Oct. 26, 1926. 1,604,128

E. G. LORDEN

'UT CASTELLATING MACHINE

Filed July 8, 1924 7 Sheets-Sheet 1

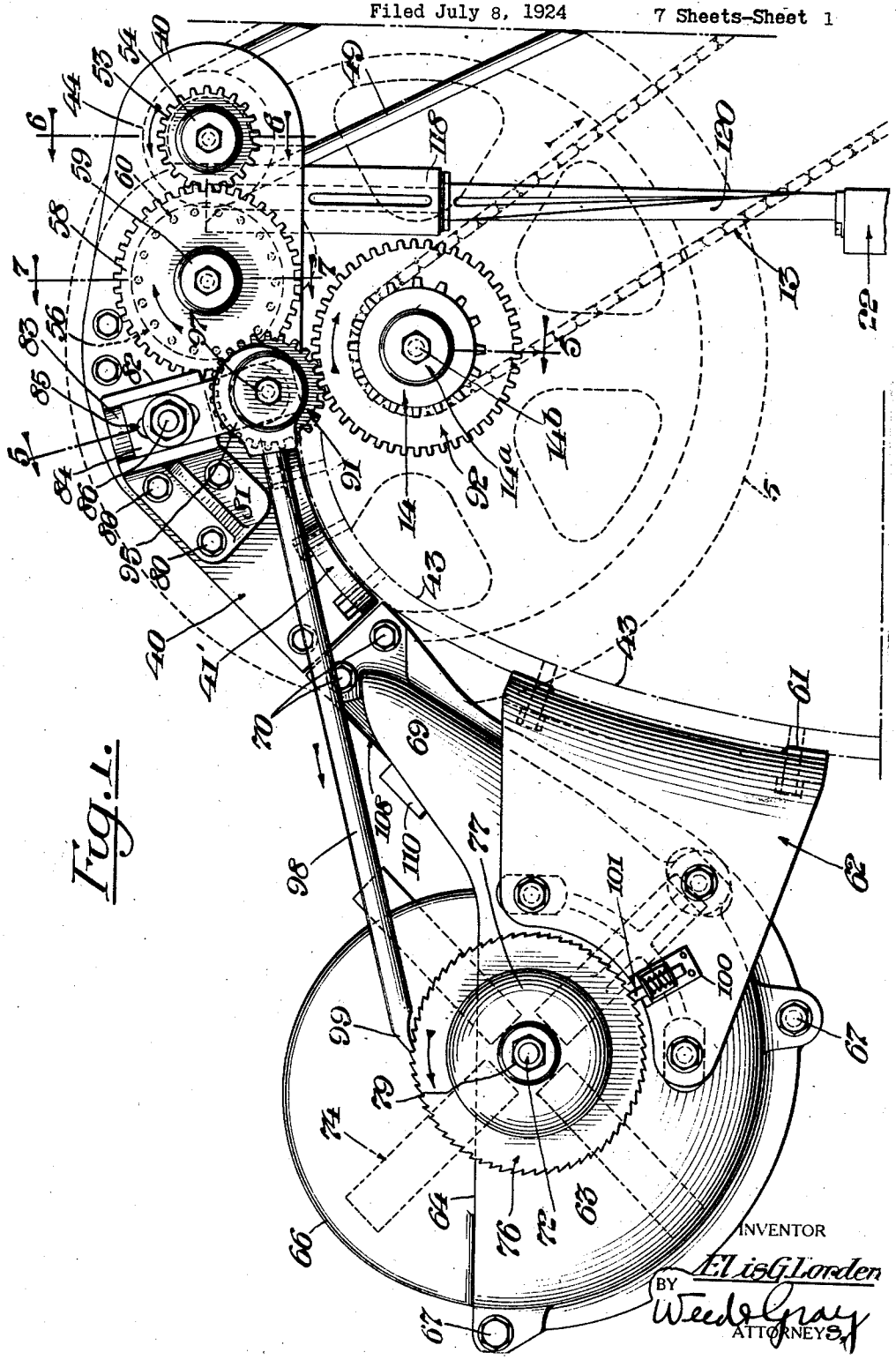


Fig. 1.

INVENTOR

Elis G. Lorden

BY Weed & Gray

ATTORNEYS

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E. G. LORDEN

NUT CASTELLATING MACHINE

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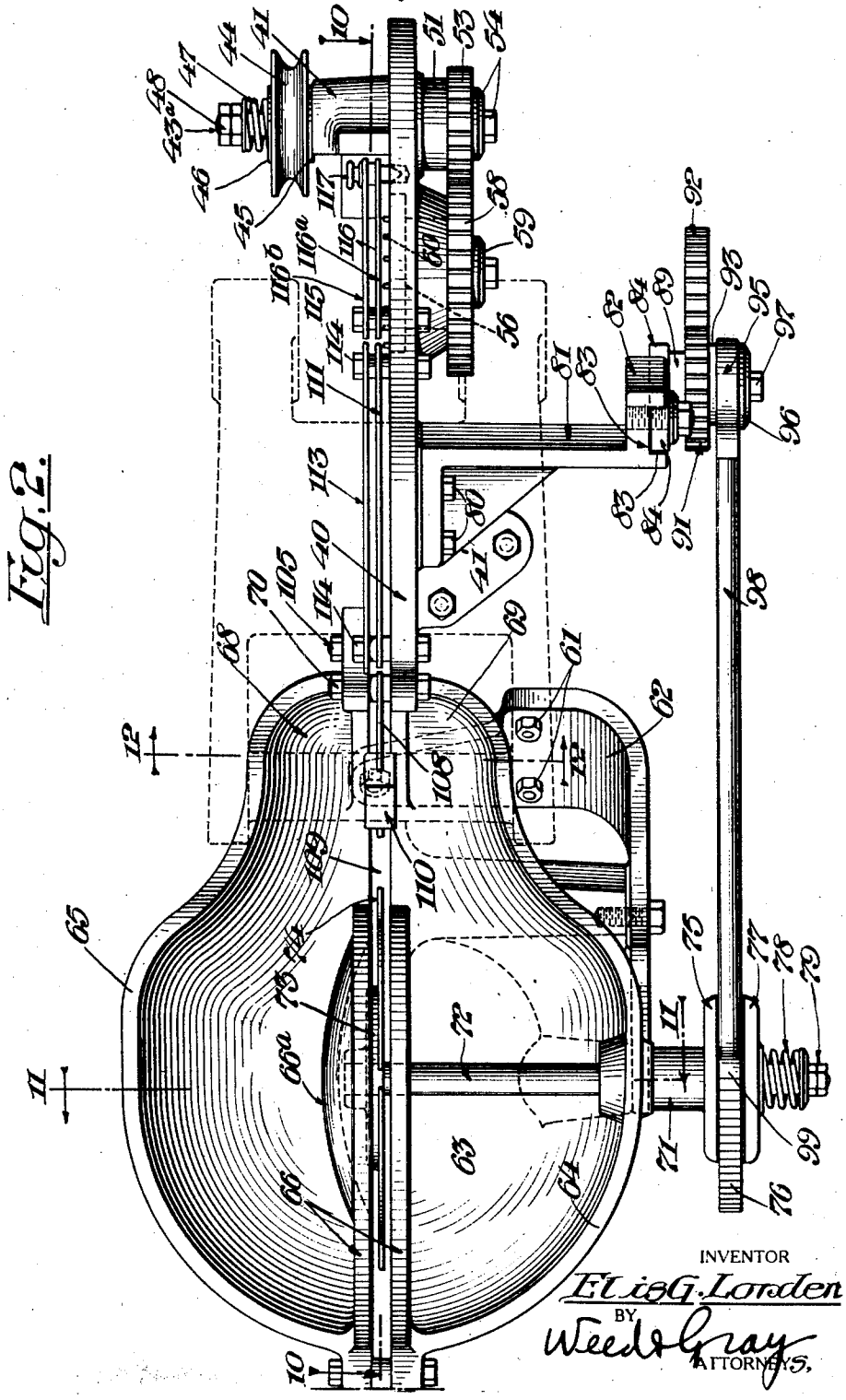


Fig. 2.

INVENTOR

Elis G. Lorden

BY

Weed & Gray

ATTORNEYS.

Oct. 26, 1926. 1,604,128

E. G. LORDEN

NUT CASTELLATING MACHINE

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Fig. 3.

