No. 765,327. PATENTED JULY 19, 1904.

A. M. STILLMAN.

SCREW MAKING MACHINE.

APPLICATION FILED APR. 10, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1

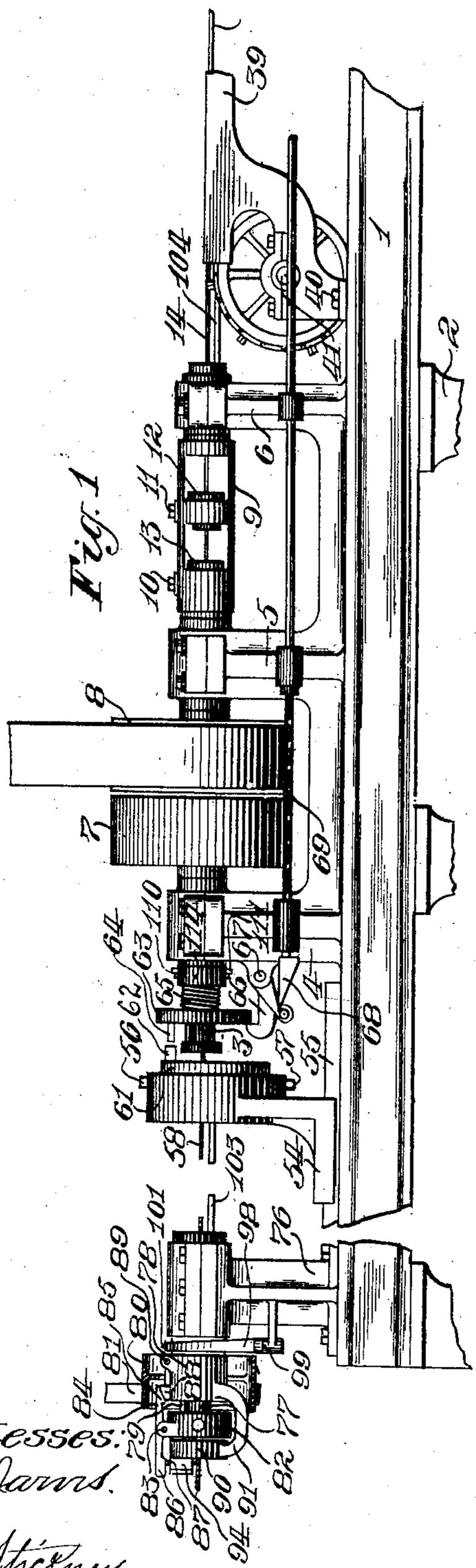
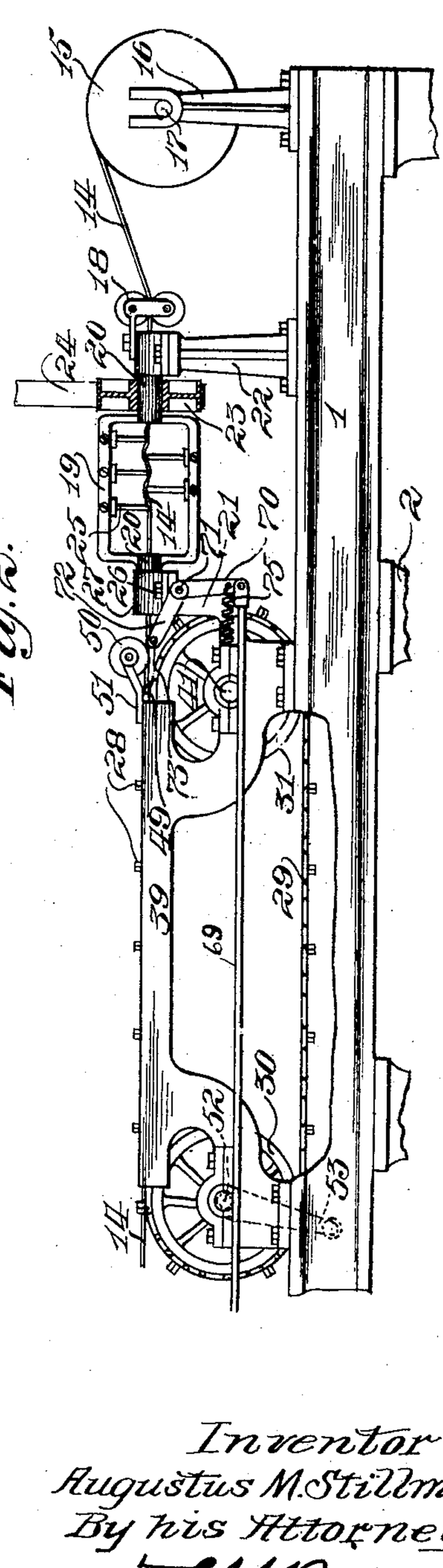


Fig. 2.



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P. C. Stickney.

Inventor:
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F. A. Richards

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NO MODEL. 5 SHEETS—SHEET 2.

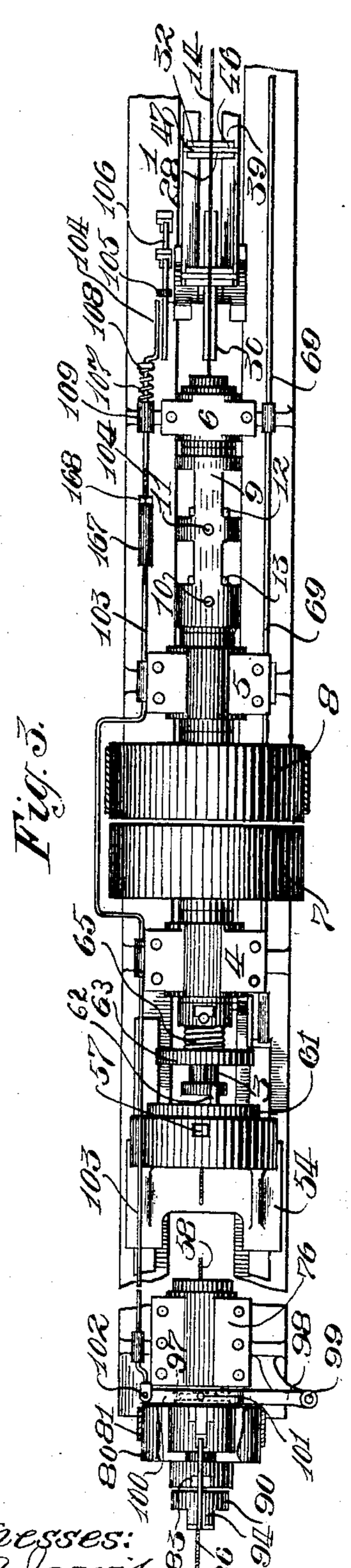

Fig. 3.

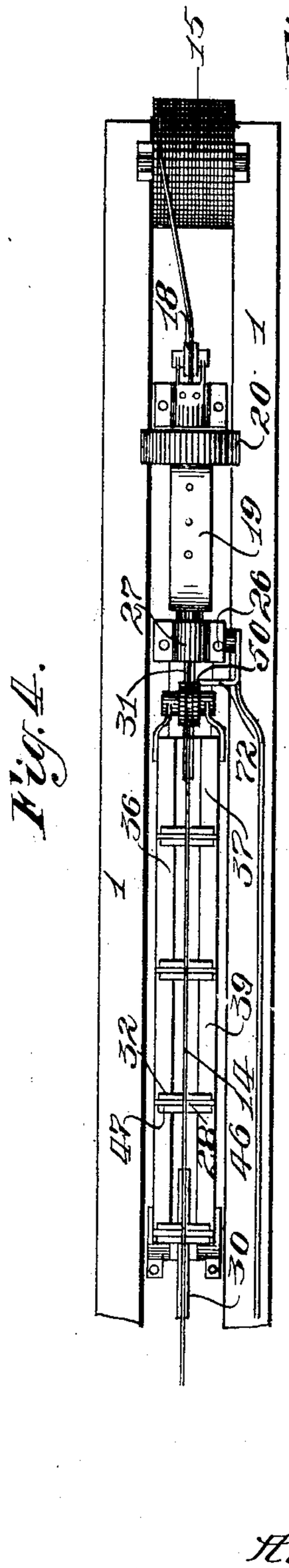

Fig. 4.

