No. 868,167. PATENTED OCT. 15, 1907.

W. W. DOOLITTLE.

NIPPLE MAKING MACHINE.

APPLICATION FILED AUG. 9, 1906.

8 SHEETS—SHEET 1.

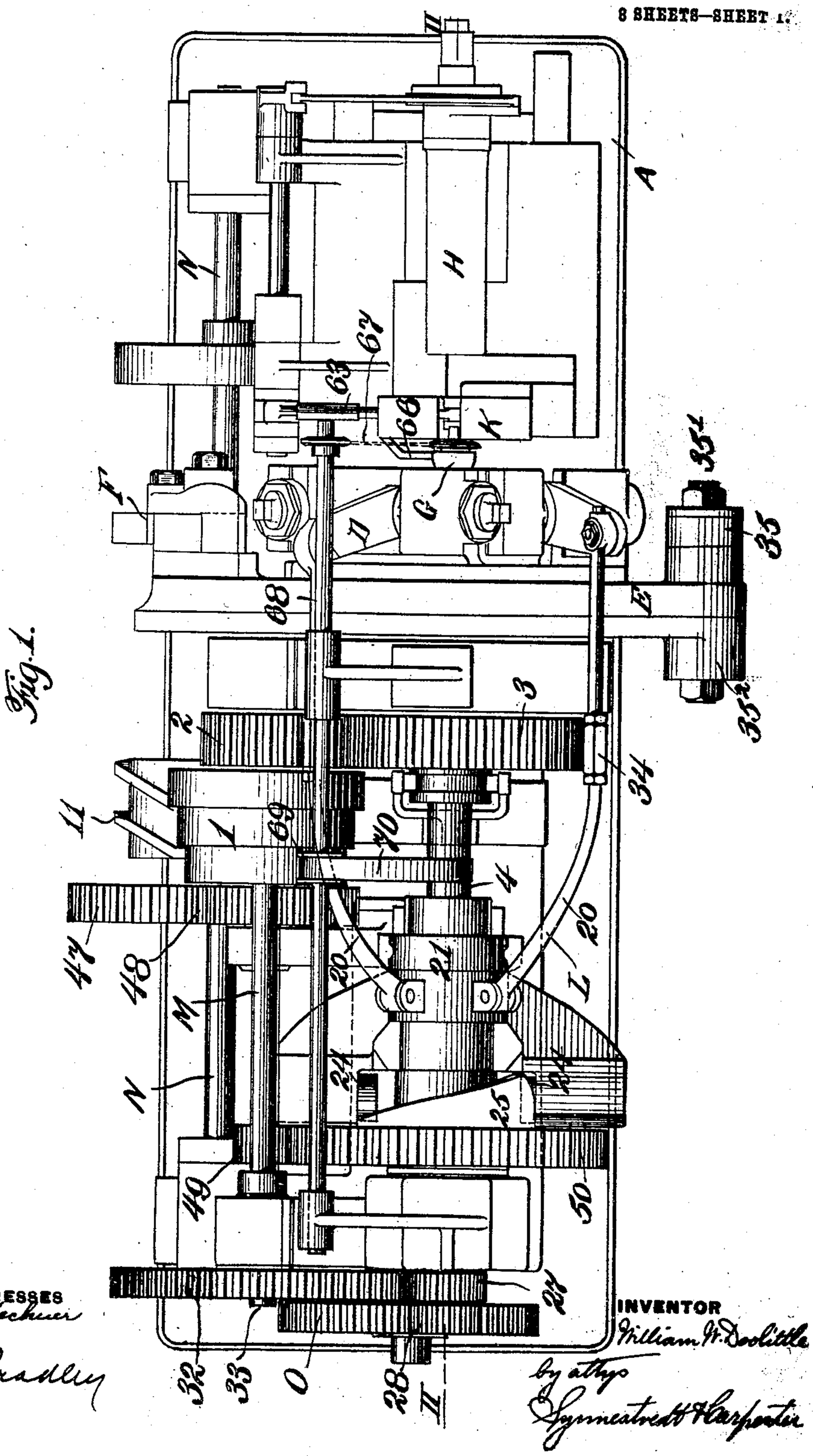

Fig. 1.

WITNESSES

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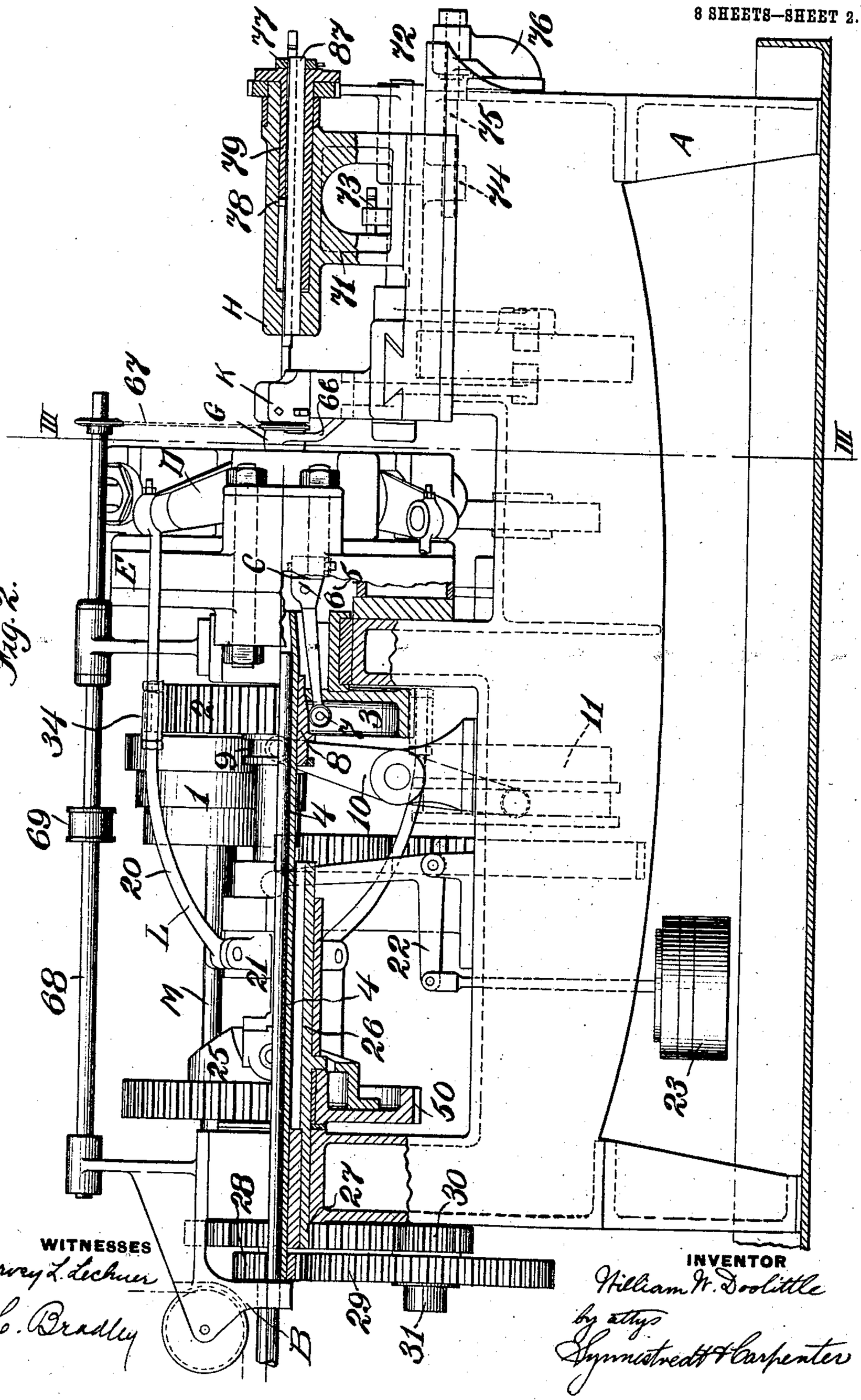

Fig. 2.