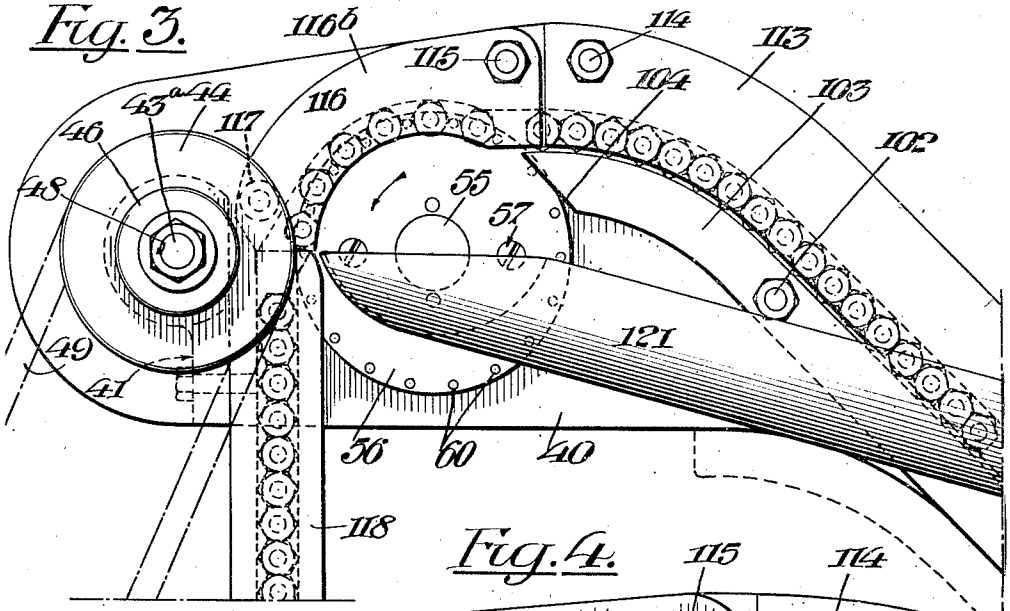
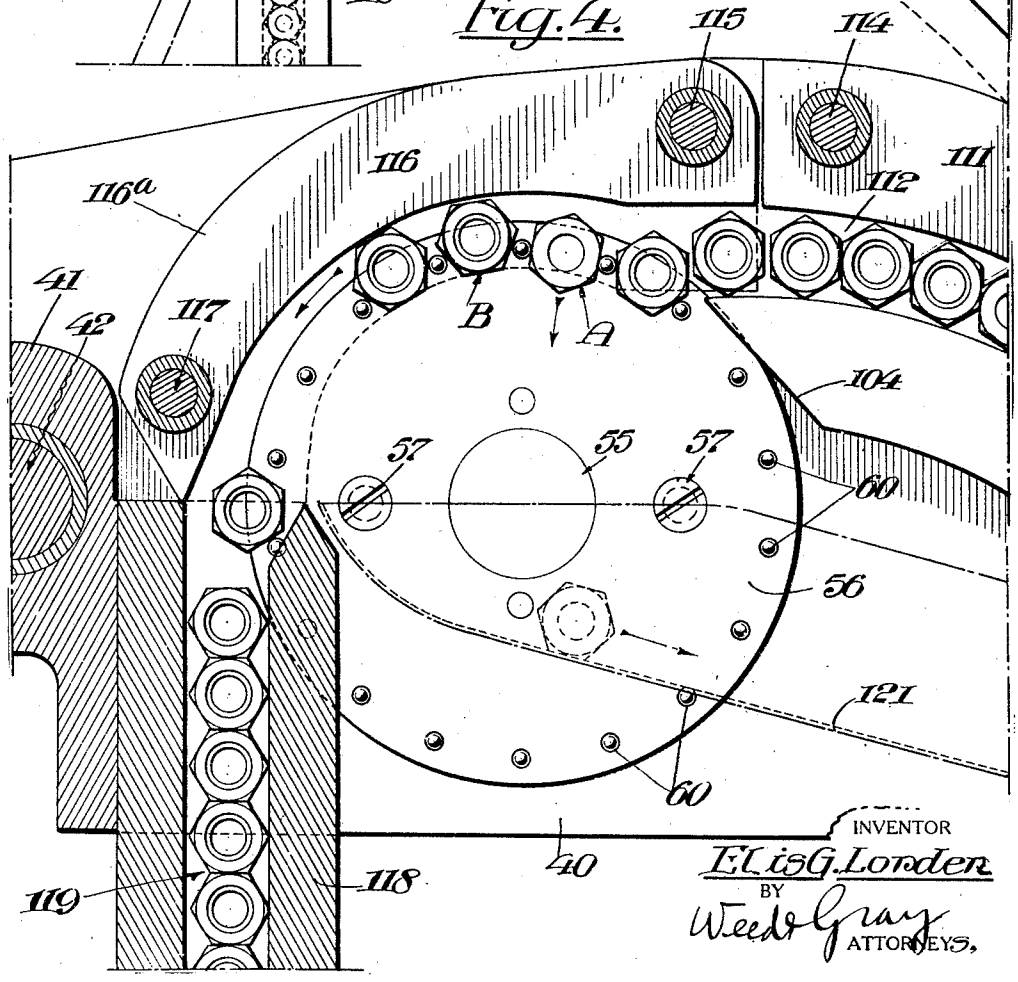


Fig. 4.



INVENTOR

E. G. Lorden

BY

Weed & Gray

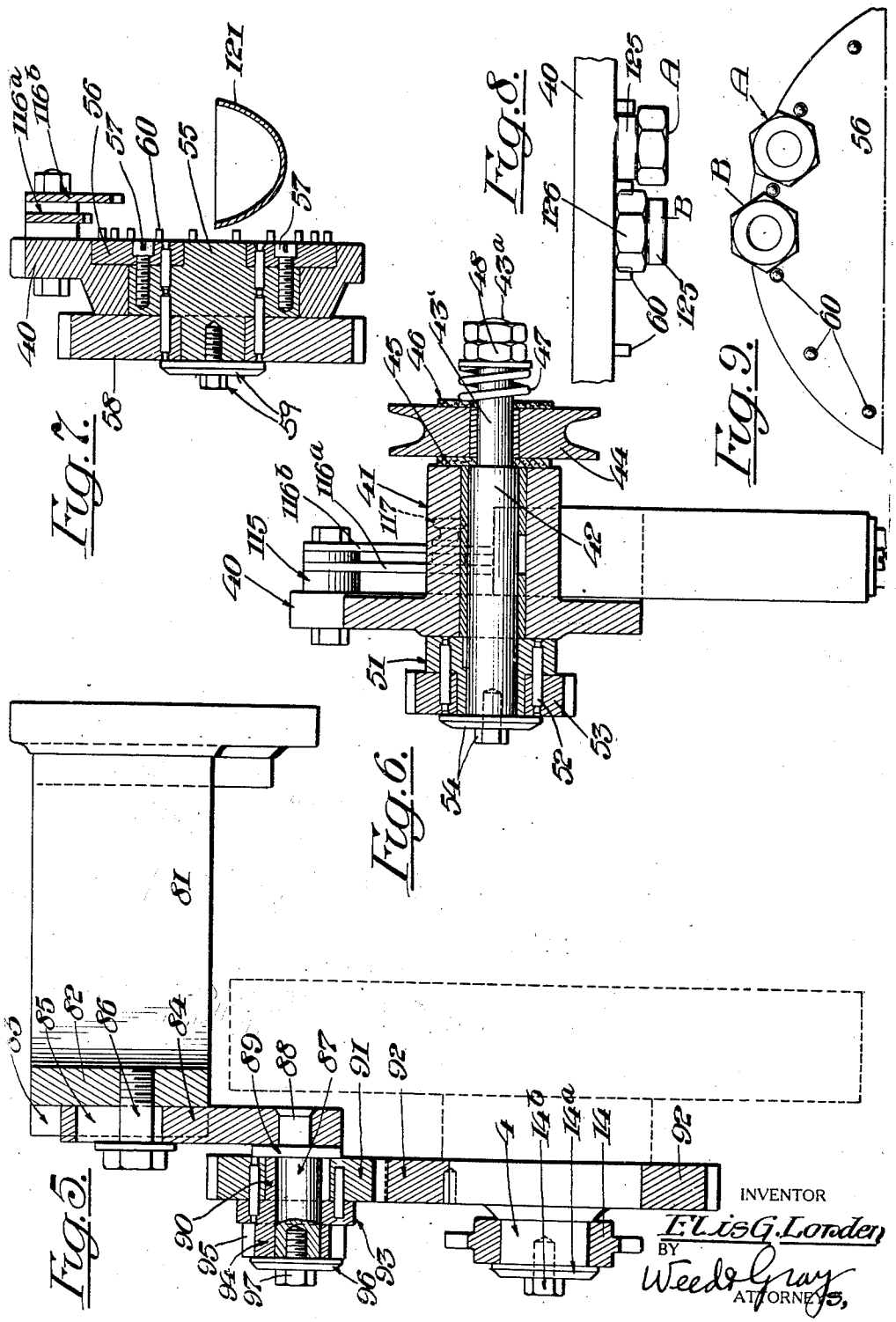
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E. G. LORDEN