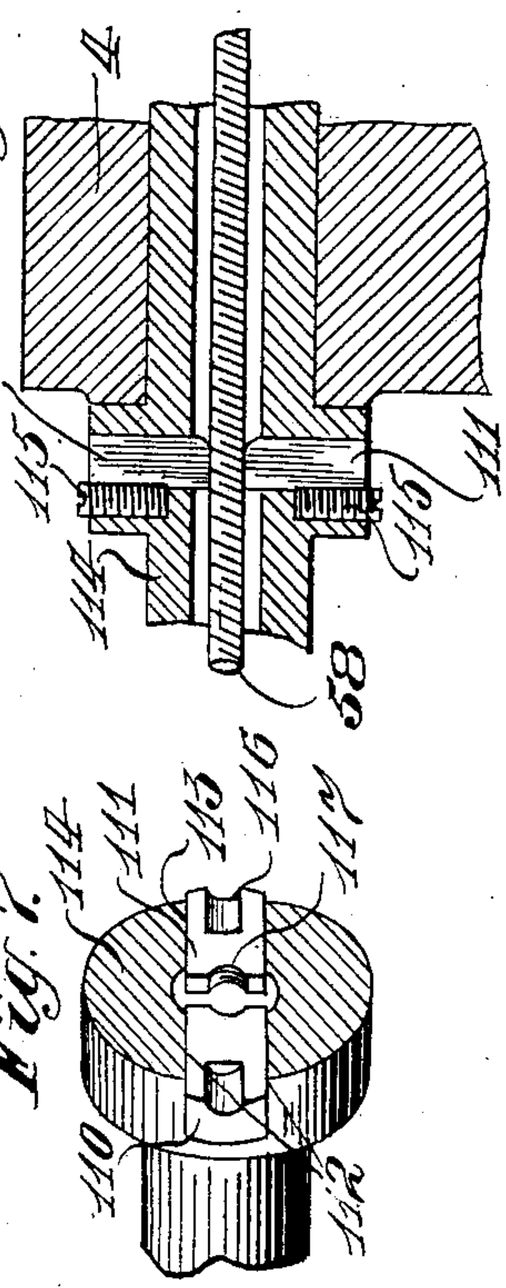

Fig. 5.

Fig. 7.

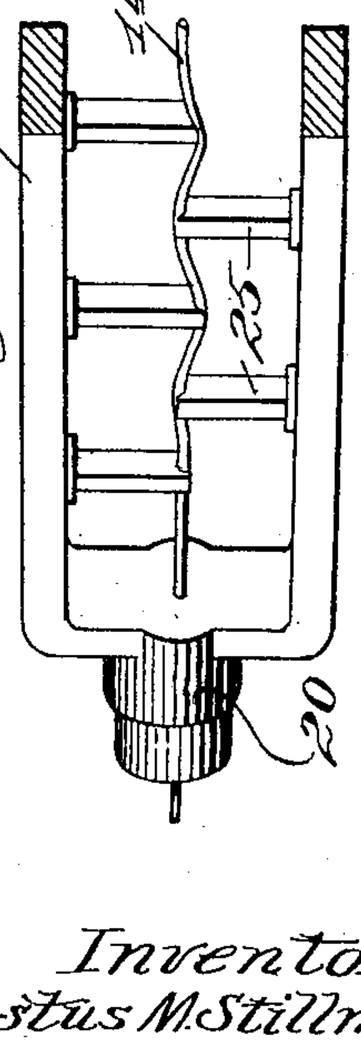

Fig. 6

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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 17

