams 172^c and 172^d, on cam drum 150 at the proper time, so that through the medium of this slide 172 the extractor tubes 35, one carried by each work spindle, are each successively operated when the work spindles

are in position intermediate the saws and the magazine to force out the work blanks after the chuck opening lever 155 has opened the chucks of the work spindles.

- 5 From the foregoing it will be observed that immediately after a work blank has been forced by the plunger 132 into a chuck of one of the work spindles the chuck is closed by the lever 153 operating upon the
10 clutch at the rear end of the work spindle and the blank is then rotated by the turret away from the magazine and to a position intermediate such magazine and the upper of first saw. Thereupon the turret is ro-
15 tated into position to have the first saw cut a diametrical slot. The turret is then rotated into position to have the intermediate saw cut a diametrical slot at an angle to the first slot. The work turret is then
20 rotated to have the lower saw cut another diametrical slot at an angle to the two preceding slots, succeeding which the turret is rotated into position to have the chucks opened by the lever 155, immediately fol-
25 lowing which, and while the blank is in the position just indicated, intermediate the saws and the magazine, the extractor tube is operated by the slide 172 to extract the blank, whereupon the empty chuck is then
30 rotated by the turret into position to receive another blank in the manner hereinbefore described.

- The clutch mechanism located on the rear end of each spindle is similar to that which
35 is well known, and therefore a detailed description thereof would seem to be unnecessary, it comprising the usual cone clutch having a grooved collar 190 and shiftable levers or fingers 191, and which cone clutch
40 is shifted at one time by the lever 153 and at another time by the lever 155. When the grooved collar 190 is shifted toward the right or rear end of the work spindle it spreads the inner ends of the pivotally sup-
45 ported fingers 191 and thereby forces the sleeve 192 surrounding the extractor tube 35 endwise toward the blank carrying chucks, thus forcing the tapered ends of such chucks into engagement with the chuck cap
50 31 and closing the chuck upon the blank, this being permitted by the slots 193 by means of which the spring jaws are secured to the enlarged portion 28 of the work spindle. At the proper time the shoe 161 of
55 the rod 159, operated by the lever 155, forces the grooved collar 190 in the opposite direction, or toward the chuck carrying end of the work spindle, thus permitting the inner end of the fingers 191 to close, whereby
60 the spring formed chucks will automatically open and force the sleeve 192 toward the rear end of the spindle. At this time the grooved collar on the rear end of the extractor is forced toward the left or chuck
65 end of the spindle, thus operating the ex-

tractor and forcing out the blank in the manner hereinbefore described. A short shaft 200 is secured to the rear end of the turret or cylinder, and on the outer end of this shaft is fastened a disk 201 which holds
70 the extractors in their proper position when the machine is in operation.

The operation of the machine, briefly, is as follows: A work blank having been re-
75 ceived by the middle spindle from the magazine by means of the feeding plunger, it is carried, through the medium of the revoluble turret and the fan gear, to the next station, at which point the turret is locked. At this station it is not operated upon by
80 the saws. It is then revolved to the next station and locked, whereupon the upper saw on the saw slide slots the work blank in the center thereof vertically. On the completion of this operation the cylinder
85 revolves to the third station, where the intermediate or center saw operates in the same way as the upper saw to cut a vertical slot, but owing to the revolution of the cylinder to this station the second cut is at an
90 angle to the first cut, and in the present machine is shown at an angle of sixty degrees to such first cut. The cylinder is then revolved to the third and last cutting
95 station, where the lower or bottom saw performs the same operation upon the work blank, this cut being also a vertical one centrally of the blank, but owing to the revolution of the cylinder the cut is at an angle
100 to the second cut and as shown herein it is at an angle of sixty degrees thereto. Thus the surface of the blank has been cut into six equal parts. The cylinder then revolves
105 to the next station, where the blank chuck is opened and the blank extracted, whereupon the empty chuck is revolved to the next station and adjacent to the magazine, where it is reloaded from the magazine. It is merely necessary to add or remove saws to
110 or from the saw spindles to increase or decrease the number of slots or cuts in the work blanks. It will also be understood that the turret is locked at each indexing thereof.