NUT CASTELLATING MACHINE

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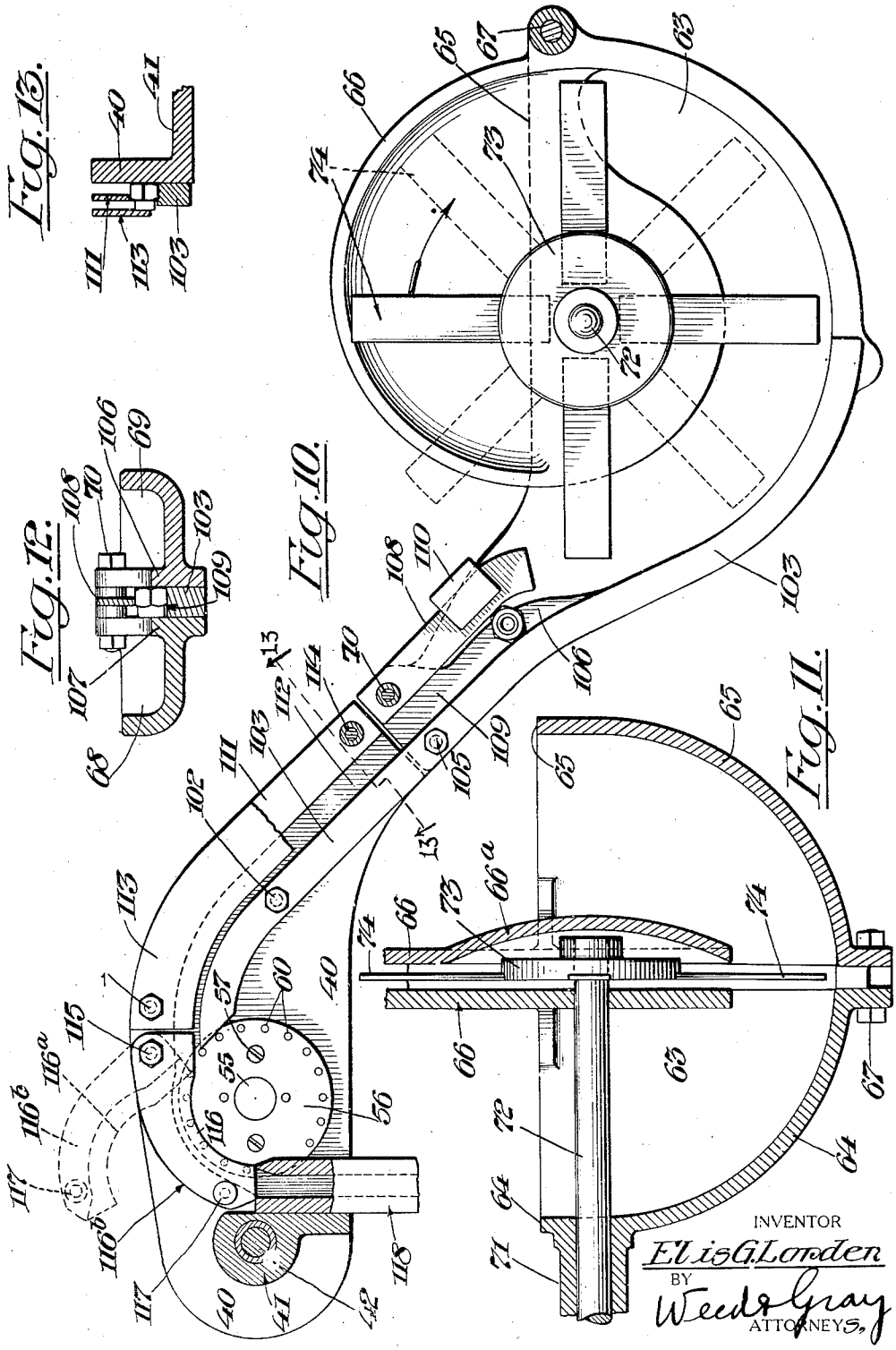


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E. G. LORDEN

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Fig. 14.

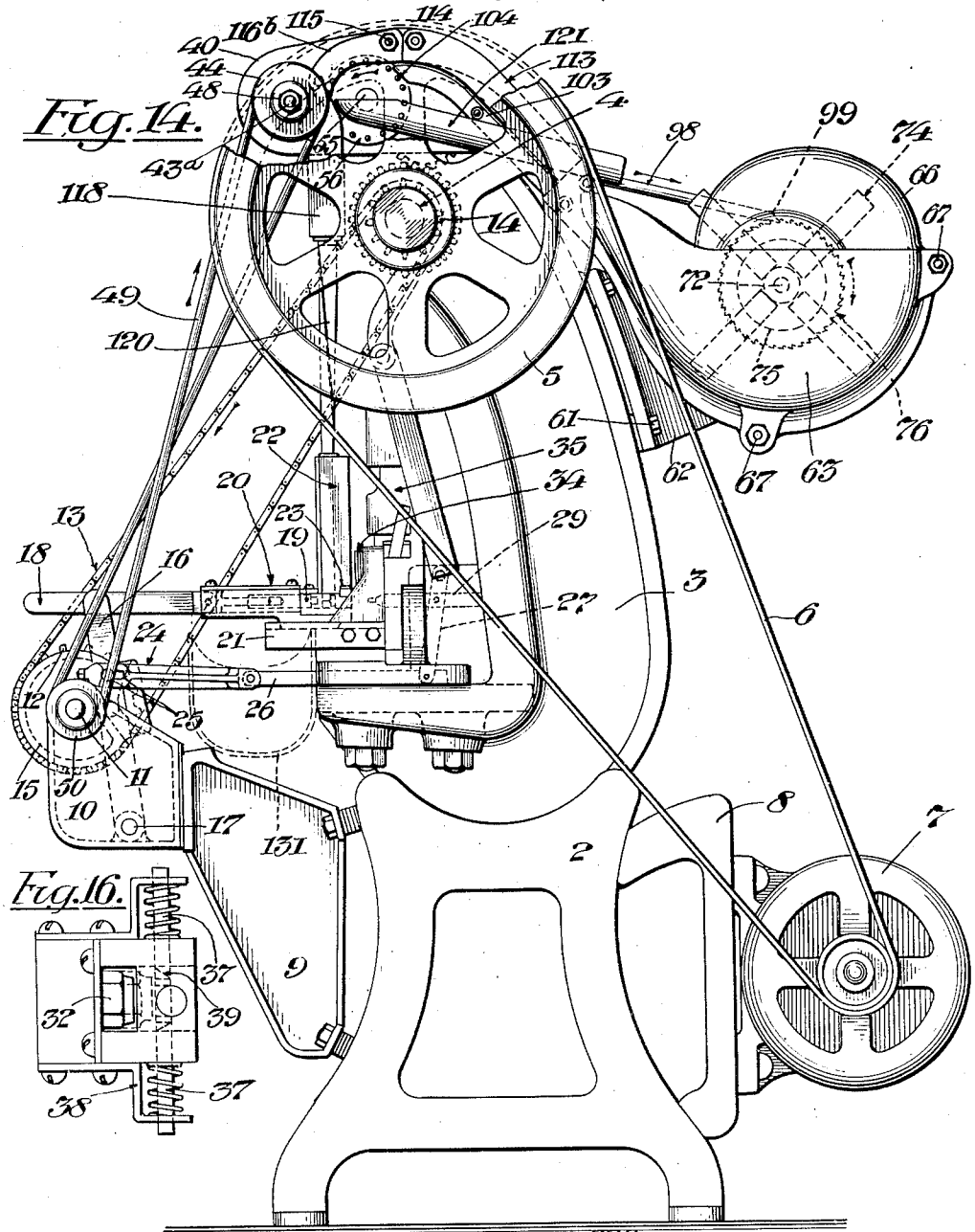
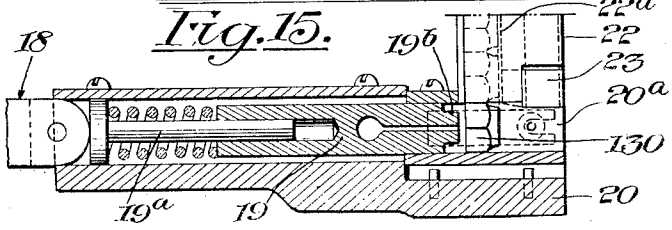


Fig. 16.

Fig. 15.



INVENTOR
E. G. Lorden
BY
Wood & Gray
ATTORNEYS.