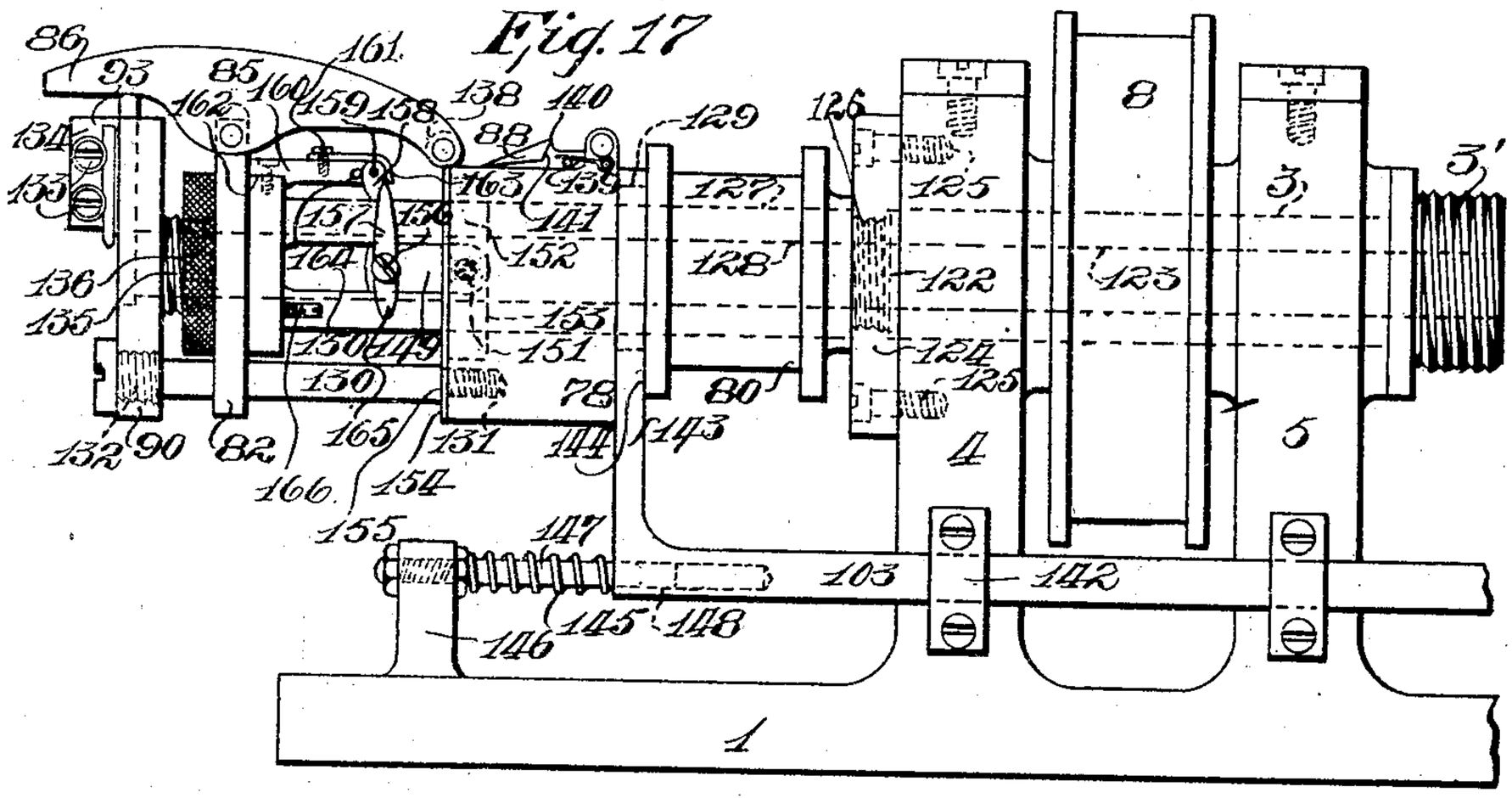


Fig. 18

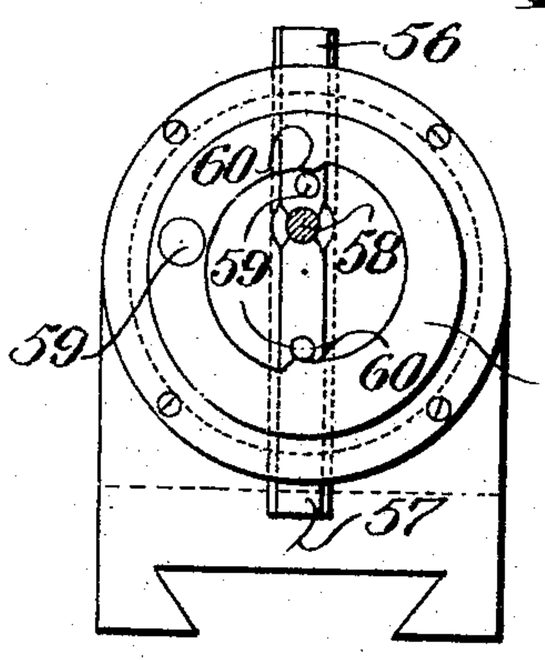


Fig. 19

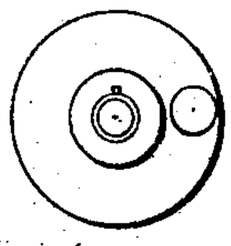


Fig. 20

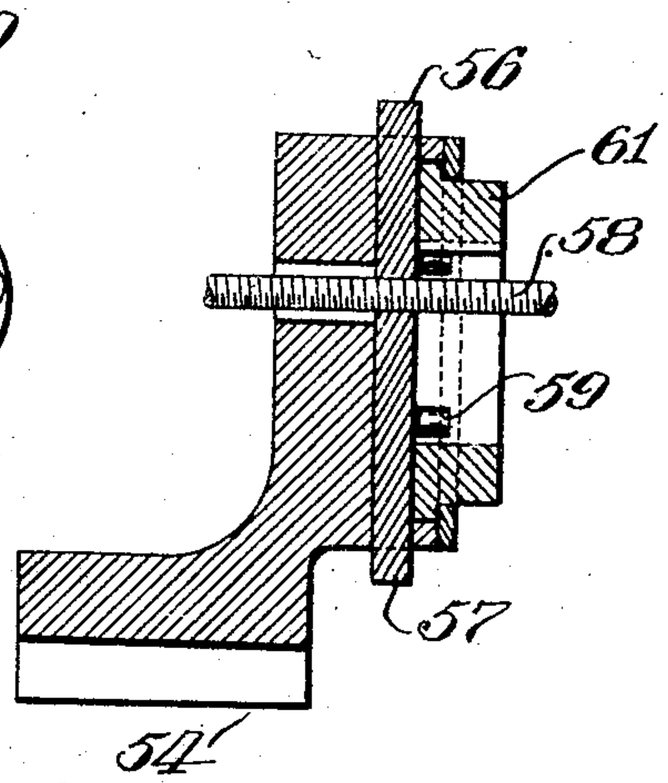
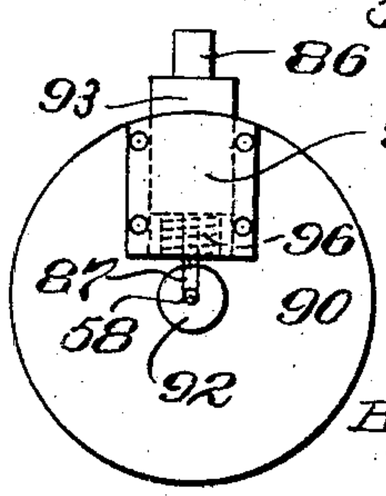


Fig. 5



Witnesses:
Calderon C. Fuss,
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NO MODEL. 5 SHEETS—SHEET 4.

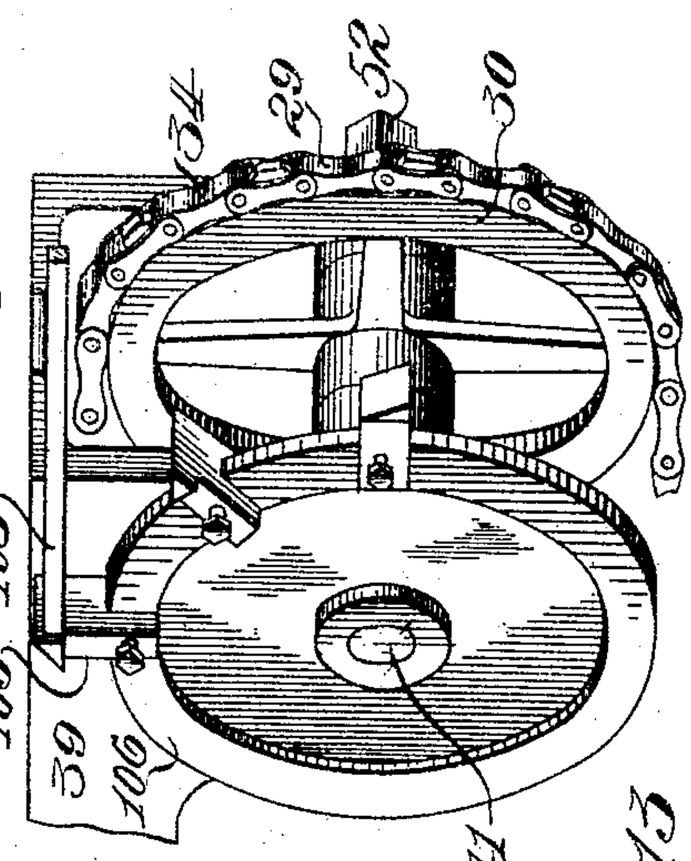

Fig. 14.

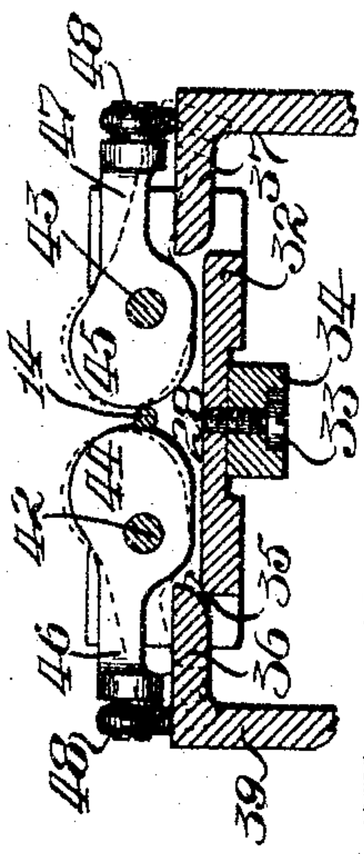

Fig. 10.

Fig. 16.

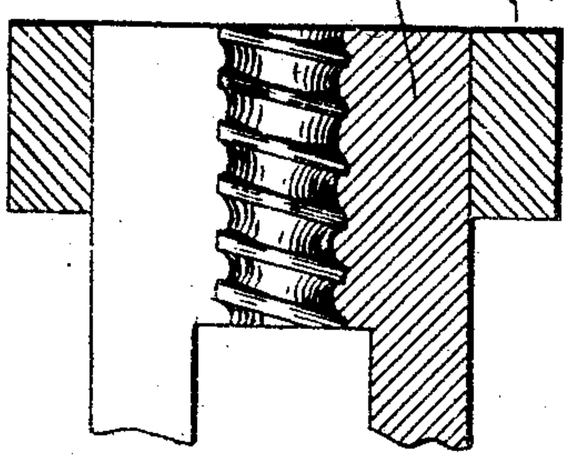

Fig. 13.

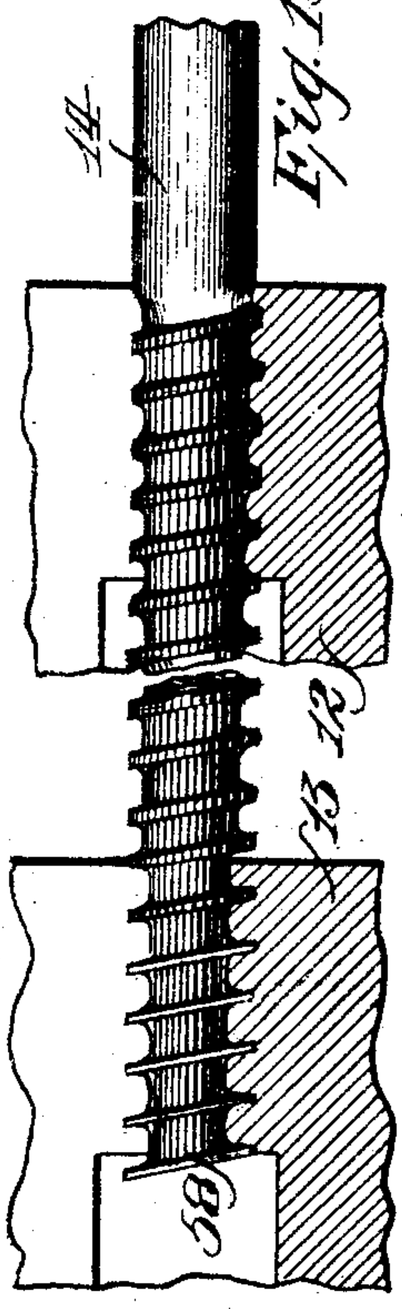

Fig. 15.

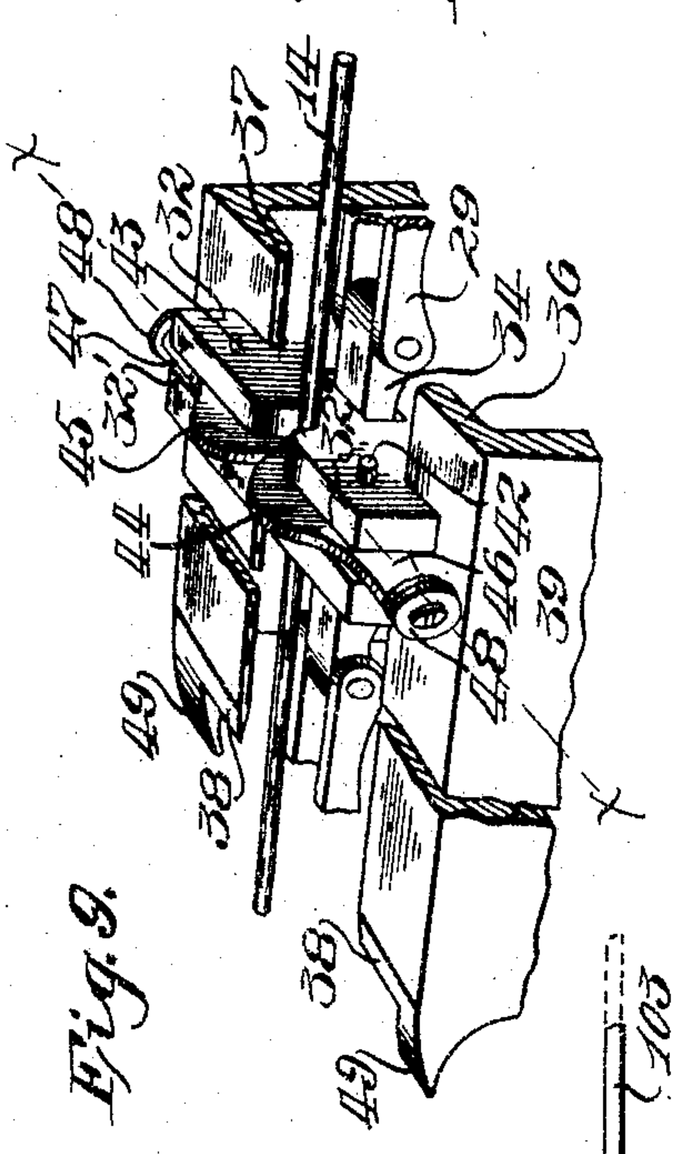

Fig. 9.