From the foregoing it will be observed
115 that three blanks are simultaneously operated upon, the three saws cutting simultaneously a vertical slot diametrically of the blank, but the slot of one blank is always cut at an angle to the preceding slot, and
120 this without any independent rotation of the blanks themselves relatively to the turret.

It will of course be understood that the chuck jaws will conform in shape to the shape of the nut, they being shown in the
125 present instance constructed to receive a hexagonal shaped nut.

I claim as my invention:

1. In an automatic nut castellating machine, the combination of an intermittently
130

revolvable turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously, with the slot of one blank located at an angle to that of another.

2. In an automatic nut castellating machine, the combination of an intermittently revolvable turret, means for automatically indexing it, a series of non-rotatable blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously, with the slot of one blank located at an angle to that of another blank.

3. In an automatic nut castellating machine, the combination of an intermittently revolvable turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts and located in parallel planes, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another blank.

4. In an automatic nut castellating machine, the combination of an intermittently revolvable turret, means for automatically indexing it, a circular series of blank holding means carried by the turret, a reciprocatory slide, a series of three shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts one located in a plane parallel with its companion tools, and means for automatically reciprocating the slide after each indexing of the turret whereby a series of three blanks will be slotted simultaneously

with the slot of one blank located at an angle to those of companion blanks.

5. In an automatic nut castellating machine, the combination of an intermittently revolvable turret member, means for automatically indexing it, a circular series of blank holding means carried by the turret member, a reciprocatory slide member, a series of slotting tools carried by the slide member and located in circular arrangement corresponding with the circular series of blank holding means of the turret member, and means for automatically reciprocating one of said members after each indexing of the turret member, whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to those of its companion blanks.

6. In an automatic nut castellating machine, the combination of an intermittently revolvable turret member, means for automatically indexing it, a circular series of blank holding means carried by the turret member, a reciprocatory slide member, a plurality of slotting tools carried by said slide member and having their axes located in parallel planes, said tools also being located in parallel planes, and means for automatically reciprocating one of said members after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another blank.

7. In an automatic nut castellating machine, the combination of an intermittently revolvable turret, means for automatically indexing it, a circular series of blank holding means carried by the turret, a reciprocatory slide, a series of slotting tools carried by said slide and located in circular arrangement corresponding with the circular series of blank holding means of the turret, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to those of its companion blanks.

8. In an automatic nut castellating machine, the combination of an intermittently revolvable turret, means for automatically indexing it, a circular series of blank holding means carried by the turret, a reciprocatory slide, a plurality of slotting tools carried by said slide and having their axes located in parallel planes, said tools also being located in parallel planes and in circular arrangement corresponding with the circular series of blank holding means of the turret, and means for automatically reciprocating the slide after each indexing of the turret, whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to those of its companion blanks.

9. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding means carried by the turret, a reciprocatory slide, a series of three shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart a distance to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts and located one in a plane parallel with the plane of its companion tools and in a circular arrangement corresponding with that of the work holding means of the turret, means for automatically reciprocating the slide after each indexing of the turret, whereby a series of three blanks will be slotted simultaneously with the slot of one blank located at an angle to those of its companion blanks.

10. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding chucks carried by the turret, means for automatically opening and closing said chucks, means for ejecting a blank from each of the chucks, a reciprocatory slide, a plurality of slotting tools carried by said slide and in position to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

11. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, means for automatically feeding blanks successively to the blank holding means of the turret, a reciprocatory slide, a plurality of slotting tools carried by the slide and located to slot a plurality of blanks simultaneously with the slot of one blank at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

12. In an automatic nut castellating machine, the combination of an intermittently revoluble turret member, means for automatically indexing it, a plurality of blank holding means carried by the turret member, means for automatically feeding blanks successively to the blank holding means of the turret member, a reciprocatory slide member, a plurality of slotting tools carried by said slide member and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of a companion blank, and means for reciprocating one of said members after each indexing of the turret member.

13. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding chucks carried by the turret, means for opening and closing the chucks at predetermined times, means for ejecting blanks successively from the chucks, means for automatically feeding blanks successively to the chucks, a reciprocatory slide, a plurality of shafts carried by said slide and located in horizontal planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding chucks of the turret, means for rotating said shafts, slotting tools carried by the shafts and located in parallel planes, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another blank.

14. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding chucks carried by the turret, means for opening and closing the chucks at predetermined times, means for automatically and successively ejecting the blanks from the chucks, means for automatically feeding blanks successively to the chucks, a reciprocatory slide, a series of three shafts carried by the slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the chucks of the turret, means for rotating said shafts, slotting tools carried by the shafts one rotatable in a plane parallel to its companion tools, and means for automatically reciprocating the slide after each indexing of the turret whereby a series of three blanks will be slotted simultaneously with the slot of each blank located at an angle to those of companion blanks.

15. In an automatic nut castellating machine, a sliding tool carrier having a plurality of shafts located in parallel planes, slotting tools carried by said shafts and located to rotate in parallel planes, means for rotating said tools, and means for reciprocating said sliding tool carrier.

16. In an automatic nut castellating machine, a sliding tool carrier, a series of three shafts carried thereby and located in parallel planes, a slotting tool carried by each of said shafts one located in a plane parallel to its companion tools, means for rotating said shafts, and means for automatically reciprocating the sliding tool carrier.

17. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of non-rotatable blank

holding chucks carried by the turret, means for automatically opening and closing the chucks successively at predetermined times, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

18. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of non-rotatable blank holding chucks carried by the turret, means for automatically opening and closing the chucks successively at predetermined times, means for automatically ejecting the blanks from the chucks successively, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

19. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding chucks carried by the turret, means for working upon the blanks carried by the turret and comprising a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, means for automatically reciprocating the slide after each indexing of the turret and means for automatically and successively feeding blanks to the chucks of the turret.

20. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding chucks carried by the turret, means for working upon the blanks carried by the turret and comprising a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, means for automatically reciprocating the slide after each indexing of the turret, means for automatically and successively feeding blanks to the chucks of the turret, and means for automatically and successively ejecting the blanks from the chucks.

21. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of blank holding chucks carried by the turret, means for

working upon the blanks carried by the turret and comprising a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, means for automatically reciprocating the slide after each indexing of the turret, and means for automatically and successively feeding blanks to the chucks of the turret and comprising a swinging magazine automatically operated to free a blank therefrom and to return to its normal position.

22. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of blank holding chucks carried by the turret, means for working upon the blanks carried by the turret and comprising a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, means for automatically reciprocating the slide after each indexing of the turret, and means for automatically and successively feeding blanks to the chucks of the turret and comprising a swinging magazine automatically operated by a blank to free it therefrom and to return to its normal position.

23. In a machine of the class described, the combination of a revoluble turret, means for rotating it, a plurality of blank holding means carried by the turret, automatically operative means for feeding blanks successively to the blank holding means of the turret and comprising a magazine shiftably supported to automatically free itself from the blanks fed to the turret, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

24. In a machine of the class described, the combination of a revoluble turret, means for rotating it, a plurality of blank holding means carried by the turret, automatically operative means for feeding blanks successively to the blank holding means of the turret and comprising a magazine shiftably supported to automatically free itself by the blanks from the blanks fed to the turret, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

25. In a machine of the class described,

the combination of a revoluble turret, means for rotating it, a plurality of blank holding means carried by the turret, automatically operative means for feeding blanks successively to the blank holding means of the turret and comprising a magazine supported for swinging movement relatively to the turret and shifted by a blank to free it therefrom, and means for returning the magazine to its normal position, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

26. In a machine of the class described, the combination of a revoluble turret, means for rotating it, a plurality of blank holding means carried by the turret, automatically operative means for feeding blanks successively to the blank holding means of the turret and comprising a magazine supported for swinging movement relatively to the turret and shifted by a blank to free it therefrom, means for returning the magazine to its normal position, said magazine having a tapered portion at its lower rear side adapted to be engaged by a blank, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

27. In a machine of the class described, the combination of a revoluble turret, means for rotating it, a plurality of blank holding means carried by the turret, automatically operative means for feeding blanks successively to the blank holding means of the turret and comprising a magazine supported for swinging movement relatively to the turret and shifted by a blank to free it therefrom, means for returning the magazine to its normal position, said magazine having a tapered portion at its lower rear side adapted to be engaged by a blank and a spring actuated plunger located above its pivotal connection, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

28. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, means for automatically feeding blanks successively to the blank holding means of the turret and com-

prising a magazine, an automatically actuated plunger for forcing blanks from the magazine into the blank holding means of the turret, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

29. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, means for automatically feeding blanks successively to the blank holding means of the turret and comprising a magazine, an automatically actuated plunger for forcing blanks from the magazine into the blank holding means of the turret, said magazine being pivotally supported for swinging movement toward and from the turret and adapted to be automatically swung to free itself from the blanks, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

30. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, means for automatically feeding blanks successively to the blank holding means of the turret and comprising a magazine, an automatically actuated plunger for forcing blanks from the magazine into the blank holding means of the turret, said magazine being pivotally supported for swinging movement toward and from the turret and adapted to be automatically swung by a blank to free itself from the blanks, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

31. In a machine of the class described, the combination of work supporting means adapted to carry simultaneously a plurality of pieces of work, a tool head, a plurality of tools mounted on said head, and means for operating said tools simultaneously in opposite directions each upon a different piece of work, whereby the thrust of one tool offsets the thrust of the other.

32. In a machine of the class described, the combination of work supporting means adapted to carry simultaneously a plurality

of pieces of work, a sliding tool head, a plurality of tools carried by said head, and means for operating said tools in opposite directions simultaneously each upon a different piece of work, whereby the thrust of one tool offsets the thrust of the other.

33. In a machine of the class described, the combination of work supporting means adapted to carry simultaneously a plurality of pieces of work, a sliding tool head, means for sliding it, a plurality of rotary cutting tools carried by said head, and means for rotating said cutting tools in opposite directions simultaneously each upon a different piece of work, whereby the thrust of one cutting tool offsets the thrust of the other.

34. In a machine of the class described, the combination of work supporting means adapted to carry simultaneously a plurality of pieces of work, a reciprocatory tool head, means for reciprocating it, a plurality of rotary cutting tools carried by said head and located in parallel planes, and means for rotating said tools simultaneously in opposite directions each upon a different piece of work, whereby the thrust of one tool is offset by that of the other.

35. In a machine of the class described, the combination of work supporting means adapted to carry simultaneously a plurality of pieces of work, a reciprocatory tool head, means for reciprocating it, a plurality of rotary cutting tools carried by said head and located in parallel planes, and means for rotating said tools simultaneously in opposite directions each upon a different piece of work, whereby the thrust of one tool is offset by that of the other, the axes of said cutting tools being also located in parallel planes.

36. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory tool slide, means for automatically reciprocating it toward and from the turret, a plurality of rotary slotting tools carried by said slide, and means for rotating said tools in opposite directions simultaneously whereby the thrust of one is offset by the thrust of the other.

37. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory tool slide, a series of three rotating slotting tools carried by the slide, and means for simultaneously rotating said tools one in a direction opposite to the direction of rotation of its companion tools whereby the thrust of one tool offsets the thrust of another tool.

38. In an automatic nut castellating ma-

chine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another.

39. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, slotting tools carried by the shafts and also located in parallel planes, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another.

40. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding means carried by the turret, a reciprocatory slide, a series of three shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, means for rotating said shafts, saws carried by the shafts and located in parallel planes, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another.

41. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a series of blank holding means carried by the turret, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, slotting tools carried by the shafts, means for rotating said shafts in opposite directions whereby the thrust of one tool will be offset by the thrust of a companion tool, and means for auto-

atically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another.

42. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of non-rotatable blank holding means carried by the turret, a reciprocatory slide, a series of three shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the blank holding means of the turret, saws carried by the shafts and located in parallel planes, means for rotating one of said shafts in a direction opposite to the other whereby the thrust of one saw will offset the thrust of another saw, and means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another.

43. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of work spindles carried by the turret and carrying chucks, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the chucks of the turret, means for rotating said shafts, slotting tools carried by the shafts, means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another, means for feeding the blanks successively to the chucks, means for ejecting the blanks successively from the chucks and carried by the work spindles and projecting from the rear ends thereof, and means for automatically and successively operating each of said ejecting means.

44. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of work spindles carried by the turret and carrying chucks, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the chucks of the turret, means for rotating said shafts, slotting tools carried by the shafts, means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to

that of another, means for feeding the blanks successively to the chucks, means for ejecting the blanks successively from the chucks and carried by the work spindles and projecting from the rear ends thereof, means for automatically and successively operating each of said ejecting means, and means for holding the ejecting means in proper position.

45. In an automatic nut castellating machine, the combination of an intermittently revoluble turret, means for automatically indexing it, a circular series of work spindles carried by the turret and carrying chucks, a reciprocatory slide, a plurality of shafts carried by said slide and located in parallel planes with the axes thereof spaced apart to correspond with the distance between the axes of the chucks of the turret, means for rotating said shafts, slotting tools carried by the shafts, means for automatically reciprocating the slide after each indexing of the turret whereby a plurality of blanks will be slotted simultaneously with the slot of one blank located at an angle to that of another, means for feeding the blanks successively to the chucks, means for ejecting the blanks successively from the chucks and carried by the work spindles and projecting from the rear ends thereof, means for automatically and successively operating each of said ejecting means, and means for holding the ejecting means in proper position and comprising a disk supported from the turret.

46. In a machine of the class described, the combination of an intermittently revoluble turret having a circular series of non-rotatable work carrying spindles each carrying a chuck, clutch mechanism carried by the spindles, means for automatically and successively operating the clutch mechanism for opening and closing the chucks, an extractor carried by each of the spindles and projecting from the rear end thereof, means for automatically and successively actuating the extractors, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret.

47. In a machine of the class described, the combination of an intermittently revoluble turret having a circular series of non-rotatable work carrying spindles each carrying a chuck, clutch mechanism carried by the spindles, means for automatically and successively operating the clutch mechanism for opening and closing the chucks, an extractor carried by each of the spindles and projecting from the rear end thereof, means for automatically and suc-

cessively actuating the extractors, a disk supported from the turret for holding the extractors in their proper position, a reciprocatory slide, a plurality of slotting tools 5 carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret. 10

48. In a machine of the class described, the combination of an intermittently revoluble turret having a circular series of non-rotatable work carrying spindles each carrying a chuck, clutch mechanism carried by 15 the spindles, means for automatically and successively operating the clutch mechanism for closing the chucks, means for automatically and successively operating the clutch mechanism for opening the chucks, a reciprocatory slide, a plurality of slotting tools 20 carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret. 25

49. In a machine of the class described, the combination of an intermittently revoluble turret having a circular series of non-rotatable work carrying spindles each carrying a chuck, clutch mechanism carried by 30 the spindles, means for automatically and successively operating the clutch mechanism for closing the chucks, means for automatically and successively operating the clutch mechanism for opening the chucks, said 35 chuck opening mechanism comprising a sliding shaft, a shoe carried thereby, a pivoted cam operated lever for sliding said shaft, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to 40 slot a plurality of blanks simultaneously with the slot of one blank located at an

angle to that of another blank, and means 45 for automatically reciprocating the slide after each indexing of the turret.

50. In a machine of the class described, the combination of an intermittently revoluble turret, means for automatically indexing 50 it, a circular series of non-rotatable work carrying spindles carried by said turret, a blank extractor carried by each of said spindles and projecting from the rear thereof, means for automatically operating said 55 extractors successively, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, 60 and means for automatically reciprocating the slide after each indexing of the turret.

51. In a machine of the class described, the combination of an intermittently revoluble turret, means for automatically indexing 65 it, a circular series of non-rotatable work carrying spindles carried by said turret, a blank extractor carried by each of said spindles and projecting from the rear thereof, means for automatically operating said 70 extractors successively and comprising a cam operated slide having means coöperating with the end of the extractor, a reciprocatory slide, a plurality of slotting tools carried by said slide and located to slot a 75 plurality of blanks simultaneously with the slot of one blank located at an angle to that of another blank, and means for automatically reciprocating the slide after each indexing of the turret. 80

Signed at Cleveland, county of Cuyahoga and State of Ohio, this 28th day of December, 1910.

OSCAR A. SMITH.

Witnesses:

W. R. MITCHELL,
S. M. MATHEWS.