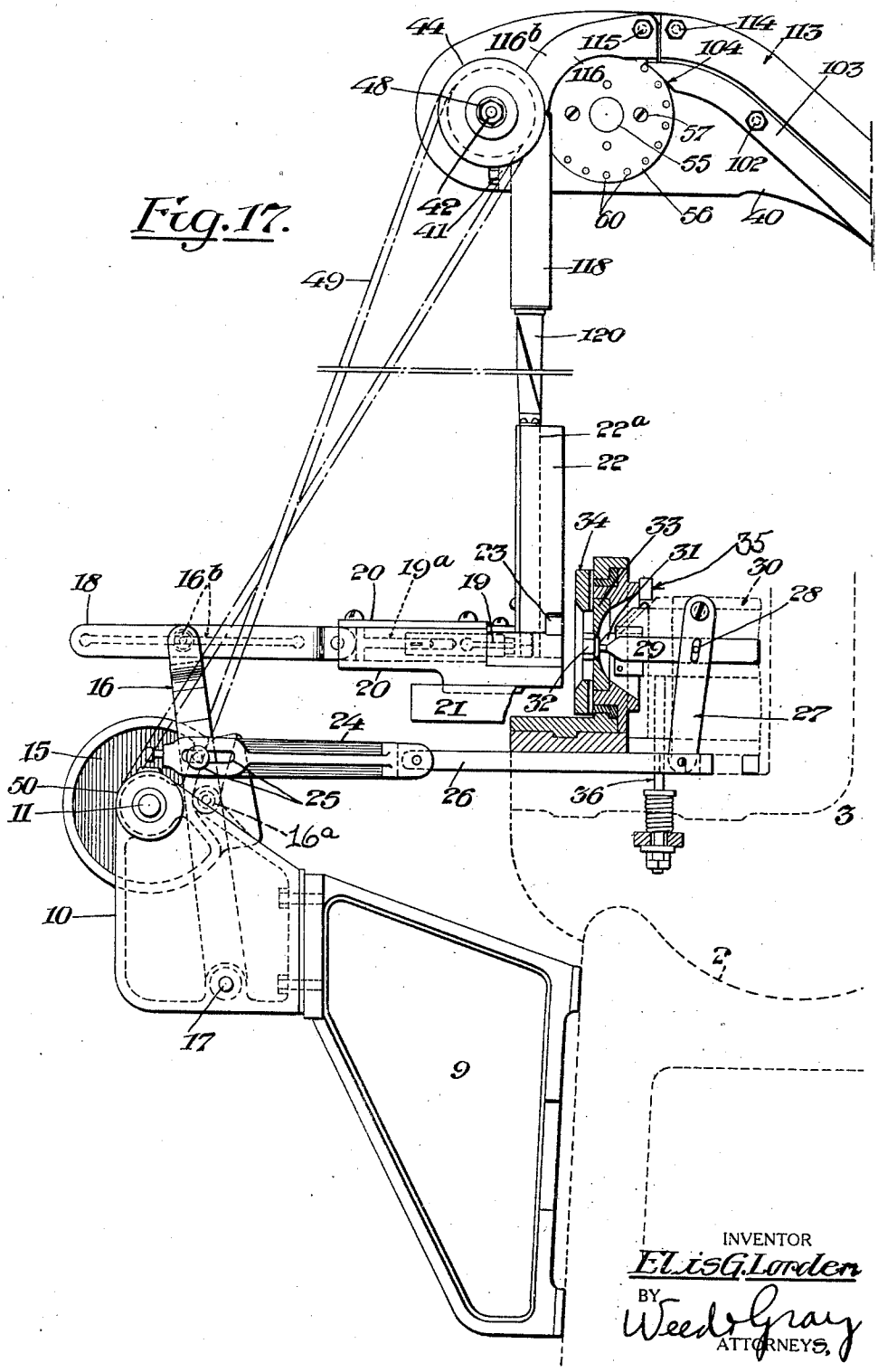
Oct. 26, 1926. 1,604,128

E. G. LORDEN

NUT CASTELLATING MACHINE

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Fig. 17.



INVENTOR
Elis G. Lorden
BY
Weed & Gray
ATTORNEYS.

Patented Oct. 26, 1926. 1,604,128

UNITED STATES PATENT OFFICE.

ELIS G. LORDEN, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL ACME COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

NUT-CASTELLATING MACHINE.

Application filed July 8, 1924. Serial No. 724,773.

This invention relates to metal working machines, and particularly to nut castellating machines, an object of the invention being to provide an improved machine having automatic mechanism for feeding nut blanks from an unarranged supply, and sorting the blanks in order to enable them to be fed in position to be operated upon by the tool.

A further object of this invention is to provide an improved machine such as a nut castellating machine wherein means is provided for feeding blanks to a blank holding means from a magazine, and wherein improved mechanism is provided for automatically sorting the blanks and feeding them to the magazine.

A further object of this invention is to provide a nut castellating machine wherein mechanism is provided for feeding blanks from an unarranged supply, sorting the blanks and delivering them in proper position and in uniform direction to mechanism adapted to feed the blanks to a blank holder, and wherein the blanks are castellated and thereafter ejected from the blank holder, the improved construction being such that all of the operations are automatic and at the same time the mechanism is so organized that the tendency of any of the parts to jam or otherwise get out of order is greatly minimized.

A further object of this invention is to provide a machine having mechanism for automatically feeding nut blanks from a source of supply, sorting the blanks so that they will be arranged in proper position when fed to the cutting tool and wherein safety means is provided for rendering such mechanism inoperative in case of jamming or in the event that more blanks are fed than can be taken care of in the normal operation of the machine.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters indicate corresponding parts in the several views, and wherein Fig. 1 is a view illustrating the hopper and the assorting dial mechanism, this view being a side elevation of the construction shown in Fig. 2 taken at the upper part of the mechanism; Fig. 2 is a top plan view illustrating particularly the hopper and assorting dial mechanism; Fig. 3 is an enlarged fragmentary side view showing particularly the assorting dial mechanism and taken at the right hand side of the machine; Fig. 4 is an enlarged sectional view of the construction shown in Fig. 3, and illustrating the manner in which the blanks are assorted by the dial mechanism; Fig. 5 is an enlarged section taken substantially on lines 5—5 of Fig. 1, in the direction of the arrows; Fig. 6 is an enlarged section taken substantially on lines 6—6 of Fig. 1 in the direction of the arrows; Fig. 7 is a section taken substantially on lines 7—7 of Fig. 1 in the direction of the arrows; Fig. 8 is a fragmentary top view of the assorting dial showing the manner in which the blanks are sorted; Fig. 9 is a fragmentary side view of the construction shown in Fig. 8; Fig. 10 is a central sectional side view taken at the right hand side of the machine on lines 10—10 of Fig. 2 in the direction of the arrows; Fig. 11 is a sectional view taken substantially on lines 11—11 of Fig. 2 in the direction of the arrows; Fig. 12 is a sectional view taken substantially on lines 12—12 of Fig. 2 in the direction of the arrows; Fig. 13 is a transverse sectional view taken on lines 13—13 of Fig. 10; Fig. 14 is a side elevation of the machine taken at the right hand side thereof; Fig. 15 is a fragmentary sectional view illustrating the feeding or loading plunger mechanism for feeding the blanks from the magazine; Fig. 16 is a detail plan view showing the tension spring mechanism for the magazine, and Fig. 17 is a side view partly in section showing particularly the feed mechanism and the ejector or extractor mechanism.

Before explaining in detail the present improvement and mode of operation thereof, I desire to have it understood that the invention is not limited to the details of construction and arrangement of parts which are illustrated in the accompanying drawings, since the invention is capable of other embodiments, and that the phraseology which I employ is for the purpose of description and not of limitation.

Heretofore, in machines constructed for the purpose of operating upon nut blanks, such as for castellating, tapping or other-

wise working upon the blanks and wherein a predetermined face of each blank must be positioned toward the cutting tool, it was necessary for the operator to sort by hand the blanks and position them in the proper manner and all in the same direction, either in a blank operating means, or a magazine, or otherwise in readiness to be fed into position to be operated upon by the tool. This task of sorting or selecting the blanks and placing them in the proper direction required considerable labor and time, the frequent or constant attendance of an operator, and affected materially the cost of production. If the blanks are not sorted and fed to the tool facing the same way, considerable waste of material in defective product results. Furthermore, where the sorting, arrangement, or positioning of the blanks is dependent upon the attendance and manual skill of an operator, it has been found in practice that uniform results are not obtained, that the blanks are frequently positioned the wrong way particularly where fed by hand into a magazine.

The foregoing disadvantages are entirely eliminated as a result of the present invention, which does away with all handling of the blanks by the operator, and renders entirely automatic the sorting, arrangement or positioning of the blanks in a uniform direction for operation by the tool. Furthermore, the present invention provides for the first time automatic operation of the machine at every stage from the time the blanks are in unarranged condition in a hopper or other source of supply until the blanks are delivered in finished condition.

