A. MILL.

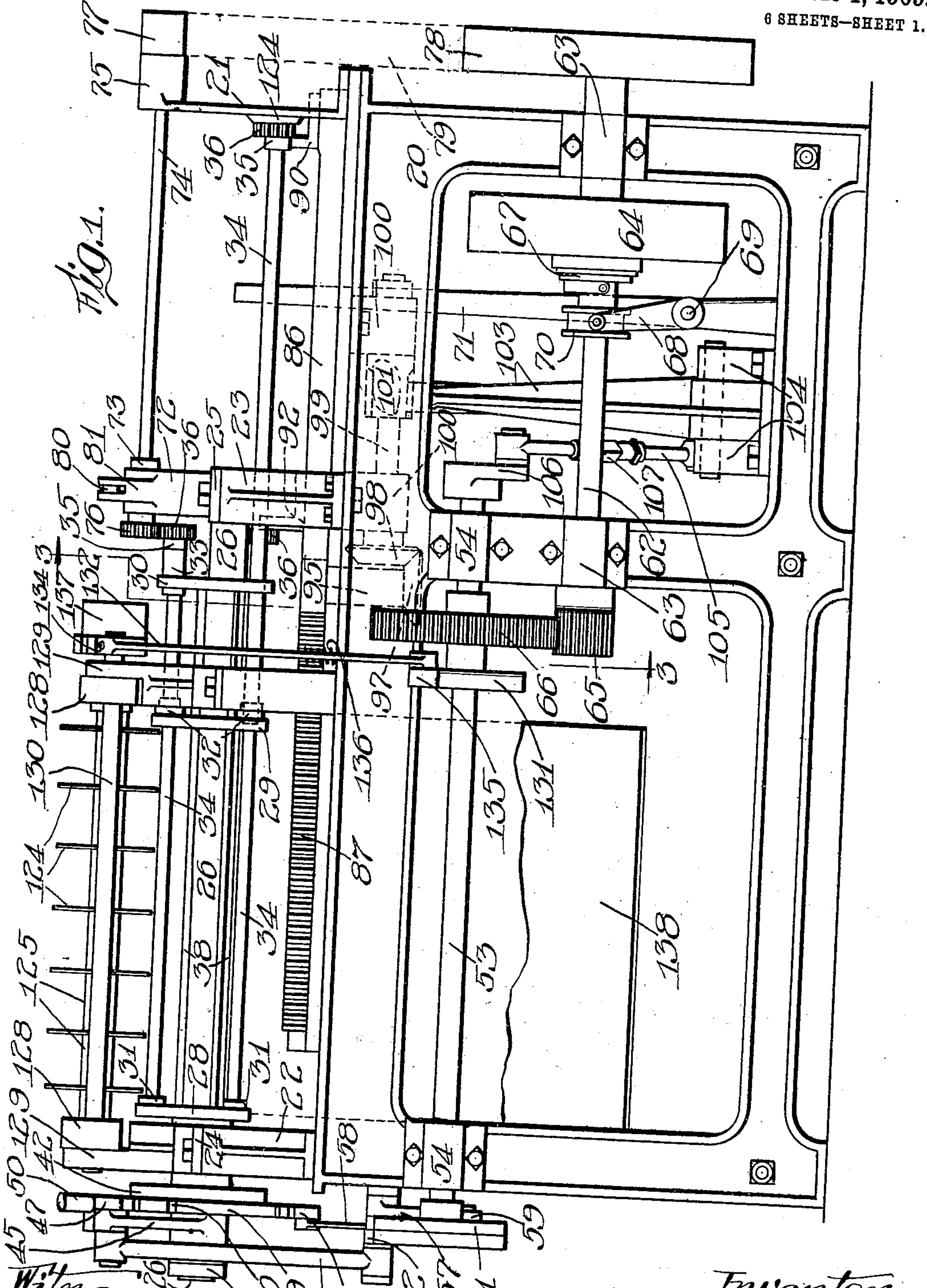
TUBE CUTTING MACHINE.