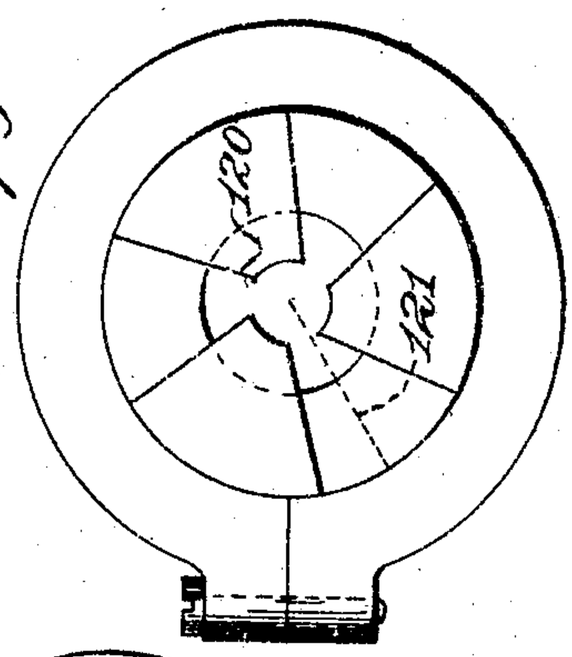

Fig. 12.

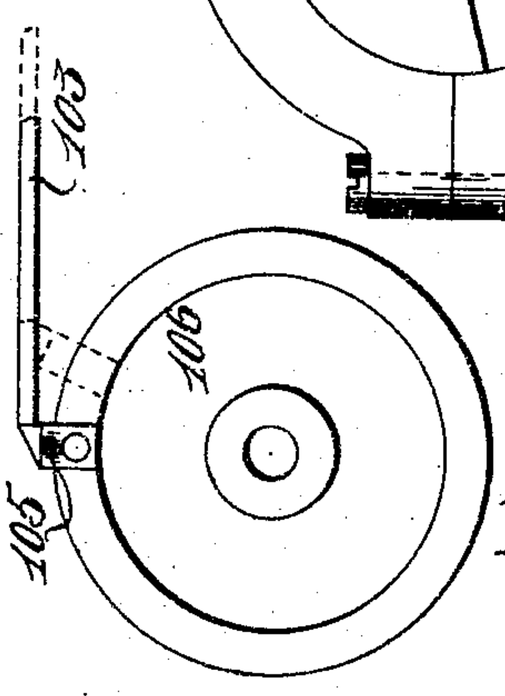

Fig. 11.

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SCREW MAKING MACHINE.

APPLICATION FILED APR. 10, 1903.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 21.

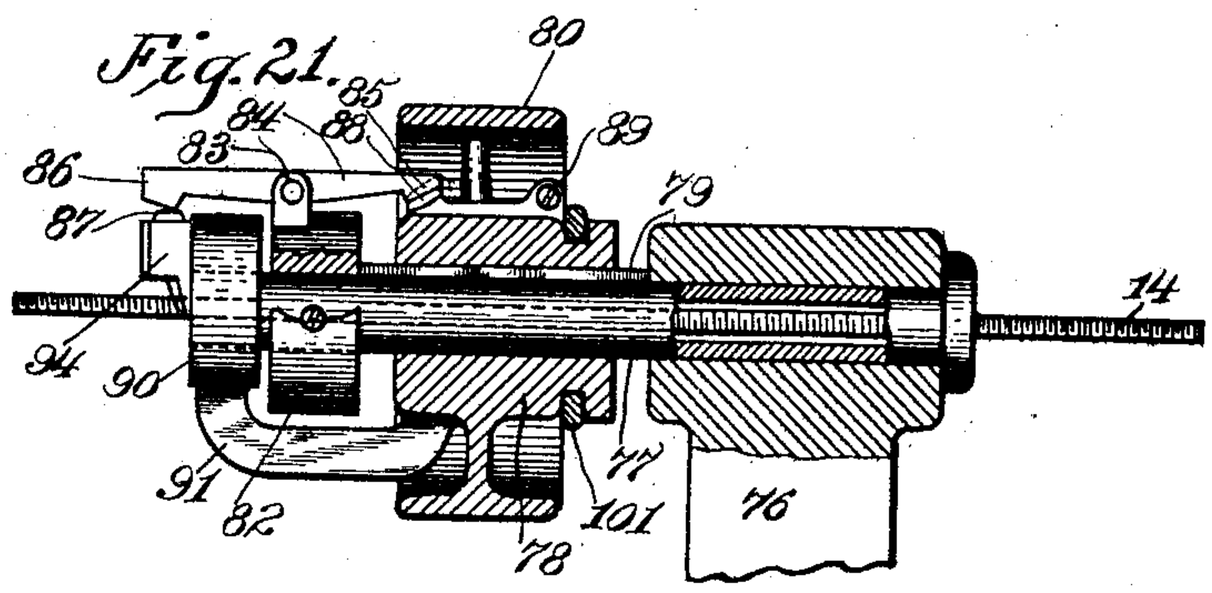


Fig. 22.

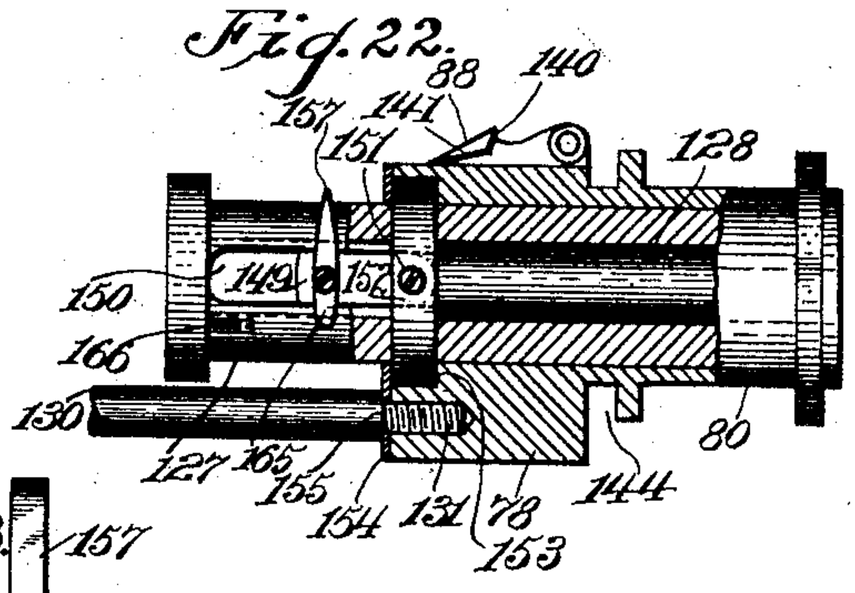


Fig. 23.

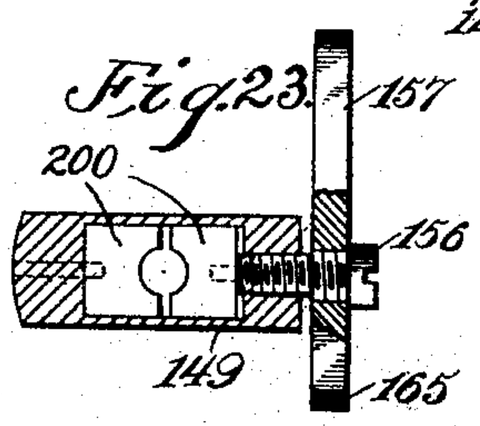
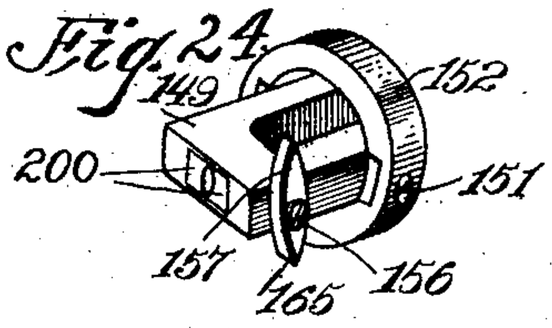


Fig. 24.