In the drawings is illustrated a nut castellating machine embodying my invention, and this machine is an improvement over Patent No. 1,157,258, dated October 19, 1915, to Smith and Rindfleisch, and also an improvement over the co-pending application of Smith and Kinley Serial No. 648,755 filed June 30, 1923, both said patent and co-pending application being assigned to the National Acme Company, assignee of the present invention. In the machine covered by Patent No. 1,157,258 the nut blanks were sorted or arranged and placed by hand in a magazine, and the blanks were fed successively from the magazine to the punch mechanism by means of a feed rod operated by a hand lever. In this patent therefore, the entire operations of sorting and feeding the nut blanks was accomplished by hand, and an operator was required to be in constant attendance on each machine of this patent. In the machine covered by the aforesaid co-pending application the nut blanks were also sorted or arranged or placed by hand in a magazine, but automatic mechanism was provided and so timed as to automatically feed the nut blanks successively and at the proper times to the blank holding means, and automatic means was also provided for ejecting or extracting the blanks at the proper times.

As a result of that invention it was possible for one operator to attend to four machines. The present invention however eliminates all handling of the blanks, which are automatically sorted or arranged and fed to the magazine, and it has been found that one operator can attend to at least fifteen machines of the present improved construction.

The machine illustrated in the drawing comprises the usual stand or base 2 for supporting the punch press. The drive or crank shaft 4 is mounted in the upper part of the punch press and is provided with the usual power driven wheel 5, which may be operated by means of a belt 6 connected to the armature shaft of a suitable motor 7, supported by means of a bracket 8 connected to the base 2.

To the base of the machine is bolted a bracket 9 having secured at the upper end thereof a housing member 10 in which is supported a shaft 11. Mounted upon the shaft 11 is a sprocket 12 which is connected by means of a chain 13 to sprocket 14, secured to the outer end of the crank shaft 4.

Mounted upon the shaft 11 and adapted to be connected and disconnected therefrom by suitable clutch mechanism (not shown) is a cam disk 15 which acts upon a stud 16^a carried by a swinging feed lever 16. This lever is pivoted at 17 to the member 10 and is connected by means of safety mechanism, indicated in general at 16^b, to a link 18. The link 18 is connected by means of a spring plunger 19^a to a feed plunger 19 which reciprocates horizontally in a channel 20^a formed in a magazine supporting bracket or housing 20 mounted upon a pair of extensions or bars 21 bolted to the frame of the machine. To the inner end of the bracket or housing 20 is mounted in proper position a magazine 22 having at one side thereof a vertical feed channel 22^a for the nut blanks. At its opposite side the feed channel is provided with a vertical bore in which is housed a spring controlled stripper plunger 23.

A link 24 is connected to the swinging lever 16 by means of a pin and slot connection 25. Extending in prolongation of the link 24 is a link 26 which is pivoted thereto at one end and at the opposite end to a swinging lever 27. This lever is connected at 28 to a horizontally reciprocating extractor or ejector member 29, the latter being housed at one side of a horizontally extending punch holder 30. The punch holder 30 carries a punch 31 having a cutting blade normally extending into the center opening of the nut blank 32 when held in position

within the die 33 by means of holder plate 34. The punch is operated vertically from the center opening of the blank outwardly through the wall of the blank to castellate the same by means of a vertically reciprocating ram 35 operated in the usual manner from the crank shaft of the machine. The die 33 is indexed after each punching operation by suitable mechanism (not shown) and the punch after being forced by the ram through the crown of the nut blank to form a slot therein is returned to its normal position within the center opening of the blank by means of a spring plunger 36.

Beneath the feed magazine 22 and projecting into the horizontal channel 20^a are a pair of spring plungers 37. These plungers are suitably supported by means of brackets 38 and are provided with tapered ends 39 normally extending into the path of the blank 32 so that when the blank is fed forwardly from the magazine 22 into the die 33, these plungers will retard the blank sufficiently to cause it to be seated upon the split end 19^b of the feed plunger 19.

A further detailed description of the foregoing mechanism is not herein deemed necessary since the same is fully described in the aforesaid co-pending application and also in the above mentioned patent.

Upon the top of the punch press frame is mounted a bracket 40 which is in the form of a vertically extending rib provided with an angularly extending flange 41′ bolted to the upper part 43 of the machine frame. The forward end of the bracket 40 is provided with an extended bearing 41 extending at right angles thereto, and within this bearing is housed an auxiliary drive shaft 42. Mounted upon a reduced portion 43^a of the shaft 42 is a grooved pulley 44 which is frictionally connected to the shaft by means of a fibre collar 45 located between the pulley and the shoulder formed by the reduced part 43, a second fibre collar 46 mounted on the shaft at the opposite face of the pulley, and a coiled spring 47 held under compression between the fibre collar 46 and lock nuts 48 secured to the outer end of the shaft. The fibre collars 45 and 46 in conjunction with the spring 47 frictionally bind the pulley 44 to the shaft to a predetermined degree. In case of overload however, this frictional resistance will be overcome thereby permitting the pulley to rotate relatively to the shaft. The pulley 44 is driven by means of a belt 49 which is connected to a pulley 50 secured to the outer end of the shaft 11.

On the opposite end of the shaft 42 and bearing against the face of bracket 40 is mounted a drive collar 51 which is keyed to the shaft 42. Secured by means of pins 52 to a reduced portion of the sleeve 51 is a gear 53, this gear being held against endwise movement by means of a bolt and collar 54. A suitable distance away from the shaft 42 and parallel thereto is a dial shaft 55 which extends through a bore in the bracket 40. The face of the bracket 40 is also bored to receive an assorting dial or disk 56, this dial having a central bore through which extends the shaft 55 (see Fig. 7). The dial 56 is bolted at 57 to an extended portion of the shaft 55, and to the opposite face of this extended portion is pinned a gear 58 which is mounted upon the shaft 55 and held in position by means of a collar and bolt 59. The gear 58 meshes with the gear 53 on auxiliary drive shaft 42 so that rotation of this shaft will cause the assorting dial or disk 56 to rotate. This disk is provided with a series of projecting pins 60, located in circular arrangement adjacent the periphery of the disk and spaced an equal distance apart.

Bolted at 61 to the punch press frame is a bracket 62, and bolted to this bracket is a hopper 63. This hopper is constructed in two half sections 64 and 65. The sections of the hopper when placed together as shown in Fig. 2 form a bowl, and each of these sections are provided with an upwardly and inwardly extending curved flange portion 66 of similar configuration. The section 64 of the hopper is bolted to the supporting bracket 62 and the two sections are bolted together in spaced relation by means of bolts 67 and suitable spacer washers. The upper ends 68 and 69 of the hopper sections form an upwardly inclined trough and are bolted together in spaced relation by means of bolts 70. The hopper section 64 at one side thereof is provided with an extended bearing 71 in which is housed a shaft 72. The shaft extends through the curved flange 66 of the hopper section 64 and has secured at its inner end a feeding disk 73. This disk is provided with a series of radially extending vanes or paddles 74 and it will be noted that the feed disk 73 is housed between the curved flanges 66 of the hopper sections, the flange of the section 65 having a convex portion 66^a to provide clearance for the disk 73. The vanes 74 of the feed disk are of sufficient length to project substantially to the bottom of the hopper, and these vanes operate in the space between the hopper sections.

Adjacent to the outer end of the shaft 72 is mounted a fibre washer 75 which is located adjacent the shoulder formed by the bearing 71. A ratchet wheel 76 is mounted on the shaft 72 against the outer face of the fibre washer 75. A second fibre washer 77 is mounted on the shaft against the outer face of the ratchet 76 and the ratchet is held in position between the washers 75 and 77 by means of a spring 78 and lock nuts 79 secured to the end of the shaft 72.

From the foregoing construction the ratchet is mounted on the shaft and clutched to the shaft for rotation therewith by fric-

tional tension. In the event that the nut blanks cause the feed disk 73 to jam, or in the event that the feed chute leading from the hopper is filled with nut blanks, so that no more blanks can be fed at the moment by the feed wheel, the ratchet 76 will be unclutched from the shaft 72 and will rotate relatively thereto.

Bolted at 80 to the outer face of the dial bracket 40 is an outwardly projecting bracket 81. This bracket at its outer end has a right angle projection 82 which is provided with a rectangular guide slot 83 (see Figs. 1, 2 and 5). Within this guide slot is housed a gear slide 84, the upper end of which is provided with an elongated slot 85. The slide is adjusted and secured in adjusted position within the guide slot 83 by means of an adjusting bolt 86 extending through the slot 85. The lower end of the gear slide 84 is provided with a suitable bore in which is fastened a reduced end 88 of a stud 87 which is spaced from the slide 84 by means of a collar 89. The stud 87 is provided with a suitable bushing 90 upon which is loosely mounted a gear 91. This gear is in mesh with a gear 92 secured to the crank shaft of the machine. The sprocket 14 hereinbefore described is mounted on the crank shaft at the outer side of the gear 92 and is held in position by means of a collar 14^a and bolt 14^b. A collar 93 is mounted upon the stud 87 against the outer face of the gear 91 and is pinned thereto and mounted upon the stud on the outer face of the collar 93 is an eccentric 94 to which is clamped a sleeve 95, the eccentric 94 and sleeve 95 being held in position by means of a collar 96 and bolt 97. Secured to the sleeve 95 is a ratchet feed lever or pawl 98, and the outer end of this pawl is machined at 99 to coact with the teeth of ratchet 76.