APPLICATION FILED OCT. 29, 1906.

923,554.

Patented June 1, 1909.

6 SHEETS—SHEET 1.



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[signature]
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6 SHEETS—SHEET 2.

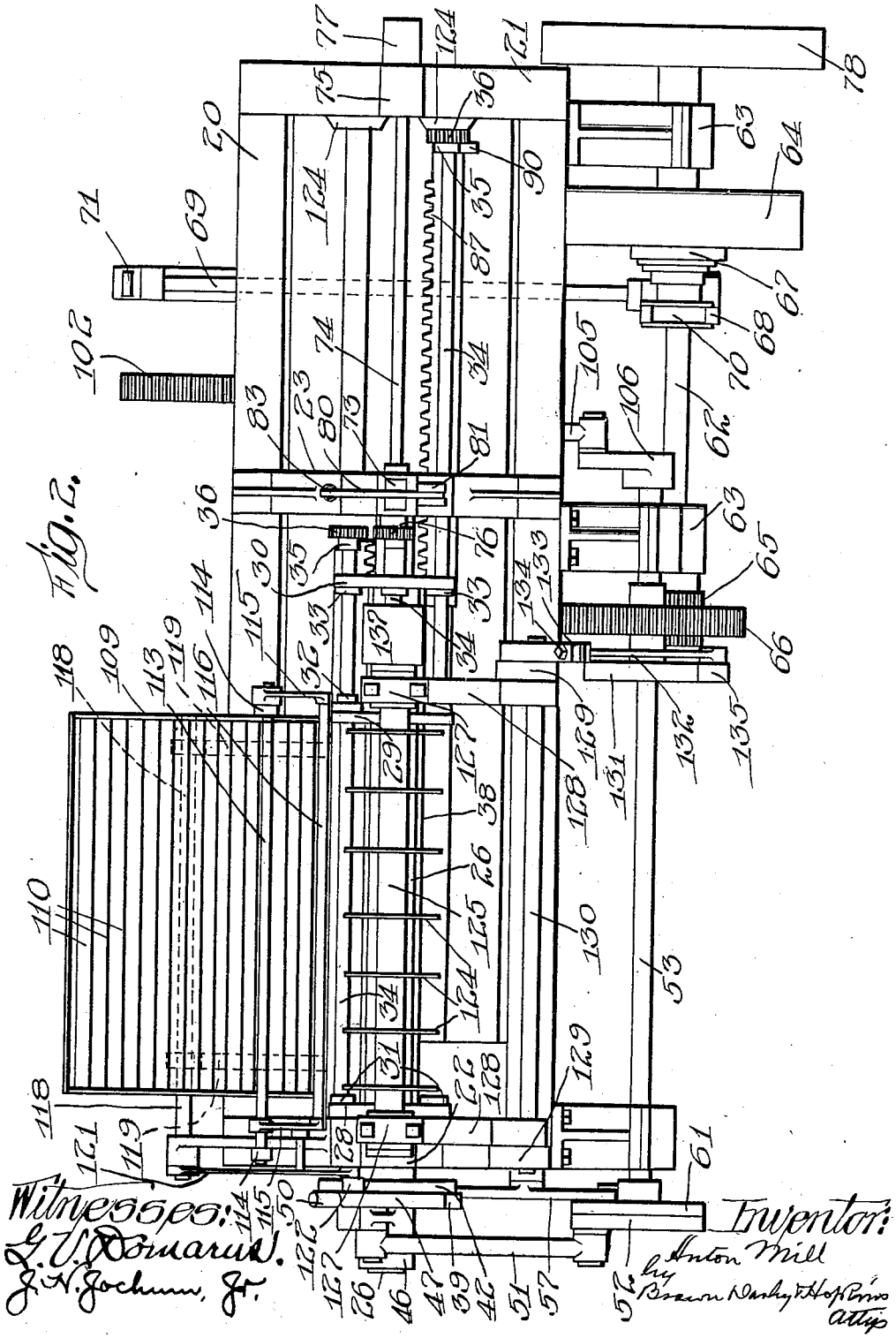

Fig. 2.