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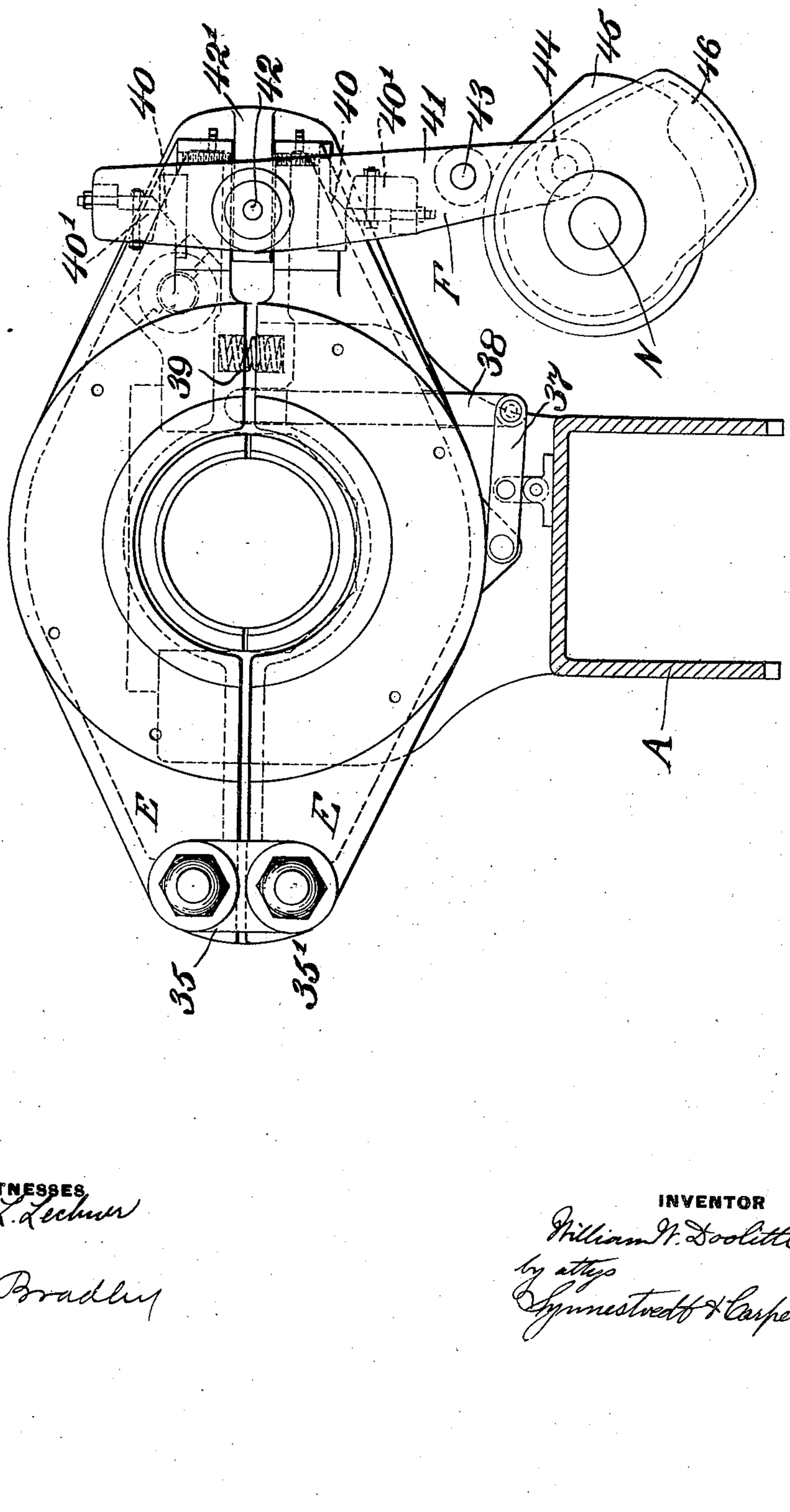

Fig. 3.

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Fig. 4.