Witnesses:
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F. E. Maynard.

Inventor:
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By his Attorney,
F. A. Richards.

No. 765,327. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

AUGUSTUS M. STILLMAN, OF BRIDGEPORT, CONNECTICUT.

SCREW-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 765,327, dated July 19, 1904.

Application filed April 10, 1903. Serial No. 151,955. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS M. STILLMAN, a citizen of the United States, residing in Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Screw-Making Machines, of which the following is a specification.

This invention relates generally to wire or rod threading machines, and particularly to screw-making machines; and one of its principal objects is to enable headless screws of any desired length to be made directly from a reel of wire.

Another object is to provide efficacious threading means, which object I gain by providing a plurality of threading-dies, one to take a roughing cut and the other to take a finishing cut, and I also form the dies with more effective cutting edges than usual.

Another object is to adapt the machine for threading single rods when desired, as well as for cutting the threaded rods into lengths.

Other objects will hereinafter appear.

In the drawings forming part of this specification, Figure 1 is an elevation of the left-hand portion, and Fig. 2 an elevation of the right-hand portion, of a machine made in accordance with my improvements. Fig. 3 is a plan of the portion seen at Fig. 1. Fig. 4 is a plan of the portion seen at Fig. 2. Fig. 5 is an enlarged end elevation of a cutting-off tool and a rotary holder whereon it is mounted. Fig. 6 is a sectional perspective of a wire-straightener. Fig. 7 is a sectional perspective view illustrating a detachable auxiliary feeding-nut mounted upon the main spindle of the machine. Fig. 8 is a longitudinal section illustrating a method of mounting said auxiliary feeding-nut. Fig. 9 is a perspective view of a portion of a stock-gripping mechanism which prevents the stock from turning while being threaded by the rotating dies. Fig. 10 is a cross-section taken at about the line $x\ x$ of Fig. 9. Fig. 11 is a diagram illustrating the manner in which an adjustable tappet connected to the stock-gripping mechanism is enabled to operate and release a rod which controls the cutting-off tool seen at Fig. 5. Fig. 12 is an enlarged end view of a roughing-die. Fig. 13 is a longitudinal section thereof. Fig. 14 is a perspective illustrating the method of mounting and operating the adjustable tappets which control the cutting-off tool. Fig. 15 illustrates the manner in which the tandem dies shown at Fig. 1 coöperate, and Fig. 16 is a diagram showing the successive cuts made by the two dies. Fig. 17 shows a modification. Fig. 18 is a front view of the clutching mechanism at the rear end of the machine. Fig. 19 is a face view of the plate to actuate the same. Fig. 20 is a central section of the rear clutching mechanism. Fig. 21 is a central longitudinal section of a cutting-off mechanism of the form of machine shown in Fig. 1. Fig. 22 is a side view, partly in longitudinal section, Fig. 23 a cross-section, and Fig. 24 a perspective view, of a detail of the cutting-off device of the form of machine shown in Fig. 17.

In the several views like signs denote like parts.

The main framing of the machine comprises a bed 1 and legs 2. A spindle 3 is mounted upon standards 4, 5, and 6 and carries between the standards 4 and 5 fast and loose pulleys 7 and 8. The portion of the spindle between the standards 5 and 6 consists of a die-holder 9, in which are secured by fasteners 10 and 11 a roughing-die 12 and a finishing-die 13, whereby is threaded the wire or stock 14, the latter passing entirely through the spindle, which is hollow.

The wire 14 may be drawn from a reel 15, which is supported upon a reel 16 by gudgeons 17, the reel-holder being secured upon the right-hand end of the bed 1 of the machine. From said reel the wire is led through guide-rollers 18 to a wire-straightener 19, which is mounted, by means of hollow gudgeons 20, through which the wire passes, upon arms or standards 21 and 22. The straightener is operated by a pulley 23 and a belt 24 independently of the spindle 3 and preferably comprises a series of inwardly-projecting hickory spurs 25, secured at their outer ends to the framing of the wire-straightener and engaging the wire at their inner ends.

When it is desired to thread short wires or rods, the bolt 26 may be unscrewed, the caps

27, which confine the straightener-gudgeons 20, may be removed, and the wire-straightener taken off.

Between the wire-straightener and the dies the wire is held against rotation by means of a circulating series of grippers 28, mounted upon a chain 29, which runs over guide-wheels 30 and 31. The grippers upon the upper reach of the chain grip the wire when they rise upon the wheel 31 and release the same just before they begin to run down over the wheel 30.

Each of the series of gripping devices preferably comprises a cross-block 32, secured by a screw 33, Fig. 10, to one of the solid links 34 of the chain. Said cross-block is recessed at 35 to fit upon horizontal guiding-rails 36 and 37, which extend between the guide-wheels 30 and 31 and parallel with the run of the wire 14, whereby said block is guided during the wire-gripping portion of its travel. Preferably the ends of the rails are beveled, as at 38, Fig. 9, to facilitate receiving the guide-blocks. Said rails may be supported by integral brackets 39, secured by bolts 40 upon the bed 1 of the machine, and are also provided with bearings for the axles 41 of the chain-guiding wheels 30 and 31. Upon each guide-block is pivoted at 42 and 43 a pair of wire-grippers, which are designated, respectively, as 44 and 45, and upon these grippers are formed operating-arms 46 and 47, respectively, which are preferably provided with rolls 48, adapted to run upon the rails 36 and 37, and thereby clamp the grippers upon the wire. As the grippers run up over the forward guiding-wheel 31 the rolls 48 rise up over inclines 49, provided upon the front ends of the rails 36 and 37, thereby lifting the arms to the full-line position, Fig. 10, and causing the grippers to bite the wire. When the rolls run off the rear ends of the rails, the bite of the grippers upon the wire is relieved and the arms may fall by gravity to the dotted-line positions. Thus as the grippers are pulled along by the wire they are automatically released from and reëngaged therewith, there being always a sufficient number of grippers biting the wire to enable the latter to drive the chain positively and forcibly effect the biting operation of each successive pair of grippers as it rides to reëngage the wire. The blocks 32 may be vertically slotted at 32′ to receive the gripping-jaws and their operating-arms. By having the wire 14 run nearly upon a level with the tops of the rails 36 and 37, as illustrated, a true movement of the gripping mechanism is insured and a liability of binding the guide-blocks 32 upon the rails is avoided.

A grooved wheel 50 is mounted upon a bracket 51, secured upon the front ends of rails 36 and 37, for guiding the wire between the wire-straightener and the gripping mechanism and serving to prevent the wire from jumping as it is engaged by one after another of the grippers.

The end of the axle 41 of the rear chain-guiding wheel 30 may be squared, as at 52, to receive a key 53, whereby the wheel may be rotated by hand to facilitate leading the end of the wire through the gripping mechanism before it is introduced into the threading and feeding dies 12 and 13.

A wire-gripping mechanism is also provided in rear of the dies and comprises a slide 54, mounted upon a guide 55, provided upon the bed 1 and having opposing clamping-jaws 56 and 57 (see Figs. 18 to 20) movable radially in said slide for clamping the threaded wire (designated as 58) to prevent rotation thereof, this clamping means being intended for use as the final portion of the wire is passing through the dies. The slide is provided with a central perforation to receive and guide said wire 58. Each clamping-jaw is provided with suitable means for causing it to be closed and opened, said means comprising a pin 59 on each jaw, which is located in position to be acted upon by cam-surfaces 60, provided upon an actuator 61. This actuator is mounted for rotation upon the slide 54, and the cam-surfaces 60 are so formed that such rotation causes the clamp-jaws 56 to close upon the threaded wire or stock 58. An operating-pin 62 is secured to the face of the actuator 61. A locking-disk 63 is secured upon the end of the spindle 3 and carries a pin 64, adapted to engage the pin 62 to rotate the actuator 61. The pins 62 and 64 are eccentrically movable with respect one to the other, the actuator 61 being preferably eccentric to the spindle 3. When the pin 64 is in the uppermost position, as at Fig. 1, it engages the pin 62; but before the parts complete a single rotation the pin 62 escapes from the pin 64. At this time the clamp-jaws 56 and 57 are driven in sufficiently to bite the threaded stock 58 and hold the same against rotation. The locking-disk 63 is splined to the spindle 3, and a compression-spring 65 tends to force the disk to the outer limit of its play. A latch 66, pivoted at 67 to the standard 4, engages the disk 63 to hold it in its innermost or dormant position. For operating the latch to release said disk a cam 68 is mounted upon an endwise-movable rod 69, so that when the rod is moved rearwardly, or to the left in Fig. 1, said latch is forced to turn down about the pivot 67 and releases the disk 63, so that the spring 65 may force it back and enable the pin 64 to operate the pin 62. The rod 69 is connected at its right-hand end, Fig. 2, with the depending arm 70 of a lever which is pivoted at 71 upon the framework and has a rearwardly-extending arm 72, carrying an inwardly-projecting finger 73. The latter is pressed against the unthreaded wire or stock 14 at a point close to the bearing-wheel 50, the pressure being effected by means of a draw-

spring 75, caught in the lever-arm 70. It will be seen that until the stock 14 is exhausted the lever and hence the releasing-rod 69, are prevented from moving to release the latch 66; but when the end of the stock feeds past and releases said lever or the finger 73 thereon the spring 75 is enabled to vibrate the lever, and thereby thrust the rod 69 to the left. The cam 68 on the rod operates the latch 66, and through the described mechanism the devices 56 and 57 are caused to bite the stock before the latter is released from the advance gripping devices 28, and as the stock feeds along it drives the slide 54 along the way 55, the latter having sufficient length to permit the remainder of the stock to feed entirely through the dies.