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6 SHEETS—SHEET 3.

Fig. 3.

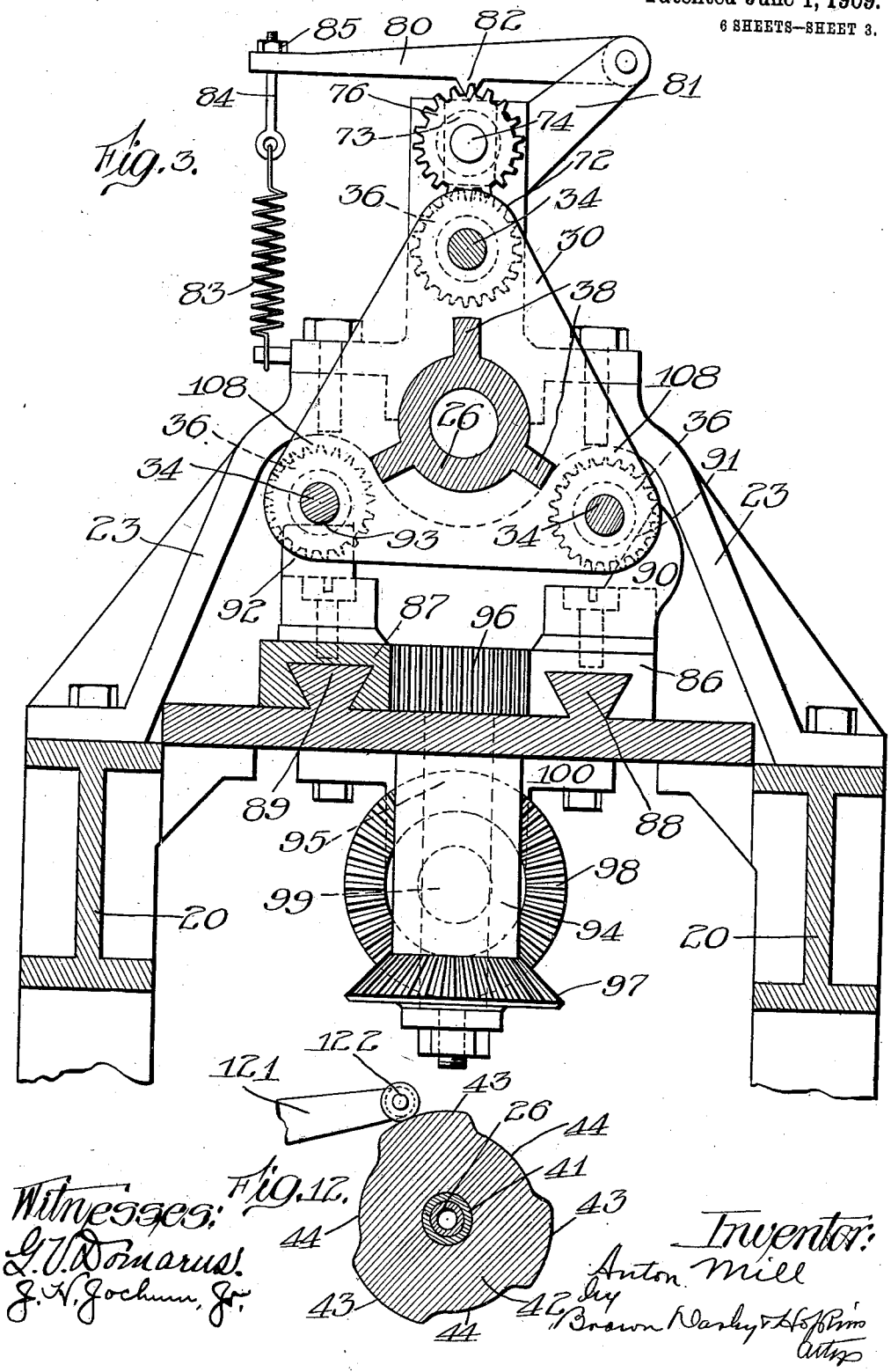

Fig. 12.