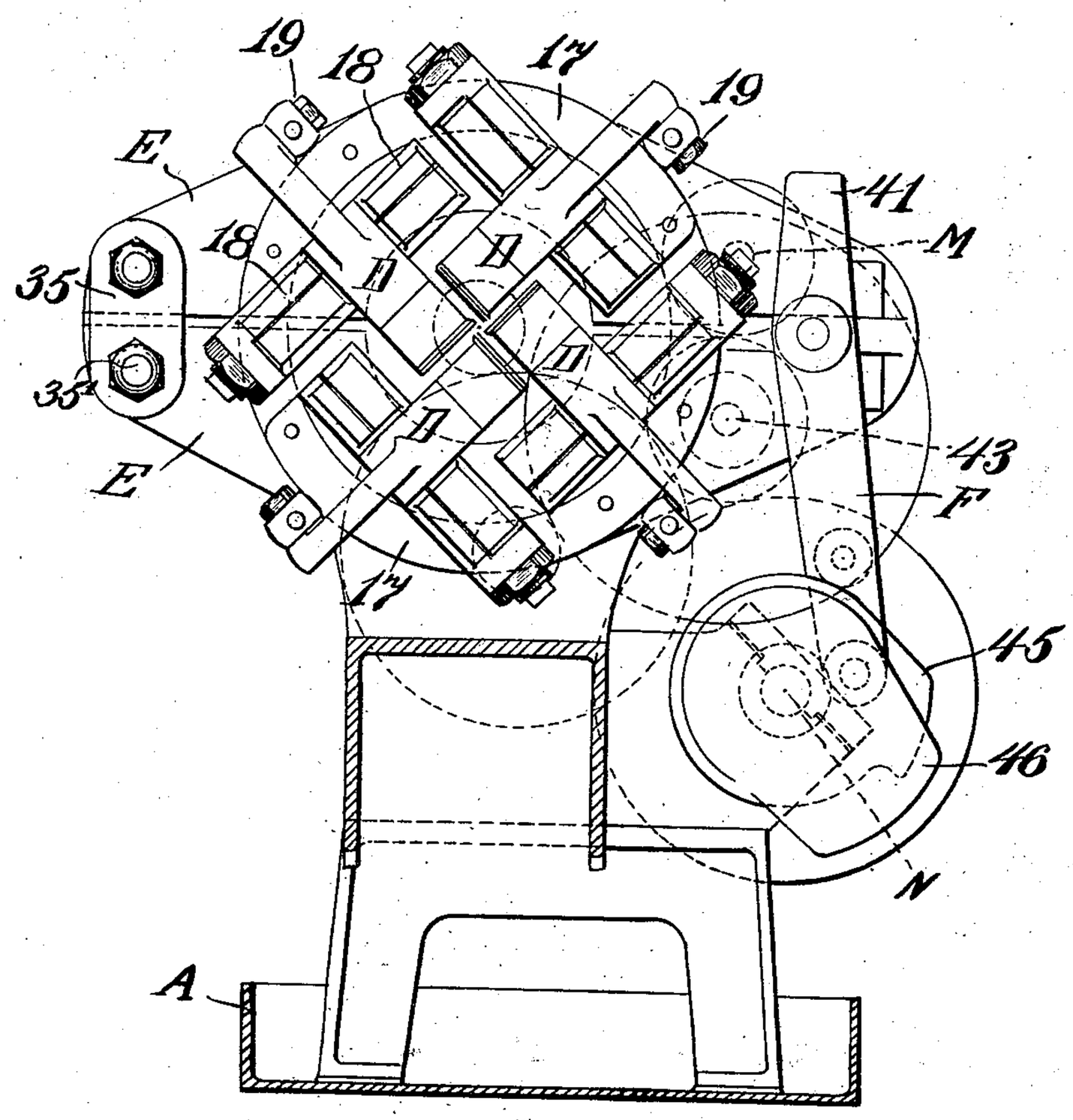

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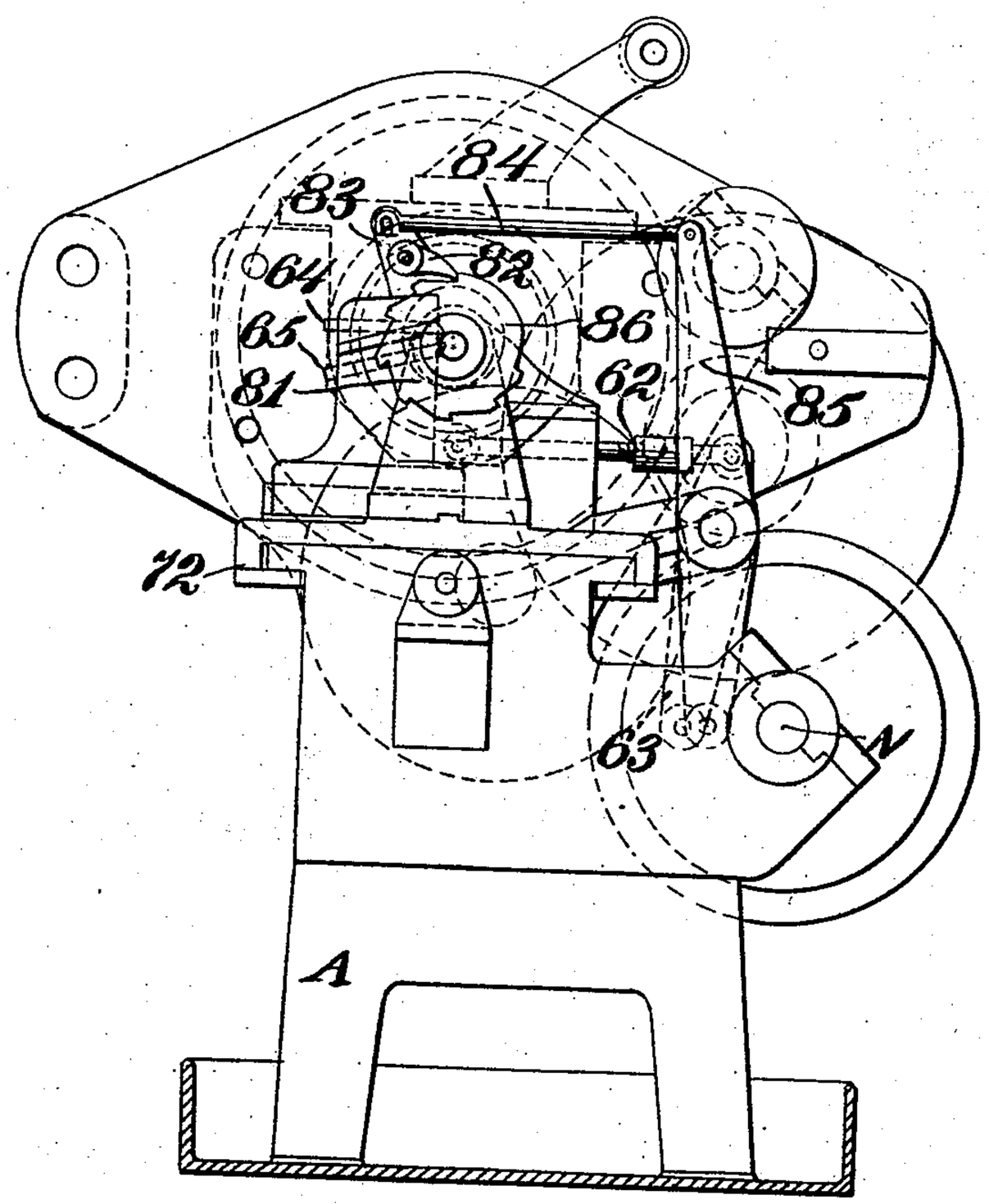
Fig. 5.



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8 SHEETS—SHEET 6.

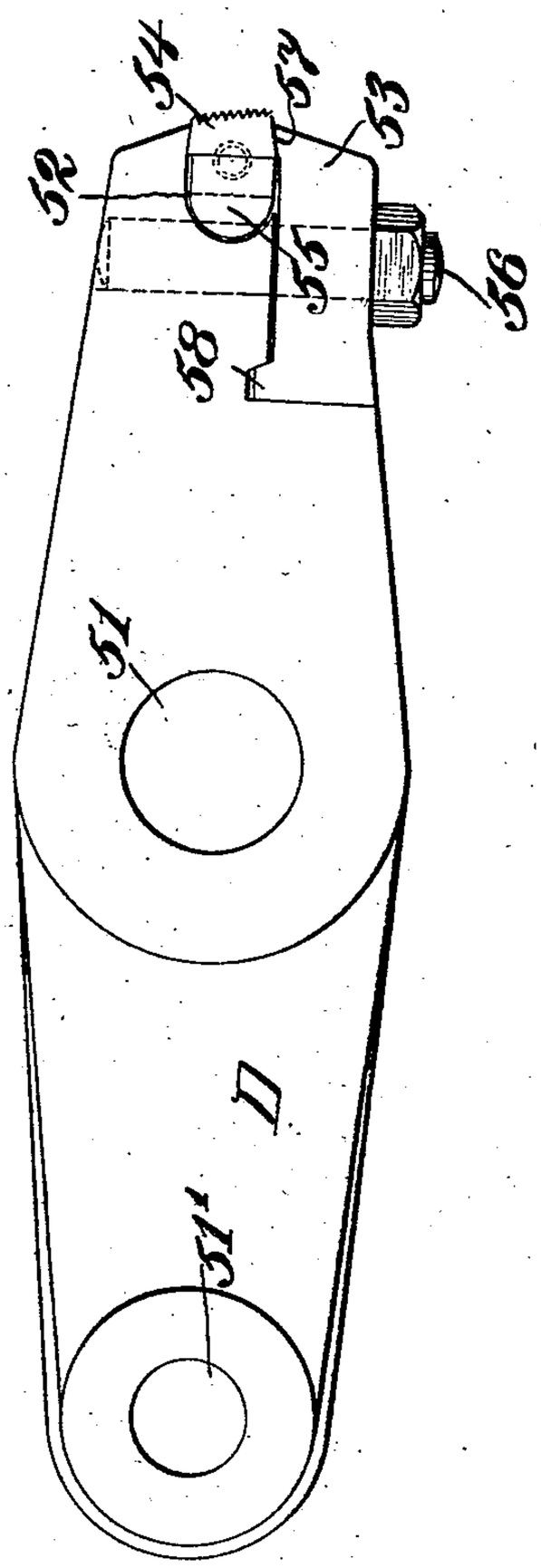

Fig. 6.