The mechanism so far described is adapted for straightening and threading a reel of wire or for simply threading rods without performing any operation upon the threaded stock. In order, however, to enable screws of predetermined lengths to be made directly from the stock when desired, I mount upon a bracket 76 (which is preferably secured detachably upon the bed 1 at its left-hand end) a spindle 77, carrying a sleeve 78, which is splined thereto at 79, and also has a pulley 80, which may be driven by a belt 81 independently of the means for operating the die-spindle 3. Fixed upon the spindle 77 is a collar 82, upon which is pivoted at 83 a lever of the first order, consisting of a forwardly-projecting arm 84, having at its front end an operating-cam 85, overhanging the rearwardly-projecting arm 86, (see Fig. 21,) which is adapted to operate a cutting-off tool 87. The cam 85 of the lever is adapted to ride up over a cam 88, pivoted at 89 upon the splined sleeve 78. It will be seen that when the sleeve 78 is moved to the left at Fig. 1 the cam 88 lifts the forward end 84 of the lever and depresses the rear end 86 thereof, thereby driving in the cutting-off tool 87. The latter is mounted upon a collar 90, which is formed upon the end of an arm 91, projecting from the sleeve 78 and rigid therewith. The collar 90 is provided with a central guiding-bushing 92 for the threaded stock 58, and the tool 87 is provided with a radially-sliding shank 93, working in guides 94, Fig. 5, and is also provided with a compression-spring 96 for returning the tool to dormant position after operation. Thus it will be seen that by moving the sleeve 78 to the left the cam-lever 84 86 is operated and the tool 87 is driven in to cut off the wire, said tool of course revolving with the spindle 77. It will be understood that this movement of the sleeve 78 and collar 90 thereon may be timed to correspond substantially with the feeding movement of the stock, so as to enable the tool to operate satisfactorily.

For effecting intermittent operation of the sleeve 78 and its connected parts I groove the sleeve at 97 and mount a lever 98 at 99 upon the framework, Fig. 3, said lever having forks 100, provided with pins 101, engaging said groove, so that by vibrating the lever the desired movement of the sleeve may be produced. To the lever is pivoted at 102 an operating-rod 103, which extends forward and terminates at 104 in position to be engaged by a succession of tappets 105, which are adjustably mounted upon a wheel 106. Said wheel is fixed upon the rear chain-wheel axle 41 at a point outside of the gripper-guiding rail, as seen at Figs. 3 and 14. As the wheel rotates each tappet strikes against the end of the rod and forces the same along until by reason of the sinking movement of the tappet it becomes disengaged from the rod, as seen at Fig. 11. By this time a length of the threaded wire has been cut off by the tool 87, which is controlled by said rod, and the rod, lever, and sleeve are returned to dormant position by a compression-spring 107, which works between a collar 108 of the rod, Fig. 3, and a fixed bearing 109, in which the rod itself works. The tool is returned to dormant position by the spring 96. During the return movement of the parts the cam upon the forward end of the lever-arm 84 slips back under the cam 88 on the sleeve, the pivotal mounting of the latter at 89 permitting the same to rise sufficiently for the purpose.

The tappets may be adjusted at any desired intervals around the rim of the wheel 106, and it will be understood that the speed of movement of the tappet slightly exceeds that of the chain of grippers, whereby the pins 101 on the lever 98 (which is of the second order) are caused to advance the sleeve 78 at a speed about equal to the feeding movement of the stock 58.

I prefer to use in connection with the dies 12 and 13, each of which both threads and feeds the work, an auxiliary feeding means consisting of a divided nut, the portions whereof are marked 110 and 111, said portions being adapted to work in sockets 112 and 113, formed in a boss 114 upon the spindle 3. These nut portions may be set toward each other by means of screws 115, which enter screw-holes partly in the boss 114 and partly in the sides of the nut portions, the portion in the boss being threaded and the portion in the nuts being plain, with shoulders 116 to receive the ends of said screws. The threaded portions 117 of the nut agree with the dies 12 and 13, and it will be understood that nuts of different pitch or diameter may be used in connection with different dies.

For some kinds of work one die alone may be used. When necessary, the auxiliary feeding-nut just described may be used in conjunction therewith, the auxiliary feeding means being important largely because of the drag upon the stock or work as it is fed along by the threading and feeding means, such

drag being caused by the gripping and other devices which are operated by the stock. It will be seen that the wire operates both of the gripping mechanisms and also controls the mechanism that operates the cutting-off tool, besides which it is called upon to pull the wire through the straightener, if the latter is used, and it is to be understood that in order to thread the rod cheaply the work must be done at high speed and that without something more than a single die this result would be impracticable. Both the steady pull and the sudden jerks which come upon the wire or stock tend to cause the die to act erratically thereon. By the provision of the auxiliary feeding-nut one die alone may be successfully used in many instances; but when cutting deep or large threads or when cutting a threaded rod into lengths it is desirable to use both dies, together with the auxiliary feeding-nut, so as to insure an even product.

At Fig. 15 it will be seen that the roughing-die 12 removes more material from the stock 14 than is left to be removed by the finishing-die 13, this difference being indicated diagrammatically at Fig. 16, in which the depth of the roughing cut is indicated at 118 and that of the finishing cut at 119. The roughing-die thus takes off more than half of the material which comes off from the stock at the threading operation. It will be understood that the stock is of full strength as it enters the roughing-die, and hence the latter may take a more substantial cut than the finishing-die without liability of twisting off the stock. The latter enters the finishing-die after it has been more or less weakened by the cut made by the roughing-die, as will be understood. It will also be understood that it would be impracticable for a single die, unassisted, to cut a lag-screw thread—such as that illustrated at 58, Fig. 15—at manufacturing speed, especially when there is considerable work for the stock to do as it is drawn through the die, the resistance offered by the work tending to cause the die to act erratically, not to mention the unavoidable choking of the die by the great amount of material which is separated from the stock.

In Fig. 12 the "cutting" side of the die is indicated by 120, and for some classes of work and material such a general formation of die may be found to produce better results than a die having the usual face, which is represented by the dotted line 121.

Referring now to Fig. 17, in this form of my machine the slide 54 and other portions of the rear gripping mechanism heretofore described are omitted, the spindle 3 being provided at its forward end with a threaded boss 3′ for receiving the die-holder 9 and having a single fast pulley 8 between the standards 4 and 5 and terminating at 122, the hollow thereof being indicated by dotted lines 123. The rotatory portion of the cutting-off mechanism is supported upon a plate 124, secured by screws 125 to the rear vertical face of the standard 4. Into said plate is screwed at 126 the threaded end of a fixed axle or spindle 127, which is hollowed, as at 128, and extends in line with the live-spindle 3. Upon said axle I mount the high-speed driving-pulley 80, which is fast to the sleeve 78 and arranged at the end thereof, the pulley and sleeve being connected by a reduced cylindrical portion 129 and being preferably integral. The tool-carrying collar or ring 90 is secured to the end of the sleeve 78 by two headed screw-studs 130, of which one is seen at Fig. 17, the tips of said studs being threaded at 131 into said sleeve 78 and their heads being threaded at 132 into said collar 90. The shanks of said studs pass loosely through the intermediate collar 82, which carries the lever 85 86. The cutting-off tool 87 is adjustably supported by screws 133 upon an angular piece 134, formed upon the radially-sliding member 93. The fixed axle 127 terminates in a threaded portion 135, upon which is threaded a nut 136, bearing against a shoulder on the end of said axle 127, so as to retain thereon the lever-carrying collar 82.

The lever-arm 85 may in practice be provided with a roller 138 for riding up over the cam 88, and the latter is provided with a returning-spring 139. The effect of moving the sleeve 78 to the left is to drive the cam 88 between the roller 138 and the sleeve, so as to vibrate the lever until said roller drops over the rear edge 140 of the cam. Upon the return movement of the sleeve said roller, working on the rear inclined face 141 of the cam, forces the same up and then runs under the same, the cam upon escaping from said roller being forced down by the spring 139.