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923,554

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6 SHEETS—SHEET 4.

Fig. 4.

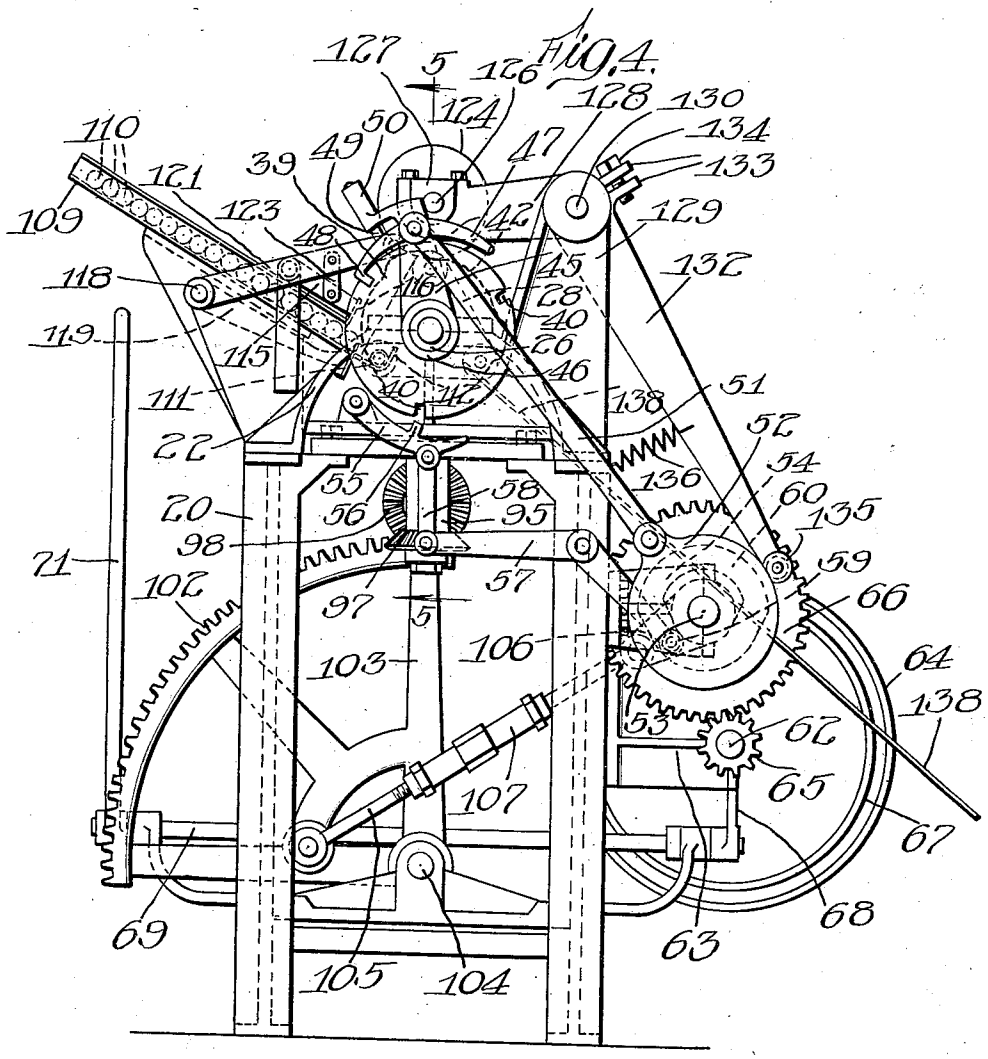
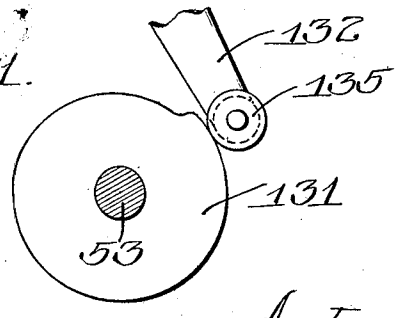


Fig. 11.