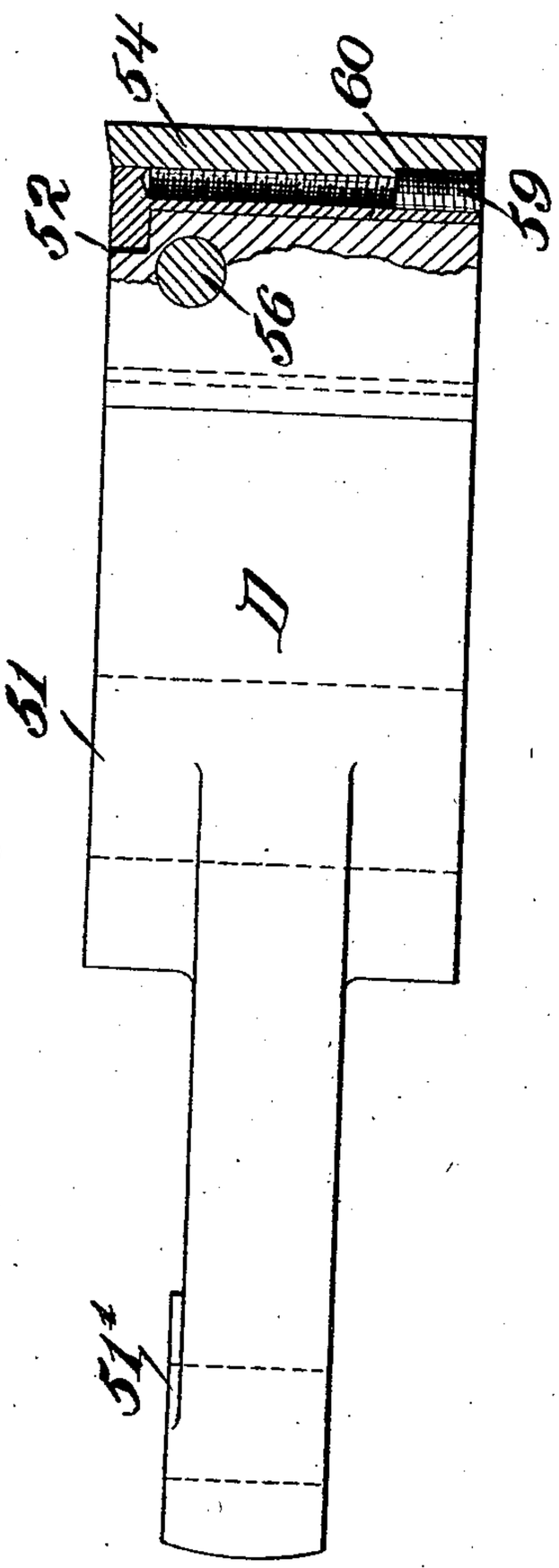

Fig. 7.

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Fig. 8.

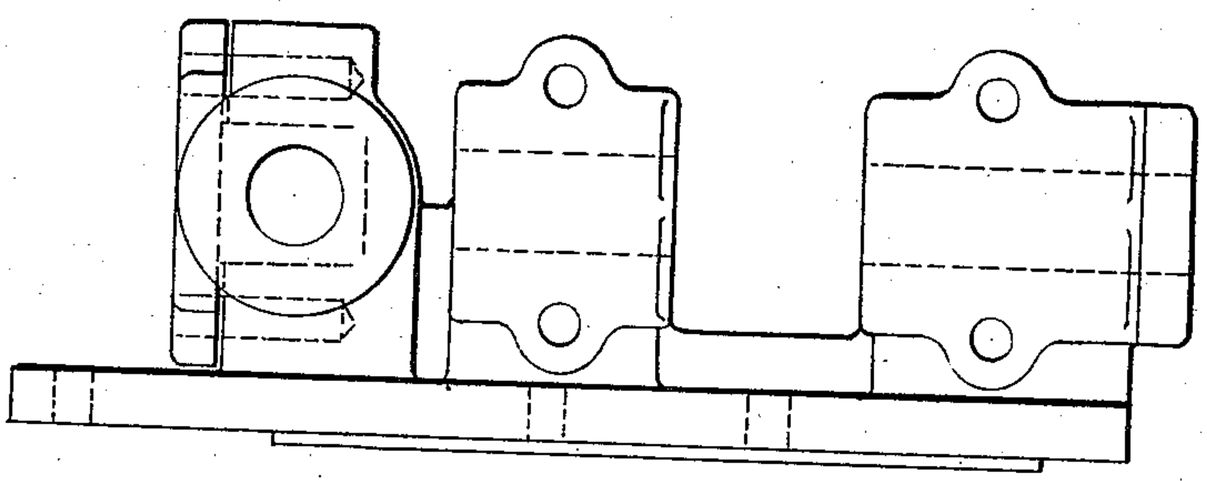
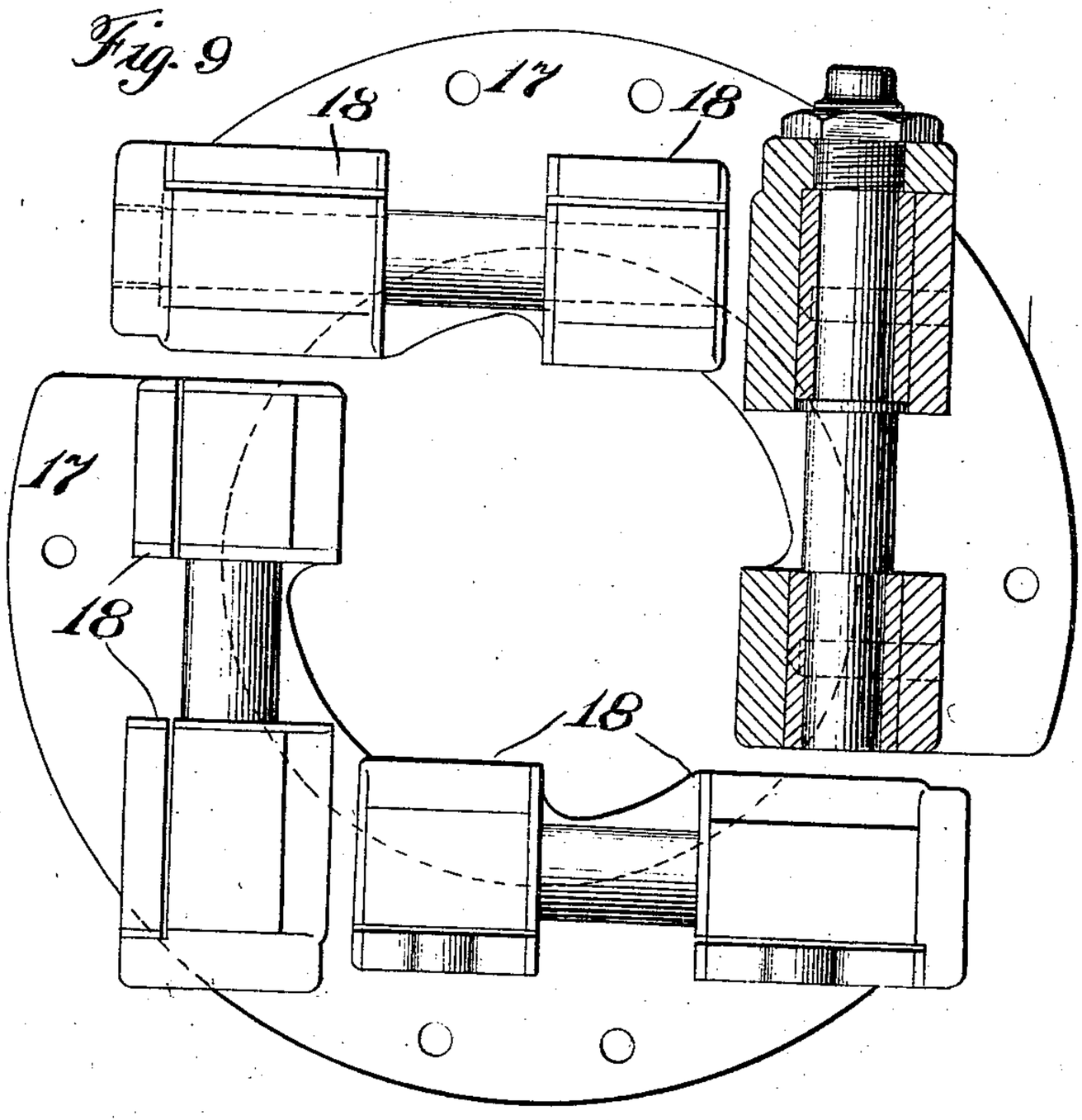