The operating-rod 103, which may be suitably supported in guides 142 or otherwise, is in this instance provided with a spur 143, which lies in a groove 144, formed between the pulley 80 and the sleeve 78, so as to reciprocate said pulley and sleeve along the axle 127. Said spur 143 may be forked, so as to have sufficient bearing-surface in engagement with the groove 144. The rod 103 may be returned to normal position by a compression-spring 145, working between the rear end of said rod 103 and a lug 146, formed upon the bed 1, said spring being preferably coiled about a stud 147, which is secured to said lug and enters a perforation 148, formed in the end of the rod 103, whereby it may guide the same.

I prefer also to provide means close to the cutting-off tool for gripping or holding against torsional movement the threaded stock during the cutting-off operation, so as to insure the making of a satisfactory cut, and at said Fig. 17 one form of such gripping means is shown. This consists of a split or otherwise compressible bushing 149, having an un-

threaded bore fitting closely upon the threaded wire, said bushing being rectangular or non-circular in contour and fitting in a longitudinal slot 150, cut in the left-hand portion of the fixed axle 127, said slot guiding said bushing and also preventing rotation thereof. Such bushing may be provided with interchangeable dies 200, if desired, in practice. In order to enable the bushing to travel with the constantly-feeding wire, I connect it by a screw 151 to an annular head 152, which is fitted in an annular recess or cup 153, formed in the left-hand end of the sleeve 78. An annular plate 154, which is secured by means of shoulders 155, formed on the screw-studs 130 against the left-hand face of said sleeve 78, confines said annular head 152, said plate 154 fitting upon the axle 127, so that said head 152 is prevented from moving independently of the sleeve along the arbor 127, but does not interfere with the rotation of said sleeve. By means of said head 152 the gripper 149 is reciprocated along in the slot or slots 150. Said dies 200 are tightened by a screw 156, which for this purpose is provided with a tappet-arm 157, which engages a dog 158, pivoted at 159 upon a bracket 160, secured by a screw 161 to a flange 162, provided upon the front face of the lever-collar 82. Said dog 158 is provided with a returning-spring 163 and a stop 164. As the gripper 149 moves to the left during the operation of the cutting-off mechanism said tappet 157 contacts with the dog 158 and is thereby vibrated to the right, so as to drive the screw 156, and thereby tighten the gripper upon the threaded stock, this operation being substantially completed by the time the tool 87 begins cutting, a dead space being left for this purpose between the roller of lever 138 and the cam 88, as will be observed.

In order to release the gripper 149, so as to avoid cramping the return movement of the cutting-off mechanism, I provide upon said screw a depending tappet 165, which during the leftward movement of the gripper contacts with a fixed stop 166, whereby the tappet-arms are vibrated to an upright or dormant position, thereby releasing the stock from the bite of the gripper 149, and upon the return of the movement of the sleeve to the right the tappet 157 may push the dog 158 to one side, the latter being pivoted for this purpose. The stop 166 is preferably in the form of a screw, whereby it may be adjusted to operate the tappet-arm 165 at different points.

I prefer to connect the forward end 104 to the main portion of the rod 103 by means of a threaded sleeve-coupling 167, provided with one or more locking-nuts 168, so that the tip of said rod may be adjusted to different points in the path of the tappets 105, which all release the rod at the same point, but which need to be in engagement with the rod for a longer or shorter period of travel when cutting off stock of larger or smaller diameter.

Still other variations may be resorted to within the scope of my invention, and parts of my improvements may be used without others.

Having thus described my invention, I claim—

1. In a wire-threading machine, the combination with a die and rotating means; of a series of wire-gripping devices each comprising a pair of opposing jaws, means to carry said series of gripping devices and to place them in sequence at their effective positions, and means to close each gripping device upon its reaching the gripping position and to open the same prior to its leaving the working position.

2. In a wire-threading machine, the combination with a die and rotating means, of an endless chain of grippers for holding the wire, and means for guiding the chain.

3. In a wire-threading machine, the combination with a die and rotating means, of an endless chain of grippers for holding the wire, and means for guiding the chain; each gripper comprising a pair of opposing jaws, and also having means for operating said jaws.

4. In a wire-threading machine, the combination with a die and rotating means, of a series of wire-gripping devices, each having a pair of movable gripping-jaws, means upon said jaws whereby they may be closed, and a stationary member mounted in the path of said closing means, for operating them to close the jaws.

5. In a wire-threading machine, the combination with a die and rotating means, of a series of wire-gripping devices each having a pair of pivoted gripping-jaws, arms, upon said jaws for closing them, means for causing said gripping devices to circulate, and means for vibrating said arms to close the jaws.

6. In a wire-threading machine, the combination with a die and rotating means, of an endless chain, means for guiding said chain, a series of gripping devices upon said chain, and means for causing said gripping devices to grip the wire.

7. In a wire-threading machine, the combination with a die and rotating means, of an endless chain, a track along which said chain may travel, a series of gripping devices carried by said chain, each gripping device having opposing jaws, and jaw-controlling arms mounted in position to engage said track and to be held thereby in jaw-closing position.

8. In a wire-threading machine, the combination with a die and rotating means, and an endless chain, wheels upon which said chain is mounted, a pair of tracks extending between said wheels, jaws pivoted at intervals upon said chain, and arms projecting laterally in opposite directions from said jaws in position to engage said track and to be held in jaw-closing position thereby.

9. In a wire-threading machine, the combination with a die and rotating means, and an

endless chain, wheels upon which said chain is mounted, a pair of tracks extending between said wheels, jaws pivoted at intervals upon said chain, and arms projecting laterally in opposite directions from said jaws in position to engage said track and to be held in jaw-closing position thereby; said tracks being provided at their advance ends with means for operating said arms to close the jaws.

10. In a wire-threading machine, the combination with a die and rotating means, of an endless chain, wheels upon which said chain is mounted, a track between said wheels, members upon said chain formed for engaging said track to be guided thereby, jaws pivoted upon said guide members, and jaw-operating arms provided upon said jaws in position to ride upon said track.

11. In a wire-threading machine, the combination with a die and rotating means, of an endless chain, wheels upon which said chain is mounted, a track between said wheels, members upon said chain formed for engaging said track to be guided thereby, jaws pivoted upon said guide members, jaw-operating arms provided upon said jaws, and rolls upon the ends of said arms for riding upon said track.

12. In a wire-threading machine, the combination of a die and rotating means, of a series of wire-grippers capable of gripping the wire in sequence and traveling therewith, means to connect the gripping means of the series to cause the idle grippers to travel into working position and means to cause the grippers to grip upon reaching a predetermined working position and to open upon passing the same, whereby the wire as it is drawn along through the die will cause the grippers both to circulate and also to close upon the wire and release the same.

13. In a wire-threading machine, the combination with a die and rotating means, of a system of connected self-opening gripping-jaws adapted to grip the wire and to move therewith as it is drawn through the die; and means to close the jaws upon the wire.

14. In a wire-threading machine, the combination with a die and rotating means, of a series of connected jaws adapted to close to grip the wire and to open to release themselves therefrom and to move with the die, and a guide to cause the closing and permit the opening of said jaws.

15. In a machine for threading wire, the combination with a wire-gripper mounted to permit longitudinal movement and to prevent rotation of the wire and when gripping the wire to travel with it in its longitudinal movement, of a die, means to rotate the die, and means controlled by the gripping means in its travel incident to the feed movement of the wire to cut the threaded wire into predetermined lengths.

16. A machine for making screws from a coil of wire, comprising a die, circulating means to grip the wire and adapted to be controlled in its circulation by the movement of the wire, means to effect relative rotation between the die and the wire, and cutting-off mechanism actuated by the gripping means.

17. In a machine for making screws from a reel of wire, the combination of a die, circulating means for gripping the wire, means for effecting relative rotation between the die and the wire, a cutting-off tool, and means for enabling said circulating means to operate said cutting-off tool at predetermined intervals.

18. In a screw-making machine the combination of a die. means to grip the stock end of the wire and capable of traveling with the wire in its feed movement, means to grip the threaded end of the wire, means for relative rotation between the die and the second-named gripping means, and means controlled by the first-named gripping means in its movement incident to the feeding movement of the wire to cut the threaded wire into predetermined lengths.

19. In a screw-making machine, the combination with a die and rotating means, of an endless chain of grippers for holding the wire, a chain-guiding wheel, adjustable tappets revoluble with said wheel, a cutting-off tool, and means for enabling said tappets to control said cutting-off tool.

20. In a screw-making machine, the combination with a die and rotating means, of an endless chain, a wheel for guiding said chain, a series of gripping devices upon said chain, means for causing said gripping devices to grip the wire, a second wheel rigid with said guiding-wheel, tappets adjustable on said second wheel, and a cutting-off tool intermittently operable by said tappets.