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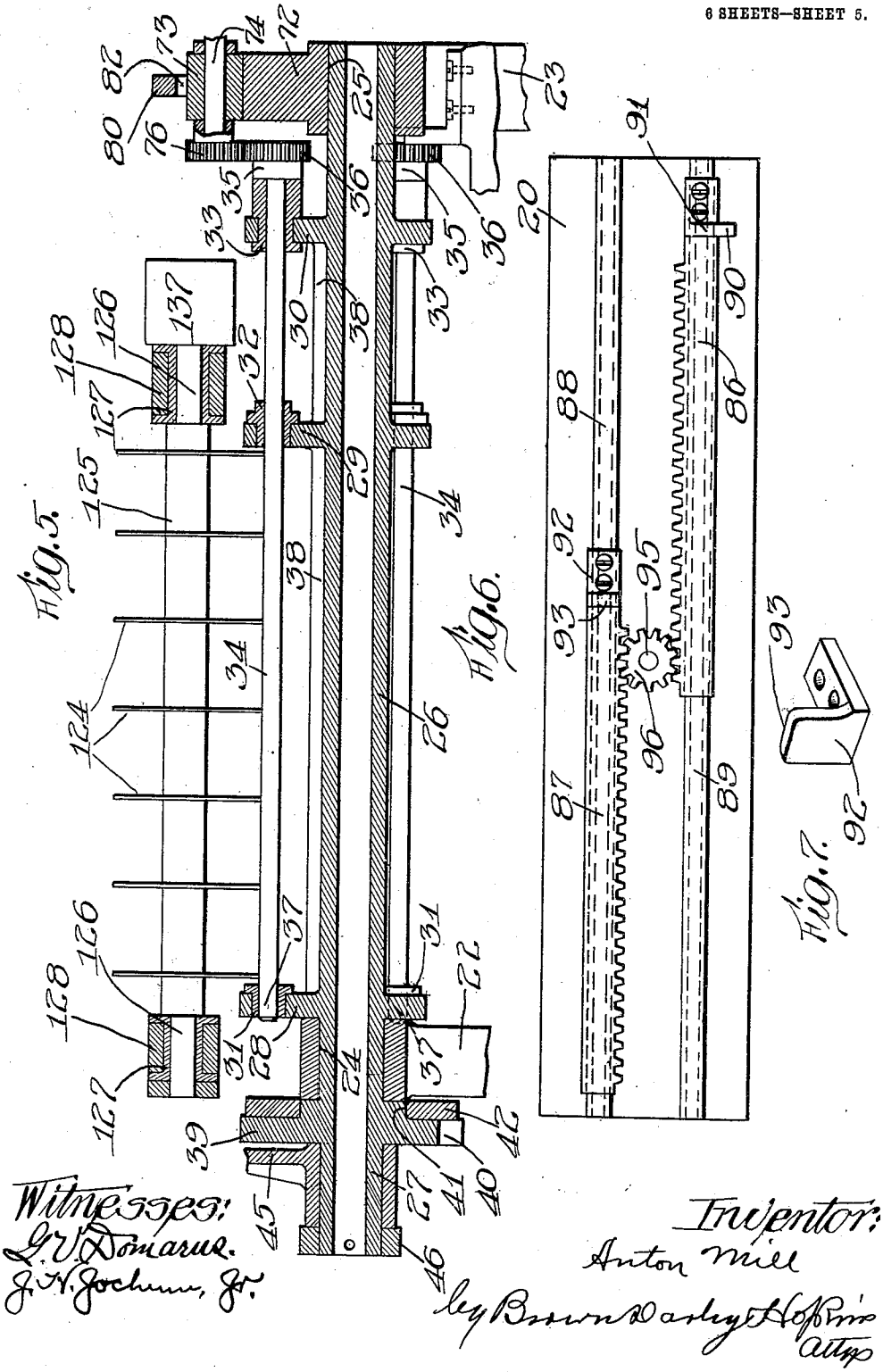
6 SHEETS—SHEET 5.