Fig. 9



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8 SHEETS—SHEET 8.

Fig. 10

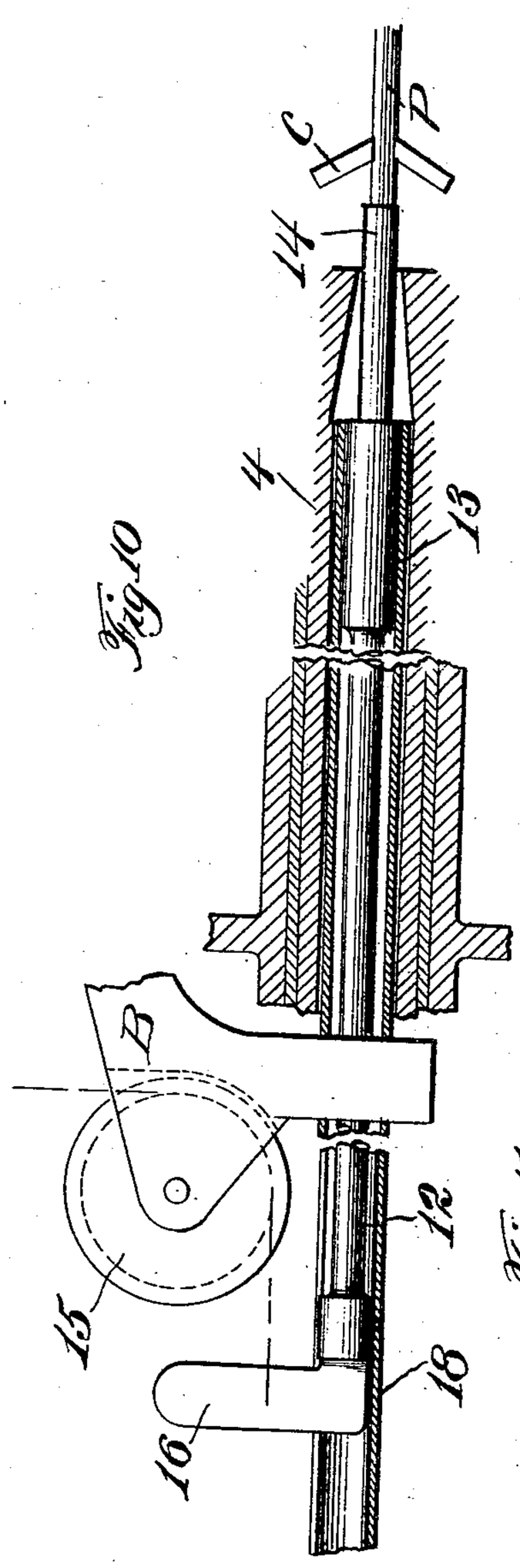

Fig. 11

Fig. 13.

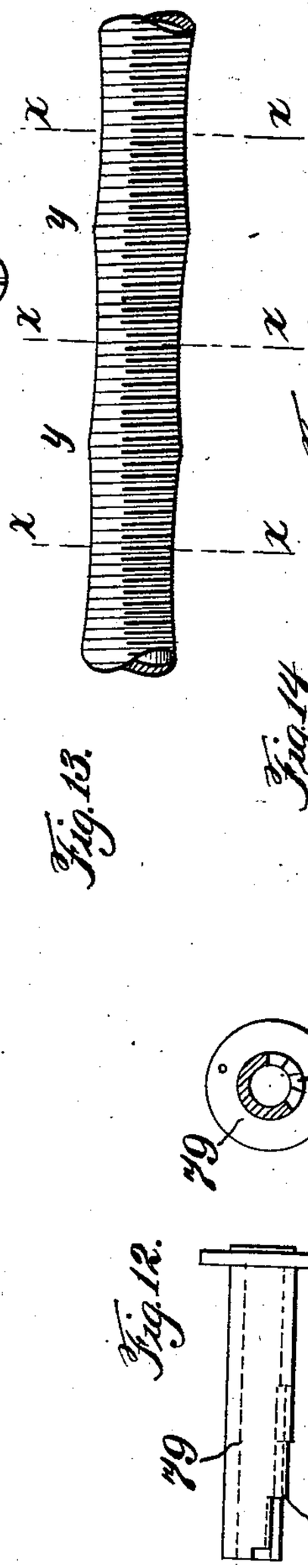

Fig. 15

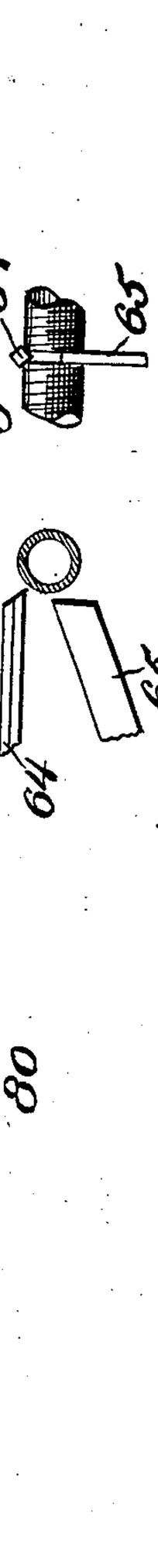

Fig. 14

Fig. 12.

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UNITED STATES PATENT OFFICE.

WILLIAM W. DOOLITTLE, OF EVANSTON, ILLINOIS, ASSIGNOR TO CRANE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

NIPPLE-MAKING MACHINE.

No. 868,167. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed August 9, 1906. Serial No. 329,889.