Secured to the supporting bracket 62 for the hopper is a bracket or knee 100 in which is suitably housed a spring controlled locking bolt 101 which mates with the teeth of the ratchet 76 and acts to releasably lock the ratchet in position during the intervals between the feeding movement of the pawl rod 98, or in other words this bolt 101 holds the ratchet against back lash. Bolted at 102 to the face of the dial bracket 40 (see Fig. 10) is a spacer or guide strip 103. The upper end of this guide strip is tapered at 104 and partially overlaps the outer face of the assorting dial or disk 56 (see Figs. 3, 4, and 10). This guide member 103 is also bolted at 105 between the upper portions 68 and 69 of the hopper and extends downwardly to the bottom of the hopper in the space formed between the confronting base portions of the hopper sections 64 and 65. The upper portions 68 and 69 of the hopper sections are formed with ribs 106 and 107 forming therebetween a channel 109, the base of which is formed by the guide strip 103 (see Fig. 12). This guide channel has a width substantially equal to the length of a nut blank thereby permitting the blanks to be fed into the channel with the longitudinal axes of the blank extending crosswise into the channel as shown in Figs. 10 and 12. Pivoted at 70 between the upper portions of the ribs 106 and 107 is a gather strip 108, which is alined with the channel or grooved passage 109 formed by the parts 103, 106 and 107. This gather strip 108 is weighted at 110 so as to cause the under edge of the strip to bear down sufficiently upon the nut blanks in the channel 109 so as to permit the blanks to be fed into the channel and maintained in proper position.

Bolted to the dial bracket 40 above the guide strip 103 and extending in prolongation of the gather strip 108 is a guide strip 111. A channel 112 is formed between the guide strips 111 and 103, as shown particularly in Figs. 4 and 10, this channel extending upwardly in prolongation of the channel 109 formed between the gather strip 108 and the guide strip 103. A guide strip 113 is bolted in spaced relation to the strip 111, the guide strips 111 and 113 being secured to the bracket 40 by means of bolts 114 and being suitably spaced apart as shown in Fig. 13. The guide strip 113 has a greater width than the strip 111 so as to project over the channel 112, (see Figs. 3 and 10).

Beyond the upper end of the guide strip 113 is pivoted at 115 (see Figs. 3, 6, and 10) a guide member 116, which is curved in accordance with the curvature of the assorting dial 56. This guide member 116 as shown particularly in Fig. 6 comprises an inner guide strip 116^a of width similar to the strip 111 and similarly spaced from the bracket 40 so as to extend in prolongation of the guide strip 111. The guide member 116 also comprises a strip 116^b of greater width as in the case of the guide strip 113, and extending in prolongation thereof. The guide member 116 may be locked in normal position as shown in full lines in Figs. 3 and 10 by means of a spring plunger 117 (see Fig. 2) adapted to project into a hole provided in the bracket 40. By pulling the plunger 117 out the guard member 116 may be raised to the position shown in dotted lines in Fig. 10.

Secured to the face of the bracket 40 in a position forwardly and below the center of the assorting dial or disk 56 and the lower end of the guard member 116 and in alinement with the same is a magazine section 118. This magazine section is constructed to form a central vertical guide channel 119 for holding a column of nut blanks. This magazine section 118 is connected to the magazine 22 by means of a section 120 which is given a quarter-turn or twist so as to place

the nut blanks in a proper direction for feeding into the blank carrier by the feed plunger 19. A return chute 121 (see Figs. 3, 4 and 14) is secured to the bracket 40 and projects from a position substantially below the center of the dial 56 so as to overhang the upper end of the hopper 63.

In the operation of the present improved machine it will be understood that the crank shaft 4 is driven through the drive wheel 5 and belt 6 from the motor 7. The gear 92 (see Fig. 1) will be driven in the direction of the arrow and will drive gear 91 thereby reciprocating the pawl rod 98 through the medium of the eccentric 94. The working end 99 of the pawl rod, coacting with the teeth of ratchet 76 will intermittently rotate the feed disk 73 and thereby impart a rotary step by step movement to the feed vanes 74.

At the same time the sprocket 14 driven by the crank shaft will rotate, through the chain 13, shaft 11 (see Figs. 14 and 17). This shaft not only operates the cam 15 but also drives pulley 50 thereby driving through the medium of belt 49 and pulley 44, shaft 42. The feeding and assorting dial 56 is rotated from the shaft 42 through the medium of gears 53 and 58 and dial shaft 55. A supply of nut blanks is placed in the hopper 63 and during the intermittent rotation of the feed disk 73, the feed vanes 74 which operate in the vertical plane of the feed channel 109 formed centrally between the hopper sections (see Fig. 2), will feed the nut blanks forwardly and upwardly beneath the gather strip 108, and between the guide ribs 106, 107, see Figs. 10 and 12. The nut blanks are thus intermittently pushed upwardly and forwardly by the feed vanes and are thus fed forwardly through the runway or guide channel 112. The blanks are kept in place against the face of the bracket 40 (see Fig. 13) by means of upper and lower guide strips 111 and 103, and by means of guide strip 113 which overlaps the end of the nut blanks and is spaced from the face of the bracket 40 a distance equal to the length of the nut blank. The assorting dial 56 rotates anti-clockwise, or toward the front of the machine, and when the nut blanks reach the top of the runway 112 (see Fig. 4), and are fed out of the runway, they come into contact with the assorting pins 60 of the feed dial 56. These sorting pins 60 are spaced apart equally a distance slightly greater than the diameter of the crown portion 125 of the nut blanks, (see Figs. 8 and 9), and the length of each pin is no greater than the height of the crown portion of the nut blank. Since the nut blanks in the hopper are unsorted, they will be fed up the runway 112, some with the crown 125 facing the bracket 40 (see Fig. 8) and some with the head or hex portion 126 against the face of the bracket 40.

As shown at A in Figs. 4, 8 and 9, those blanks which are fed to the assorting dial 56 with the crown 125 toward the face of the bracket 40 and also toward the face of the assorting dial, will pass between the pins 60 and drop into the return chute 121 and will be returned to the hopper 63. Those blanks however which are fed with the head or hex portion 126 toward the face of the bracket 40 and the face of the assorting dial 56, will be held on the pins 60, as shown at B in Figs. 4, 8 and 9. It has been found in practice that the nut blanks as they travel out of the runway 112 will be swung by gravity into such position that the corners of the hex portion of the nut blanks will be received upon the pins 60, as shown in Figs. 4 and 9. The blanks are carried by the assorting dial 56 from the runway 112 to the vertical guide channel 119 of the magazine section 118, and it will be seen that only those blanks will be fed into the magazine which face in the same direction, or which face in the present machine with the hex portions against the face of the assorting dial 56. All nut blanks therefore which are carried up the runway 112 to the dial with the crown portions against the face of the feed dial will be sorted out by virtue of the pins 60 and will be returned to the hopper 63.

It will be noted that the guard member 116 holds the nut blanks in proper position on the pins 60 as the blanks are carried around by the dial to the magazine 118. The strip 116^a of this guard member (see Fig. 4) is in position to prevent the hex portion of the nut blank turning on the pins 60, and the outer strip 116^b of this guard member (see Figs. 3 and 10) overlapping the crown of the blanks and holding them in position on the pins against endwise movement. This guard member 116 is pivotally hung at 115 so that it can be raised to remove any imperfect nut blanks that might feed to the magazine and tend to clog it.

It will be noted that the assorting dial 56 is friction driven by means of the friction fibre collars 45 and 46, and spring 47 (see Figs. 2 and 6), so that in case the magazine 118 becomes full so that no further blanks at the moment can be fed into the channel 119, the dial 56 will stop rotating and remain neutral since the frictional tension between the pulley 44 and shaft 42 will be overcome.

It will also be noted that the feed disk 73 in the hopper is provided with a frictional drive by means of friction fibre discs 75 and 77 and spring 78 so that when the sorting dial 56 stops rotating, and no further nut blanks can be fed into the runway 112, the frictional tension between the shaft 72 and ratchet 76 will be overcome thereby causing the disk 73 and its feed vanes 74 to remain neutral. Since the gather strip 108

is pivotally hung at 107 it may be raised when desired either to remove defective nut blanks or in case of jamming.

It will be seen therefore that all of the nut blanks by means of the assorting mechanism will be fed to the magazine section 118 with the crown portions facing in the same direction. All of the blanks will be given a quarter turn when passing through the magazine section 120 and will thus be delivered to the main magazine 22 with the crown portions all facing toward the die 33 and the punching mechanism.