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6 SHEETS—SHEET 6.

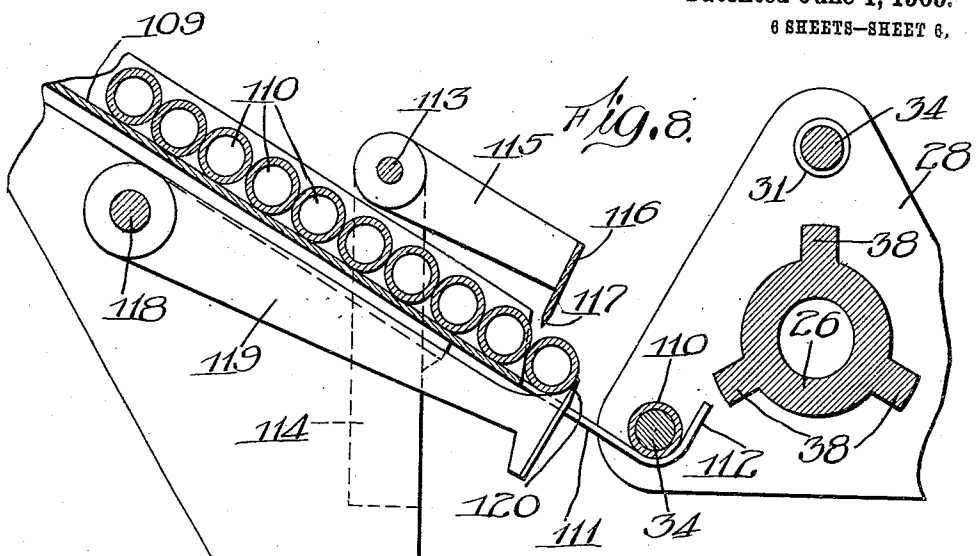

Fig. 8.