21. In a machine for making screws from a reel of wire, the combination with a die and rotating means, of a circulating system of self-opening and self-closing gripping-jaws movable by the wire as it is drawn through the die, a cutting-off tool, and means for enabling said system to operate said tool intermittently.

22. In a screw-making machine, the combination with a die and rotating means, of a system of self-closing and self-opening jaws movable by the wire as it is drawn through the die, and means for cutting the threaded wire into predetermined lengths; said cutting means including a set of adjustable tappets operable by said jaws, a cutting-off tool, and a device intermittently operable by said tappets and controlling said cutting-off tool.

23. A machine for making screws comprising wire-gripping means movable by the wire, a die, means for rotating the die, a rotatable and reciprocatable cutting-off tool, means to rotate the cutting-off tool, means controlled by the movement of the wire-gripping means to reciprocate the cutting-off tool intermit-

tently, and means to adjust the timing of the cutting-off tool.

24. In a screw-making machine, the combination of a circulating wire-gripping means, including a wheel, a die, die-rotating means, a cutting-off tool, a set of adjustable tappets mounted to rotate with said wheel, a tripping-rod operable by said tappets and extending to said cutting-off tool, said cutting-off tool being controllable by said rod, and a spring for returning said rod to normal position.

25. In a screw-making machine, the combination with circulating wire-gripping means, including a wheel; a die; die-rotating means; a cutting-off tool; a tappet mounted to rotate with said wheel; and a rod operable by said tappet and extending to said cutting-off tool, the latter being controllable by said rod.

26. A screw-making machine comprising means to grip the wire and travel therewith in its feed movement, a die, means to rotate the die, a cutting-off tool, means to rotate the cutting-off tool, means actuated by the movement of the gripping means to move the cutting-off tool longitudinally with the wire during the cutting-off operation and to effect such operation, and means to return the cutting-off tool to normal position.

27. A screw-making machine comprising means for threading and thereby feeding the wire, a rotatable cutting-off tool adapted to be effective upon reciprocation transversely to its axis of rotation and means constructed to be operated by the feed movement of the wire to cause the cutting-off tool to reciprocate to cut off and to advance with the wire during the cutting-off operation.

28. A screw-making machine comprising wire-gripping means, a die, means to rotate the die, a cutting-off tool, means to rotate the cutting-off tool and means controlled by the gripping means to intermittently actuate the cutting-off tool, and to advance said cutting-off tool with the wire during the cutting-off operation.

29. A screw-making machine comprising means for gripping, threading, and feeding the wire, a series of adjustable tappets connected to said gripping means, a cutting-off tool, means for rotating said cutting-off tool, and means operable by said tappets for controlling the operation of said cutting-off tool.

30. A screw-making machine comprising means for gripping, threading, and feeding the wire, a series of adjustable tappets connected to said gripping means, a cutting-off tool, means for rotating said cutting-off tool, and means operable by said tappets for both controlling the operation of said cutting-off tool and causing the same to advance with the wire during the cutting-off operation.

31. The combination of a spindle, a lever pivoted upon said spindle, a cam splined upon said spindle, a cutting-off tool also splined upon said spindle, and means for moving said cam and cutting-off tool along said spindle; said cam being mounted for engagement with said lever, and the latter being mounted to operate said cutting-off tool.

32. The combination of a spindle, a cam splined upon said spindle, a cutting-off tool also splined upon said spindle, a lever to actuate the cutting-off tool and pivoted upon said spindle, and means for moving said cam and cutting-off tool along said spindle; said cam being mounted to engage said lever, and the latter being mounted to operate said cutting-off tool; and a spring for returning said cutting-off tool to dormant position.

33. In a screw-making machine the combination of wire threading and feeding mechanism, a cutting-off tool, a holder for said tool, a lever to actuate said tool, means controlled by the feed movement of the wire to move said holder longitudinally of the wire and during such movement to actuate said lever.

34. In a screw-making machine, the combination of wire-threading mechanism capable of feeding the wire, a cutting-off tool for the product, a holder for said tool, means controlled by the wire as it is fed to move said holder longitudinally with the wire, a lever operable by said holder during such movement thereof to operate said tool, and a spring to return said tool to normal position.

35. In a screw-making machine, the combination of a wire gripping, threading, and feeding mechanism, a series of tappets operable by said mechanism, a cutting-off tool, a holder for said tool, means for rotating said holder, means operable by said tappets for moving said holder longitudinally with the wire, and means operable by said holder during such movement thereof for operating said tool.

36. In a screw-making machine, a cutting-off tool, a holder for said tool, means for rotating such holder, a set of tappets controlled by the feed, means operable by said tappets to move said holder longitudinally with the wire, means operable by said holder during such movement thereof to actuate said tool, a spring to return such holder-moving means to dormant position, and a spring to return said tool to dormant position.

37. In a wire-threading machine, the combination of a die, means to operate the die, wire-gripping means at the side of the die from which the wire is fed, a wire-gripper at the side of the die at which the threaded wire is delivered, and an operating-lever to control the latter wire-gripper, said lever having an arm to rest upon the wire and to sustain said gripper against gripper-operating movement while the wire is taut.

38. In a wire-threading machine the combination of a threading-die, wire-gripping means in advance of the die, wire-gripping means in the rear of the die and means to actuate such rear gripper, such actuating means

including a member adapted to engage the wire in advance of the former wire-gripping means and to be held by such wire in a position to hold the rear gripper inactive and upon the end of the wire approaching the former wire-gripping means to become active and permit the gripping action of the rear gripper.

39. In a screw-making machine, the combination of a die; rotating means; wire-gripping means in advance of the die; a wire-gripper in rear of the die; and means for operating said rear gripper; said operating means including a member mounted to ride upon the wire and control said gripping means whereby it will be sustained against gripper-operating movement, and upon the wire becoming slack to permit said gripping means to become active.

40. In a screw-making machine, the combination of a threading-die, wire-gripping means, and means controlled by said gripping means for cutting the threaded wire into predetermined lengths, and embodying a cut-off, a lever to actuate the same, a tappet controlled by the wire-gripping means, and a connection therebetween.

41. In a threading-machine, the combination with a die to cut out a thread and feed the stock, of means to rotate the die, and a detachable divided feeding-nut mounted to rotate with said die to engage the wire and cooperate therewith and feed the stock.

42. In a threading-machine the combination with a die to cut a thread and feed the stock, of a rotary spindle whereon the die is mounted, a holder, means to rotate the same from said spindle, a feeding-nut consisting of detachable sections mounted in said holder to engage the stock and adapted to coöperate with the die in its feed, and means to adjust said sections.

43. In a screw-making machine the combination with a die adapted to feed the stock and screw-thread the same, of means to rotate the die; an auxiliary wire-feeding means; wire-gripping means in advance of the die and controlled by the wire as it is fed along by said die and auxiliary feeding means; cutting-off means; means controlled by the wire-gripping means to actuate said cutting-off means, and comprising a lever and a rod to actuate the same, and a tappet controlled by the wire-gripping means.

44. In a screw-making machine in combination with a die and rotating means, the die being organized to cut the wire and feed the stock, of an auxiliary wire-feeding means; wire-gripping means in advance of the die; and wire-gripping means in the rear of the die, said wire-gripping means in advance of the die comprising a series of grippers, means to carry the grippers and permit the same to travel with the wire when gripped upon it, and means to open and close the grippers upon the wire automatically as it is fed along.

45. In a screw-making machine, the combination of threading-dies; means to rotate the dies to render the same operative and to feed the wire, means to grip the wire to hold the same against rotation and to travel with the wire, auxiliary means to feed the wire controlled by the die-rotating means, a cutting-off tool, and means operable by the wire in its feed movement to control said cutting-off tool.

46. In a screw-making machine the combination with a die and rotating means therefor, of main and auxiliary wire-feeding means actuated by said die-rotating means; wire-gripping means controlled by and movable with the wire as it is fed by said dies and said auxiliary feed device; and cut-off means controlled by the wire-gripping means in its movement with the wire.

47. A screw-making machine comprising a threading-die; wire-gripping means to travel with the wire; means to effect a relative rotation between the die and the gripping means; means actuated by the travel of the gripping means to cut the threaded wire into predetermined lengths; means to support said cutting means; and means to rotate the same.

48. In a thread-cutting machine, the combination with a feeding device comprising a holder, of detachable nut-sections mounted in said holder to engage the threaded stock; a shoulder upon each of said sections; and means to adjust said sections comprising set-screws threaded into the holder and engaging the said shoulders.

49. In a cutting-off tool for a wire-threading machine, the combination with a rotatable holder, of a reciprocatable cutting-off tool carried thereby; a lever to reciprocate the same having a cam upon its end; a member reciprocatable adjacent thereto; a cam to engage the cam on said lever and pivoted to the reciprocatable member and adapted to actuate the lever upon one excursion and to form a by-pass therewith upon the return excursion.

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