To all whom it may concern:

Be it known that I, WILLIAM W. DOOLITTLE, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Nipple-Making Machines, of which the following is a specification.

The invention relates to nipple making machines and has for its objects; to provide an improved machine adapted to produce tapered nipples rapidly and continuously from a blank pipe; to provide a machine in which the direction of movement of the cutting dies is such that the desired taper is secured without any additional transverse feeding mechanism; to provide a positive and accurate threading mechanism with a smaller number of parts than has heretofore been necessary; to provide an oscillatory die mechanism having provision for the return movement of the dies without interference with the blank stock; and finally, to provide a novel and advantageous arrangement of dies, feed, and operating mechanism, whereby increased rapidity of production is secured together with greater accuracy of product and a minimum amount of waste. One form of the invention is shown in the accompanying drawings in which,

Figure 1 is a plan view,

Figure 2 is a side elevation and section, the section being of the lower half of the machine along the line II—II of Figure 1,

Figure 3 is a transverse section through the machine on the line III—III of Figure 2, and shows in elevation the supporting members for the dies with such dies removed,

Figure 4 is a view similar to Figure 3 but with the dies in place upon the die supporting members,

Figure 5 is an elevation of the right hand end of the machine,

Figures 6 and 7 are enlarged detailed elevations of the threading members, Figure 7 being broken away at the end to show the die adjusting means,

Figures 8 and 9 are detail views of the supporting members for the threading means, Figure 8 being a side elevation and Figure 9 a plan view,

Figure 10 is an enlarged longitudinal section through the feeding mechanism,

Figure 11 is a side elevation of the stock engaging rod,

Figure 12 is a side elevation and section through the stop sleeve,

Figure 13 is an enlarged detail of the pipe after the tapered threads are cut, showing by dotted lines X—X the points at which the blank is cut to form the nipples,

Figure 14 is a detail view of the pipe and cutting off tools,

Figure 15 is a detail view of the tools in cutting position.

The machine is designed to produce the ordinary threaded nipples which taper from the center to the end (see Figure 13) from continuous stock, and the machine comprises a mechanism for clamping and rotating the blank or pipe and feeding it step by step to the threading mechanism, threading mechanism comprising oscillatory arms swinging longitudinally of the axis of the stock for producing the pitch of the thread, and securing the desired taper, and means for cutting the nipples off at the lines marked X—X in Figure 13, together with stop mechanism for positioning the pipe when the rotating clamp is released and the stock fed along intermediate the threading operations. An alternative form of machine for forming similar nipples is shown in my co-pending application No. 329,988.

Describing first the principal parts of the machine briefly, and referring particularly to the general views 1, 2, 3, 4, and 5, A is the frame of the machine, B is the rod feeding means (Figure 2, and in detail in Figure 10), C is the clamping mechanism for rotating the pipe after the feeding and during the threading operation, D are the oscillatory arms, four in number, which carry the threading dies, which dies are adapted to swing in planes longitudinally of the axis of the pipe, thereby producing the pitch of the thread on the pipe and because of the curved path of the dies, giving the taper shown in Figure 13, E are the supporting means for the oscillatory threading arms which supporting means are adapted to be moved outwardly at intervals, to allow the threading dies to return to their starting points after the length of a nipple has been cut, F is the mechanism for periodically opening and closing the supporting means for the dies after each forward movement thereof, G is the sleeve for supporting the threaded portion of the pipe intermediate the threading dies and the cutting off mechanism, which sleeve is rotated in the direction of rotation of the pipe in order to avoid injury to the threads formed thereon, H is the stop mechanism having means for engaging the end of the pipe, which stop moves back step by step, until the nipples commence to be severed after which time the stop remains stationary, K is the transversely reciprocatory carriage upon which the cutters for severing the nipples from the stock are mounted, L is the mechanism for oscillating the ends of the threading arms and includes a plurality of backwardly extending rods secured to a collar mounted coaxial with the feeding axis and operable by its rotation, M is the main shaft carrying the driving pulley, N is the countershaft carrying the cams for opening and closing the clamping jaws C, the cam for operating the closing mechanisms F, the cam for operating the stop mechanism H, and the cam for operating the reciprocatory cutter carriage K and O is the train of gearing for connecting the main shaft M with the countershaft N.

The general arrangement having been outlined, a de-

tailed description of the parts will now be given, referring first to the clamping mechanism C (Figure 2), which mechanism intermittently clamps and rotates the blank pipe which has been fed thereto. This mechanism as shown, comprises two opposing jaws which are rotated from the drive shaft M which carries the drive pulley 1, by means of the gear 2 on the shaft M meshing with the gear 3 keyed to the hollow shaft 4, which shaft 4 has an enlarged end portion 5 to which the two clamping jaws C are pivoted at 6. The jaws are provided with the operating levers 7 which are adapted to be swung outwardly by means of the camming member 8 slidably mounted upon the shaft 4, which member 8 is provided with a grooved wheel 9 engaging the end of the operating lever 10, the other end of such operating lever being in engagement with the cam groove of the wheel 11, which wheel 11 is mounted on the countershaft N heretofore referred to. It will be seen that by this means the clamping jaws C are periodically opened and closed, thereby releasing and engaging the pipe extending through the shaft 4. The mechanism by which the stock is fed through the shaft 4 and the jaws C when such jaws are opened, is shown in detail in Figure 10. As shown in this figure the member 12 is provided for pushing the pipe forward which member 12 is provided at its front end with the head 13 having a recess at its front end and adapted to receive the end of the pipe carrying rod 14 shown in Figure 11. This pipe carrying rod 14 fits into the head 13 at its rear end and at its front end is split as shown in Figure 11, to provide a spring end over which the pipe P fits, thereby securing a firm engagement between the pipe or blank and the engaging member. The member 12 is advanced through the shaft 4 by means of the weight (not shown) which is secured to a cable passing over the wheel 15 and engaging the upturned end 16 of the member 12. This provides a means constantly tending to feed the pipe P forward against the stop mechanism H whenever the clamping jaws C which rotate the pipe are opened. In order that the member 12 may be properly guided and supported, an additional pipe member 18 is fitted in the shaft 4 provided with a slot upon its upper side to which the upturned portion 16 is adapted to slide.