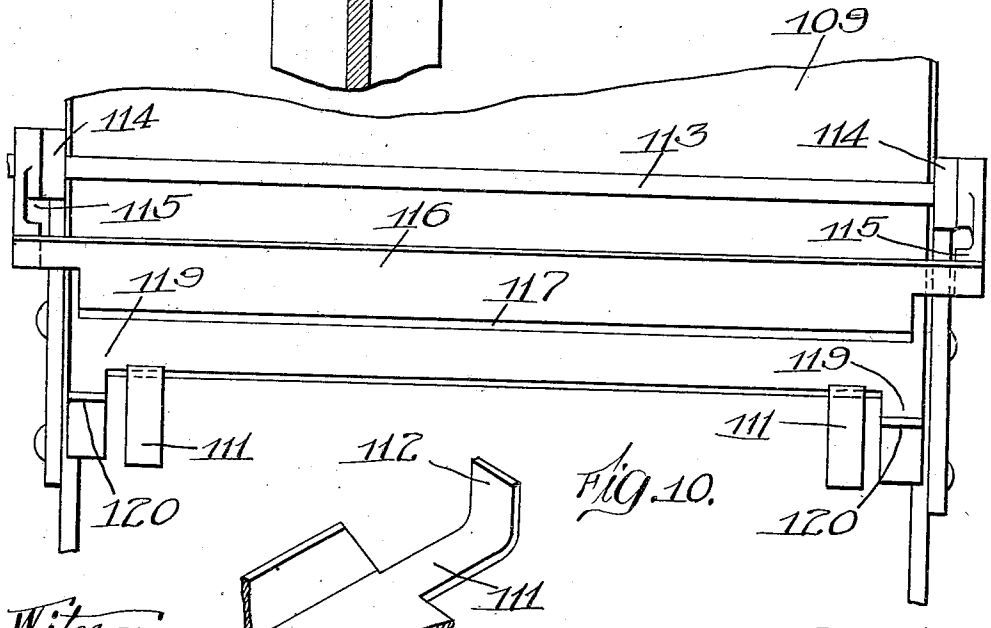

Fig. 9.

Fig. 10.

Witnesses:
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UNITED STATES PATENT OFFICE.

ANTON MILL, OF CINCINNATI, OHIO, ASSIGNOR TO THE PETERS CARTRIDGE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

TUBE-CUTTING MACHINE.

No. 923,554. Specification of Letters Patent. Patented June 1, 1909.

Application filed October 29, 1906. Serial No. 340,982.

To all whom it may concern:

Be it known that I, ANTON MILL, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Tube-Cutting Machines, of which the following is a full, clear, and exact specification.

This invention relates to improvements in tube cutting machines, and more particularly to that class of machines for cutting tubes into predetermined lengths, and the primary object of the same is to provide an improved machine of this character which will be simple, durable and cheap in construction, and efficient in operation.

A further object is to provide an improved machine of this character in which the sections of the previously cut tube will be automatically discharged while a subsequent tube is being cut.

To the attainment of these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the several parts hereinafter more fully described and claimed, and shown in the accompanying drawing illustrating an exemplification of the invention, and in which:

Figure 1 is a front elevation of a machine constructed in accordance with the principles of this invention. Fig. 2 is a top plan view. Fig. 3 is a sectional view on line 3—3 of Fig. 1. Fig. 4 is a left hand end elevation of Fig. 1. Fig. 5 is a sectional view on line 5—5 of Fig. 4. Fig. 6 is a top plan view of the racks and mandrel inserting and ejecting fingers. Fig. 7 is a detail perspective view of the mandrel ejecting finger. Fig. 8 is a detail sectional view of the tube feeding hopper or magazine, and a portion of the frame. Fig. 9 is a front elevation of the hopper or magazine. Fig. 10 is a detail view of the arms or fingers for holding and retaining the tubes in position to receive the mandrel. Fig. 11 is a detail view of the end of the cutter operating arm and cam. Fig. 12 is a detail view of the end of the operating arm of the magazine or hopper gate, and the operating cam in section.

Referring more particularly to the drawings, and in which the same reference numerals designate similar parts throughout the several views, in this exemplification of the invention, the numeral 20 designates the frame or bed of the machine, which may be of any construction suitable to form a proper support for the bearings of the various shafts. Secured to and projecting above the top of the bed or frame are a plurality of supports or standards 21, 22, 23, the supports or standards 21, 22, being located preferably at the ends thereof, and the support or standard 23 being located at a point approximately midway of the two.

The supports or standards 22, 23, are provided respectively with bearings 24, 25, and located therebetween, with its ends journaled in the bearings, is a shaft or hub 26, which is preferably tubular in construction, the extremity 27 of which projects for some distance beyond the support or standard 22, for a purpose to be set forth. Secured to this hub or shaft 26, and between the supports or standards 22, 23, are a plurality of circumferential flanges 28, 29, 30. The flange 28 is located preferably in close proximity to the support or standard 22, and the flange 30 is located adjacent, but spaced from, the support or standard 23, while the flange 29 is located between the first two flanges and in proximity to the flange 30. These flanges may be of any suitable configuration, according to the number of mandrels to be carried, but in this exemplification of the invention they are triangular in shape and arranged coincident with each other, and are provided respectively with bearings 31, 32, 33, in their apexes. The respective sets of bearings being alined with each other and adapted to receive a mandrel 34. The bearings 33 preferably extend for a short distance beyond the outer face of the flange 30, and the extremities thereof serve as a stop against which a collar 35 on the mandrel 34 rests, when the mandrel is in position. A suitable pinion wheel 36 is secured to each of the mandrels, adjacent the collar 35, and serves as a means for independently rotating each of the mandrels, in a manner to be set forth. The mandrels are adapted to be drawn longitudinally through the bearings with relation to the hub or shaft 26, in a manner to