The operation of the punch and ejector mechanism whereby the nut blanks are fed from the magazine 22 into the blank carrier 34, and ejected therefrom after being castellated is as follows:

It will be understood that the mechanism is so timed by means of the cam disk 15 that upon the upward stroke of the ram 35, which operates against the punch in the manner described in the aforesaid Patent No. 1,157,258, the feed plunger 19 through its actuating mechanism carries a nut blank 130 into the blank carrier 34 and die 33. After the ram has been reciprocated so as to cause the punch 31 to punch the desired number of slots in the blank, the ejector plunger 29 is operated through the lever 27 to eject the finished nut blank.

It will be understood that by means of the cam 15 operating upon the ram roller 16^a, the lever 16 will be shifted forwardly thereby shifting the link 18 forwardly and through the spring plunger connection 19^a shifting the plunger 19 forwardly to cause the split end 19^b of the plunger to enter the bore of the nut blank. The nut blank as it is carried out of the channel 20^a (see Fig. 15) will engage the rear tapered face of tension plunger 23 which will retard the blanks sufficiently to permit it to be fully seated upon the end of the feed plunger 19. The tapered ends 39 of the tension plungers 37 will also act to retard the blank to permit it to be properly seated on the feed plunger 19. The interval during which the cam roller 16^a travels on the annular face of the cam disk 15 is occupied to complete the punching of the blank, the blank being indexed after each stroke of the punch, and after the final stroke of the punch the lever 16 will be swung rearwardly thereby causing the plunger 19 to be shifted rearwardly away from the die 33. At this time the lever 16 will shift the links 24 and 26 rearwardly thereby the ejector lever 27 to force the ejector 29 forwardly against the nut blank and positively extract it from the die 33 and the blank carrier 34.

From the foregoing it will be seen that the present improved mechanism eliminates entirely the necessity of the operator handling the nut blanks at any stage in the operation. The mechanism of the machine is so organized that the nut blanks are automatically fed from an unarranged supply, automatically sorted and fed automatically to the blank carrier. The blanks are automatically punched and indexed in the blank carrier, and automatically ejected or extracted and delivered by means of a chute 131 (see Fig. 14) to suitable containers for the finished blanks. As a result of this improved construction it has been found in practice that many more machines can be attended to by a single operator than heretofore and in fact 15 machines of the present construction may be controlled by a single operator, thus reducing to a considerable degree the labor cost and the cost of production, and at the same time enabling the machines to be operated continuously and at longer sustained intervals without stopping.

It is to be understood that by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the modes of its use, I claim:

1. In a metal working machine, the combination of a blank carrier, a movable sorting device, means for delivering blanks to said sorting device, said sorting device having means movable toward the blank carrier for discharging from the device before reaching the carrier a blank when positioned in one direction and for delivering to the carrier a blank when positioned in the opposite direction.

2. In a metal working machine, the combination of a blank carrier, a movable sorting device, means for supplying blanks to said sorting device, said sorting device having means movable from said means of supply toward the blank carrier for discharging from the device before reaching the carrier a blank when positioned in one direction and for delivering to the carrier a blank when positioned in the opposite direction, and means for receiving the discharged blank and redelivering the same to said sorting device.

3. In a metal working machine, the combination of a blank carrier, a sorting device having means for first discharging therefrom blanks positioned in one direction, mechanism for receiving the remaining blanks from said device and for feeding the same to said carrier, means for receiving the discharged blanks and for feeding such blanks to the sorting device again, and means for operating on a blank in said carrier.

4. The combination of a blank carrying magazine, a sorting device, means for feeding blanks one at a time to said device, means for rotating said device, said device having means movable toward the magazine for discharging from the device before reaching the magazine a blank when positioned in one direction and for delivering to the magazine the blank when positioned in the opposite direction.

5. The combination of a blank carrier, a sorting device, means for moving a series of blanks toward said carrier, said sorting device having means movable into position for discharging before reaching the carrier, a blank positioned in the wrong direction with respect to the blanks to be carried by said carrier.

6. In a metal working machine, the combination of a blank holder, a blank carrying magazine, a sorting device, means for feeding blanks one at a time to the top of said device, means for supporting said device between said magazine and feeding means, means for rotating said device, said sorting device having means movable toward the magazine for discharging from the device before reaching the magazine a blank when positioned in one direction and for delivering to the magazine the blank when positioned in the opposite direction, means for feeding blanks from the magazine to said holder, and means for castellating a blank.

7. The combination of a blank carrier, means for feeding successive blanks toward said carrier, and a movable sorting device operative during the movement of the blanks toward the carrier to discharge a blank positioned in one direction before reaching the carrier thereby to permit the next succeeding blank positioned in a different direction to be delivered to the carrier.

8. In a metal working machine, the combination of a rotary sorting member, an upright magazine terminating at the peripheral edge of said member and substantially half way between the top and bottom thereof, said member having means for discharging blanks positioned in one direction and for delivering to said magazine blanks positioned in the opposite direction, and means for delivering blanks to the top of said sorting member.

9. The combination of a hopper, a movable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said sorting means adjacent to the top thereof, said sorting means having means for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, and means for receiving the properly positioned blanks from said sorting means.

10. The combination of a hopper, a movable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said sorting means at one side adjacent to the top thereof, said sorting means having means for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, and means for receiving the properly positioned blanks from said sorting means at the opposite side thereof substantially midway between the top and bottom of said sorting means.

11. The combination of a hopper, a rotatable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said sorting means at one side adjacent to the top thereof, said sorting means having a series of spaced means for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, and means for receiving the properly positioned blanks from said sorting means at a point substantially midway between the top and bottom of said rotatable sorting means.

12. The combination of a hopper, a movable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said blank sorting means adjacent to the top thereof, said sorting means having means for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, means for receiving the properly positioned blanks from said sorting means, and means having one end located substantially midway between the top and bottom of said sorting means for receiving the improperly positioned blanks.

13. In a metal working machine, the combination of a rotary sorting disk having spaced pins located circularly adjacent to the periphery of said disk, a guide channel for guiding a column of nut blanks one at a time to said pins and extending in the plane of said disk, and a blank carrier for receiving from said disk blanks arranged in a uniform direction.

14. The combination of a hopper, a rotatable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said sorting means at one side adjacent to the top thereof, said sorting means having a series of spaced pins for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, means for receiving properly positioned blanks from said sorting means and located at the opposite side substantially midway between the top and bottom of said sorting means, and means for receiving the improperly positioned blanks and having one end also located substantially midway

between the top and bottom of said sorting means.

15. The combination of a hopper, a movable blank sorting means located away from said hopper, means for feeding blanks in a row from said hopper to said sorting means adjacent to the top thereof, said sorting means having a series of spaced pins having non-connected free ends effective to retain the properly positioned blanks and immediately drop improperly positioned blanks from the top of said sorting means, and means for receiving the improperly positioned blanks from said sorting means.

16. The combination of a hopper, a rotatable blank sorting means, a blank hopper located away from said sorting means, means for feeding blanks in a row from the hopper to said sorting means at one side adjacent to the top thereof, said sorting means having a series of spaced pins for retaining properly positioned blanks and immediately dropping improperly positioned blanks from the top of said sorting means, means for receiving the properly positioned blanks from the sorting means at the opposite side thereof, and means for receiving improperly positioned blanks from the top of said sorting means and conveying them to the hopper.

17. The combination of a blank holder, means for feeding a column of blanks toward said holder, and mechanism acting to separate in spaced relation a plurality of adjacent blanks of the column and including means for removing from said adjacent blanks an improperly positioned blank in one direction to permit the next succeeding properly positioned blank spaced therefrom to be fed toward the blank holder.

18. In a metal working machine, the combination of a hopper for containing a supply of blanks, a feed channel extending upwardly from said hopper, a rotatable sorter means located adjacent to the upper end of said feed channel for receiving the blanks from the feed channel adjacent to the top of said sorter means and having means for retaining properly positioned blanks and effective to immediately release from the top of said sorting means improperly positioned blanks, and rotatable means in said hopper for forcing a column of blanks upwardly thru the feed channel to the top of said sorting means.

19. The combination of a blank carrier, a hopper, a rotatable sorter located away from said hopper, means for delivering blanks in a row from said hopper adjacent to the top of said sorter at the circumferential edge thereof, means for rotating said sorter to cause the blanks to be carried toward said carrier, said sorter having means for immediately releasing from the top of said sorter improperly positioned blanks and for delivering to the carrier only the properly positioned blanks.

20. The combination of a blank carrier, a rotatable sorting device supported for rotation on a horizontal axis, means for delivering blanks to the top of said device, means for rotating said device to cause the blanks to be carried toward said carrier, said device having means for discharging therefrom before reaching the carrier blanks positioned in one direction and delivering the remaining blanks to the carrier.