The threading mechanism will next be described, reference being had particularly to the general views of Figures 2, 3, and 4, and the detail views of the threading arms and threading arm brackets shown in Figures 6 to 9. As shown in the drawings (Figure 4), four cutting or threading arms D are preferably used, although it will be apparent that a greater or less number might be used if desired, which threading arms D are pivotally mounted, two upon the upper supporting member E and two upon the lower member E which members E are movable toward and from the axis of the pipe by a mechanism and for a purpose to be more fully described hereafter. The members E—E are provided upon their faces with removable projecting brackets 17 provided with bearings 18 between which bearings the threading arms D (Figures 4, 6, and 7) are pivotally mounted for oscillation in planes longitudinal of the axis of the pipe, and carry at their outer ends projecting pivot pins 19 for engaging the connecting rods 20 which constitute a part of the threading operating mechanism, heretofore referred to as the mechanism L. The connecting rods 20 are all pivotally secured at their rear ends to the slidable collar 21 mounted for longitudinal movement along the feeding axis 4, which collar 21 is normally held in its position to the left, by means of the pivoted crank 22 engaging the collar at one end and carrying on its free arm the weight 23. In order to feed the collar 21 to the right and thereby move the dies on the cutter arms D to the left for the threading operation, the collar 21 is provided with rollers 24 at its rear side, which rollers are in position to engage a cam 25 which cam is adapted to revolve slowly, thereby feeding the connecting rods 20 to the right and causing the die to pass over the blank pipe, thus threading the length of a nipple. The cam 25 is so shaped that the rods 20 are reciprocated once for each revolution of the cam, the weight 23 holding the rollers on the collar 21 constantly in engagement with the cam surface. The cam member 25 is secured to the sleeve 26 which is coaxial with the sleeve 4 and the sleeve 26 carries upon its end the gear 27 which gear 27 is driven from the main shaft M by means of the following train of gearing; the gears 2 and 3 mounted upon the main shaft and the shaft 4 respectively, the gear 28 keyed to the end of such shaft 4, the gears 29 and 30 mounted to rotate together upon the stud 31, and the gear 32 mounted loosely upon the end of the countershaft 33 which countershaft 33 extends parallel of and immediately beneath the shaft M of Figure 1, which gear 32 engages the gear 27 thereby revolving the sleeve 26 with its cam 25. In order that the position of the threading cut may be varied, the rods 20 are each provided with turnbuckles 34 for changing the length of such rods. It will be apparent from the foregoing that as the peripheries of the threading dies move in arcs of circles longitudinally of the pipe, the blank is threaded in a succession of curved portions with the parts Y of larger diameter (Figure 13), and when the nipples are cut off on the line X—X they will not be tapered on an exact straight line but such line of taper is sufficiently near a straight line to serve the purpose. After the ends of the threading arms have been fed along the rotating pipe thereby cutting a nipple and after such threading operation the pipe has been fed forward the length of another nipple, it will be seen that the dies cannot be swung back to their starting point without interference with the blank unless means are provided for moving the axes of the various cutting arms outwardly with respect to the pipe. The means for accomplishing this result is the mechanism E, F, shown in Figures 3, 4, 8, and 9, and as here shown each of the members E—E are pivotally connected at one end by means of the link 35 and the pivots 35′ passing through the link, the parts E—E and the supporting plates 35^2 (Figure 1) which plate 35^2 is secured to the frame A. The other ends of such supporting members E—E are provided with means whereby such ends may be periodically separated and brought together. On the face of the members E—E are bolted the brackets 17—17 each of which brackets carries a pair of bearings 18 for the reception of the axis of the cutter arms. The members E—E are mounted for centering themselves and for counterbalancing each other by means of the two links 37—38 the first of which is pivoted to the bottom of the lower member E and pivotally supported intermediate its ends from the frame A while the other member 38 is pivoted at one

end to the member 37 and rests pivotally at its upper end against the under side of the upper member E. The members E are also held normally in separated position by means of the spring 39 interposed in the recesses between the faces of such members. The means for closing the members against the tension of the spring 39 preliminary to each forward movement of the cutting dies is shown most clearly in Figure 3 and as there shown, the opposing free ends of the members E are provided with oppositely disposed cam members 40, which members are adapted to be operated by the oscillation of the cams 40′ on the pivoted operated lever 41, which member is rotatably mounted intermediate its ends on the pivot 42 carried on a projecting lug 42′ secured to the plate 35^2. The lever 41 carries at its lower end a pair of cam rollers 43 and 44 coöperating respectively with the cams 45 and 46 upon the countershaft N heretofore referred to. The countershaft N is rotated by means of the gear 47 (Figure 1) secured to the end thereof and meshing with another gear 48 upon the countershaft 33 lying immediately below the main shaft M. The countershaft 33 is rotated by means of the gear 49 upon its left hand end which gear meshes with the gear 50 adjacent the cam member 25 keyed upon the sleeve 26 (Figure 2).

The threading arms are shown in detail in Figures 5 and 6 by reference to which, it will be noted that the arm is provided intermediate its ends with the pivotal opening 51 upon which the arm is to be oscillated and at its outer end with the opening 51′ for the p vot pin 19 heretofore referred to. The inner end of the arm is transversely recessed at 52 as indicated, which recess is open on one side for the engagement of the clamping member 53. The die 54 is seated against a block 55 which block 55 is held from longitudinal movement by its engagement with the clamping bolt 56 which passes transversely through the arm. The upper portion of the recess 52 is dovetailed in such a way as to form an overhanging recess for the die 54 and such die 54 is held tightly pressed in such recess by means of the clamping member 53. Such clamping member 53 is provided at its upper end with an inclined engaging surface 57 and at its lower end has a corresponding inclined surface engaging in the recess 58. The bolt 56 passes through this clamping member 53 and when the nut on such bolt is tightened it will be seen that the die member 54 is held securely in place and is pressed tightly against the block 52. By using blocks 52 of different thicknesses the position of the die 54 relative to the oscillatory center may be adjusted. Transverse adjustment of the cutting die is secured by means of the construction indicated in Figure 7 in which the plug 59 engages screw threads upon the under side of the die 54 and upon the upper side of the block 52. The end of the plug 59 engages the shoulder 60 on the die member and such member may be thereby adjusted transversely of the arm after which the nut on the bolt 56 is tightened to hold the die rigidly in place.

The mechanism for cutting off the finished nipples will now be described, reference being had particularly to Figures 2 and 5. As shown, the carriage K is slidably mounted for movement transversely of the body of the machine and has pivotally secured to its front side the connecting rod 62 pivoted to the top of the operating lever 63 which operating lever has at its lower end a roller engaging a cam on the countershaft N thereby providing a means for the reciprocation of the cutting tools at any desired intervals. The carriage K supports, as indicated in Figures 14 and 15, two cutting tools 64 and 65 which tools are removably mounted for replacement, the tool 64 being a diamond point and adapted to bevel off the end of the nipple and the tool 65 being a flat one for finishing the cut and severing the nipple completely. In order to support the threaded portion of the pipe intermediate the threading tools and the cutting off tools a sleeve G is provided which is supported on the frame A by means of the bracket 66 and is adapted not only to steady the pipe during turning, but also while the threading dies are operating. In o der that the pipe thread may not be injured by pressing on the sleeve while rotating therein, means are provided for rotating the sleeve in the same direction and at the same speed that the pipe is rotating, which means comprises a sprocket connection 67 with the shaft 68 which shaft is mounted upon the upper portion of the frame and carries a pulley 69 having engagement with the shaft 4 by means of the belt 70, (Figure 1).