21. The combination of means for holding a supply of unsorted nut blanks, a shiftable sorter located away from said supply means for acting upon the unsorted blanks fed thereto in a row to position the same and comprising a member having a series of spaced blank engaging projections having non-connected free ends each pair thereof adapted to support therebetween a blank positioned in one direction and also adapted to immediately drop from the top of said sorter an improperly positioned blank.

22. The combination of means for holding a supply of unsorted nut blanks, a shiftable sorter located away from said supply means for acting upon the unsorted blanks fed thereto in a row to position the same and comprising a member having a series of spaced blank engaging projections having non-connected free ends of less length than the thickness of a blank, each pair thereof adapted to support therebetween a blank positioned in one direction and also adapted to immediately drop from the top of said sorter an improperly positioned blank.

23. The combination of means for holding a supply of unsorted nut blanks, a rotatable sorter disk for acting upon the unsorted blanks to position the same and having a series of blank engaging pins having non-connected free ends of less length than the thickness of a blank and effective to retain properly positioned blanks and immediately release from the top of said sorter improperly positioned blanks.

24. The combination of means for holding a supply of unsorted nut blanks, a rotatable sorter disk for acting upon the unsorted blanks to position the same and having a series of blank engaging pins having non-connected free ends of less length than the thickness of a blank and each having a uniform diameter from end to end, and effective to retain properly positioned blanks and immediately release from the top of said sorter improperly positioned blanks.

25. The combination of a hopper for holding a supply of unsorted nut blanks, an upwardly extending guideway connected thereto for successively guiding nut blanks in a column from the hopper, a rotatable sorter disk for receiving the blanks from said guideway adjacent to the top of said disk to position the blanks and having a series of blank engaging projections spaced to re-

of movement of the blanks in the magazine for ejecting the same from the carrier.

35. The combination of nut blank holding means, a guideway for conducting blanks to said holding means, a shiftable member projecting into said guideway and having spaced projections acting upon the nut blanks for discharging from the guideway the blanks adapted to pass between the projections and for delivering the remaining blanks to said holding means.

36. In a metal working machine, the combination of blank sorting means comprising a rotary disk having a series of circularly arranged spaced pin having free non-connected ends, each pair thereof adapted to support therebetween a blank positioned in one direction and to immediately drop a blank positioned in the opposite direction, a blank holding hopper located at one side of the circumference of said sorter, a feed chute extending from said hopper to said sorter, means located in the hopper for forcing a column of blanks through the feed chute to the sorter, means for automatically stopping the feeding means on the jamming of the blanks or when the feed chute from the hopper is filled with blanks, a magazine located at the opposite side of said sorter for conveying a column of properly positioned blanks downwardly from the sorter, means located at the lower end of the magazine for moving a blank transversely to the plane of movement of the blanks in the magazine, a blank carrier for receiving said transversely movable blank, and means for operating on the blank carried by the carrier.

37. The combination of nut blank holding means, a guideway for conducting blanks to said holding means, a shiftable member projecting into said guideway and having means acting upon the nut blanks for discharging from the guideway the blanks located in predetermined positions, a hopper connected to said guideway, and means for feeding blanks from said hopper into said guideway.

38. In a metal working machine, the combination of blank sorting means comprising a rotary disk having a series of circularly arranged spaced pins having free non-connected ends, each pair thereof adapted to support therebetween a blank positioned in one direction and to immediately drop a blank positioned in the opposite direction, means for rotating the rotary disk and including means for stopping the rotation thereof in the event of overload of the magazine, a blank holding hopper located at one side of the circumference of said sorter, a feed chute extending from said hopper to said sorter, means located in the hopper for forcing a column of blanks through the feed chute to the sorter, means for automatically stopping the feeding means on the jamming of the blanks or when the feed chute from the hopper is filled with blanks, a magazine located at the opposite side of said sorter for conveying a column of properly positioned blanks downwardly from the sorter, means located at the lower end of the magazine for moving a blank transversely to the plane of movement of the blanks in the magazine, a blank carrier for receiving said transversely movable blank, and means for operating on the blank carried by the carrier.

39. The combination of a blank carrier, means for sorting nut blanks fed to said carrier and including means operative only exteriorly of the blanks for permitting discharge of a blank positioned in the wrong direction before reaching the carrier and for preventing discharge of a blank positioned in the proper direction.

40. The combination of blank supply means, a rotatable blank sorting means located away from said blank supply means, means for feeding blanks in a column from said supply means to said rotatable sorting means, said sorting means having means for retaining properly positioned blanks and immediately dropping improperly positioned blanks, and means for receiving the properly positioned blanks from said sorting means, said sorting means being positioned to receive the blanks, drop the improperly positioned blanks and deliver the properly positioned blanks in less than half the rotation of said sorting means.

Signed at Cleveland, Ohio, this 3rd day of July, 1924.

ELIS G. LORDEN.

ceive properly positioned blanks and to immediately drop from the top of said sorter improperly positioned blanks.

26. The combination of a blank holding magazine, a rotary sorter having spaced circularly arranged projections having non-connected free ends, means for delivering nut blanks to said sorter adjacent to the top thereof and means for operating said sorter to deliver blanks to said magazine positioned in one direction, the blanks positioned in another direction being immediately released by said projections at the top of said sorter.

27. The combination of a blank hopper, a rotary sorter located away from said hopper and having spaced circularly arranged projections having non-connected free ends, means for delivering nut blanks in a row from the hopper to said sorter adjacent to the top thereof, means partially encircling the top of said sorter and located beyond the ends of said projections for guiding the nut blanks, and means for rotating said sorter.

28. The combination of a blank hopper, a rotary sorter located away from said hopper and having spaced circularly arranged projections having non-connected free ends, means for delivering nut blanks in a row from the hopper to said sorter adjacent to the top thereof, means located adjacent to the top of said sorter and extending beyond the ends of said projections for guiding the nut blanks, and means for rotating said sorter, said guiding means being located beyond said delivering means.

29. The combination of a blank hopper, a rotary sorter located away from said hopper and having spaced circularly arranged projections having non-connected free ends, means for delivering nut blanks in a row from the hopper to said sorter adjacent to the top thereof, means partially encircling the top of said sorter and located beyond the ends of said projections for guiding the nut blanks, and means for rotating said sorter, said guiding means being located beyond said delivering means and adjustable relatively thereto.

30. The combination of a hopper, a rotary sorter located away from said hopper and having spaced circularly arranged projections having non-connected free ends, means for delivering nut blanks in a row to said sorting device adjacent to the top thereof and including guiding means for the blanks, and blank guiding means located beyond the end of said guiding means and partially encircling said rotary disk and having a pair of guiding strips one of greater width than the other.

31. In a metal working machine, the combination of blank supply means, means for delivering blanks to be operated upon, a rotary sorter located between the blank supply means and the delivery means and comprising a rotary disk having a series of laterally projecting spaced pins having non-connected free ends, the supply means being located at one circumferential side of the disk adjacent to the top thereof and the delivery means at the opposite circumferential side of the disk and above the bottom thereof, means for rotating said disk, and means partially encircling the top of said disk for guiding the the nut blanks from the supply means to the delivery means.

32. The combination of a pair of guide channels, a movable sorting member interposed between the ends of said channels, means for operating said member to sort out certain of the blanks from one channel and deliver the remaining blanks only to the other channel.

33. In a metal working machine, the combination of blank sorting means comprising a rotary disk having a series of circularly arranged spaced pins having free non-connected ends, each pair thereof adapted to support therebetween a blank positioned in one direction and to immediately drop a blank positioned in the opposite direction, a blank holding hopper located at one side of the circumference of said sorter, a feed chute extending from said hopper to said sorter, means located in the hopper for forcing a column of blanks through the feed chute to the sorter, a magazine located at the opposite side of said sorter for conveying a column of properly positioned blanks downwardly from the sorter, means located at the lower end of the magazine for moving a blank transversely to the plane of movement of the blanks in the magazine, a blank carrier for receiving said transversely movable blank, and means for operating on the blank carried by the carrier.

34. In a metal working machine, the combination of blank sorting means comprising a rotary disk having a series of circularly arranged spaced pins having free non-connected ends, each pair thereof adapted to support therebetween a blank positioned in one direction and to immediately drop a blank positioned in the opposite direction, a blank holding hopper located at one side of the circumference of said sorter, a feed chute extending from said hopper to said sorter, means located in the hopper for forcing a column of blanks through the feed chute to the sorter, a magazine located at the opposite side of said sorter for conveying a column of properly positioned blanks downwardly from the sorter, means located at the lower end of the magazine for moving a blank transversely to the plane of movement of the blanks in the magazine, a blank carrier for receiving said transversely movable blank, means for operating on the blank carried by the carrier, and means for again shifting the blank transversely of the plane