The stop mechanism H as shown in Figures 2 and 5, will now be described. This stop mechanism is necessitated by the fact that the weight feed shown in Figure 10 tends to continuously feed the rod under the tension of the weight when the clamp C is open, and some means must be provided for limiting the forward movement when such opening of the clamp C occurs. The stop mechanism is mounted upon the base 71 which base 71 is slidably mounted on the table 72 and is adjustable thereon by means of the set screw 73 whereby any change of pos tion due to wear may be adjusted. The table 72 which carries both the stop mechanism H and the carriage K is also adjustable as will be noticed from Figure 2, the projection 74 on the bottom of such table engaging the adjusting screw 75 secured to the bracket 76. Extending longitudinally through the cylindrical top of the part 71 is the stop rod 77 which is adapted to engage the end of the pipe and position it when such pipe is fed along by means of the feeding mechanism. If this rod were not to position the blank until the nipples were cut off, it is apparent that it might be stationary and the cutting off of a nipple by the cutters 64 and 65 would permit the pipe to be advanced exactly a proper distance in order to be positioned for another cutting, but as it is desired to use the stop mechanism for positioning the pipe before such pipe reaches the cutting off mechanism 64—65, means are provided for permitting of the step by step motion rearwardly of the stop rod 77 until the end of such rod reaches a position at the right of the cutting off mechanism 64—65 after which position is reached such rod is allowed to remain stationary. To accomplish this result the rod 77 has secured thereto the stop pin 78, and a rotatable stop sleeve 79 is provided, which latter is shown in detail in Figure 12. As here shown, the sleeve 79 has a stepped slot 80 along the one side, the successive steps of such slot being apart the length of a nipple, so that when the stop pin 78 engages successively the different steps, the front or positioning end of the rod 77 will be held successively at varying positions, which positions vary by the length of a nipple. In order that the projection 78 may be free from one step to allow it to move to the next step, the sleeve 79 must be rotated

and means are provided whereby this is automatically accomplished before the clamp C is open and the blank fed forward. The mechanism consists of a ratchet wheel 81 secured to the sleeve and operable by the pawl 82 carried on the lever 83, which lever 83 is operated by means of the connecting rods 84 and the operating lever 85, engaging at its lower end a cam on the countershaft N. The operation of the pawl 82 will turn the sleeve 79 just far enough at each movement to allow the pin 78 to disengage itself from the step upon which it is engaged and place it in position to engage the next step and when the smooth portion 86 of the ratchet wheel is reached by the pawl, the device will of course cease turning and the stop rod 77 will have reached its rearmost position, at which time the nipples are being cut off by the cutting tools and hence no further retraction of the stop 77 is necessary. In order that the stop 77 may not turn, it is made square in cross section, and fits in a square slot in the member 87, which member has a driving fit in the cylindrical top of the part 71 and hence is not rotatable.

The operation of the machine briefly stated is as follows: A blank pipe having been inserted through the tube 18 in the hollow shaft 4 such pipe is pushed forward until its end is opposite the members E, and engage the end of the stop rod 77, and power is applied to the pulley 1 on the shaft M thereby driving the gears 2 and 3 and turning the shaft 4 carrying the clamping members C which are in engagement with the pipe, the closing cam 8 being in the position shown in Fig. 2. At this time the threading dies upon the oscillatory threading arms D are in position farthest to the right and as the pipe revolves between them these dies are fed gradually to the left by means of their connecting rods 20 being forced to the left by the cam 25 upon the sleeve 26. This threading movement is continuous until a portion of the pipe equal to the distance between the parts Y—Y (Figure 13) is threaded, at which time the dies, because of their curved path swing out of engagement with the pipe. The threading dies having passed out of engagement with the blank, such blank is free to be fed forward a step for a new operation and the jaws C are released by the actuation of the camming member 8 to the rear by the cam wheel 11 and the lever 10, and the feeding rod 12 actuated by its weight pushes the pipe forward a distance equal to the length of a nipple, at which time it engages the end of the stop rod 77. During this operation the threading arms are returning to their original position, which operation is permitted by the shape of the cam 25 and by virtue of the weight 23 moving the collar 21 to the left. At this time the supporting members E must be separated in order to allow the threading dies to pass along the pipe without interference, and this is accomplished by the movement of the lower end of the lever 41 to the right, thereby allowing the spring 39 (Figure 3) to press the members apart a sufficient distance to allow the rearward movement of the cutting dies to their starting position. The pipe having been positioned by means of the stop rod, the clamp C is closed by the member 8 which clamp then revolves the pipe between the cutting dies completing the operation as heretofore set forth. In the meantime the stop 77 has been adjusted for stopping the pipe one nipple's length to the rear of its previous position by means of the positioning of the stop sleeve 79 with another step in line with the pin 78 so that such pin 78 and the stop rod 77 can be moved to the rear when the pipe is again advanced by the feeding mechanism. The foregoing operations are repeated until the threaded blank passes through the sleeve G and beyond the cutting tools 64—65 on the carriage K, at which time the cam on the countershaft N operating the lever 63 and connecting rod 62 pulls the carriage K forward cutting off a nipple which drops through the machine. The stop sleeve 29 has now been rotated to such an extent that the ratchet wheel 81 secured thereto has its smooth portion 86 opposite the pawl 82 and no further rotation of the sleeve occurs.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is the following:

1. In combination, a relatively rotatable pipe holder and threading means, said threading means comprising a support, a threading tool mounted thereon to oscillate in an arc longitudinal of the pipe holder, and means for feeding the threading tool forward and swinging it reversely to starting position.

2. In combination, a relatively rotatable pipe holder and threading means, said threading means comprising a support, a threading tool mounted thereon to oscillate in an arc longitudinal of the pipe holder, means for feeding the threading tool forward and returning it, and means whereby the support may be moved radially.

3. In combination, a relatively rotatable pipe holder and supporting means, means for feeding a pipe through the holder step by step, a threading tool mounted on the said support for oscillation in an arc longitudinal of the pipe holder, means for feeding the threading tool forward and returning it, and means whereby the said supporting means may be moved radially to permit the threading tool to clear the pipe during its return stroke.

4. In combination, a relatively rotatable pipe holder and supporting means, a plurality of threading tools mounted on the support about the axis of the pipe holder for oscillatory movement in arcs longitudinal of the axis of the pipe holder, and means for feeding the tools forward and swinging them in a reverse direction to their starting positions.

5. In combination, a relatively rotatable pipe holder and sectional supporting means, threading tools mounted on the supporting means for oscillation in arcs longitudinal of the pipe holder, means for feeding the threading tools forward and returning them, and means for moving the parts of the sectional supporting means outwardly to permit of such return.

6. In combination, a rotatable pipe holder, radially movable supporting means on opposite sides of the axis of the pipe, oscillatory arms lying in planes substantially parallel to the axis of the pipe holder and mounted upon such supporting means, threading dies on such arms, means for moving the supporting means in and out, and means for moving the oscillatory arms back and forth.

7. In combination, a pair of pivoted supporting members, means for rotating a pipe between the members, means for periodically opening and closing the supporting members, threading members pivoted on each of the supporting members to oscillate in arcs longitudinal of the pipe, and means for feeding the threading members forward and returning them.

8. In combination, a pair of pivoted supporting members, means for rotating a pipe between the members, yielding means normally holding the supporting members in open position, means for periodically closing the supporting members, threading members pivoted on each of the supporting members to oscillate in arcs longitudinal of the pipe, and means for feeding the threading members forward and returning them.

9. In combination, a pair of pivoted supporting members, means for rotating a pipe between the members, means for periodically opening and closing the supporting

members, threading members pivoted on each of the supporting members to oscillate in arcs longitudinal of the pipe, means for feeding the threading members forward and returning them, and means for feeding the pipe forward the length of a nipple during the return movement of the threading members.

10. In combination in a threading machine, a pair of die supporting members pivoted at one end to the frame, means at the other ends for operating the supporting means, and balancing means comprising a lever pivoted intermediate its ends to the frame and pivoted at one end to the lower supporting member, and a link extending between the upper supporting member and the other end of the said lever.

In testimony whereof, I hereunto sign my name in the presence of the two subscribed witnesses.

WILLIAM W. DOOLITTLE.

Witnesses:

PAUL CARPENTER,

JAMES NICHOLAS LORENZ.