be set forth, the intermediate bearings 32 serving as guides for the mandrels for directing the extremities 37 thereof into the bearings 31. If desired, the hub or shaft 26 may be provided with strengthening rib 38, which are preferably located between the flanges 28, 29.

Secured to the projecting end 27 of the shaft or hub 26, remote from its extremity and adjacent to and slightly spaced from the outer face of the support or standard 22, is a ratchet disk or wheel 39, which is provided in its periphery with a plurality of spaced notches or sockets 40, which in this exemplification of the invention are three in number, and are regulated by the number of steps or rotation it is desired to impart to the shaft or hub 26. Secured to this shaft or hub, preferably between the ratchet disk or wheel 39 and the support or standard 22, and on a reduced portion or hub 41 of the disk or wheel 39, is a cam 42 having three active peripheral faces 43 (see Fig. 12), equally spaced from each other to form intermediate depressed portions 44.

Pivotally supported upon the extremity of the hub or shaft 26 is an arm 45, which is prevented from displacement by any suitable means, such as by a sleeve or collar 46 secured to the said extremity in any suitable manner.

An operating pawl or dog 47, having a depending lip or finger 48 at one end thereof, is pivotally supported by the arm 45 in such a manner that the lip or finger 48 will enter one of the notches 40, and when the arm 45 is rocked upon its pivot the shaft or hub 26 will be turned one step of rotation. This pawl 47 may be controlled by any suitable means, preferably a spring-controlled plunger 49 which rests upon the top thereof adjacent the finger or lip 48, and which is movable in a housing or barrel 50.

The arm 45 is rocked or oscillated about its pivot by means of a link or connection 51, one end of which is pivotally attached to the arm and the other to a crank 52 on a shaft 53, which is supported by suitable bearings 54 on the framework of the machine, and preferably below the hub or shaft 26.

A retaining or locking pawl 55 is pivotally supported by one end to the framework, and is provided with a projection or lug 56, which is adapted to enter the recesses or sockets 40 in the disk or wheel 39 and lock the shaft or hub 26 against rotation and also against retrograde movement. This locking or retaining pawl 55 is operated by means of an arm 57, preferably a bell crank, pivotally supported by the frame 20. One end of this arm is connected to the free end of the dog or pawl 55 by means of a link 58; the other end is preferably provided with a lateral projection 59, which is adapted to travel in a cam groove 60 in the side of a disk or member 61, which latter preferably forms a portion of the crank 52. The crank 52 and the cam groove 60, and the respective coöperating arms, are so arranged with relation to each other that when the arm 45 has reached the limit of its forward movement and turned the hub or shaft 26 one step of rotation, the projection or lug 56 will enter the adjacent notch or recess 40, so as to permit the lip or depending portion 48 of the dog or pawl 47 to disengage the notch and be returned to engage the next notch for rotating the shaft or hub another step.

The shaft 53 may be driven in any suitable manner, preferably by means of a shaft 62 journaled in suitable bearings 63 on the frame, and which in turn may be provided with a driving pulley 64. A pinion 65 is provided on the shaft 62, which meshes with a suitable gear 66 on the shaft 53. A clutch 67 may be provided for starting and stopping the shaft 62, and is operated preferably by means of a yoke 68 on one end of a rock-shaft 69, which engages a collar 70, and the shaft 69 may itself be rocked by a suitable handle or lever 71, conveniently located for the operator.

Resting upon and supported by the standard or support 23, above the bearing 25, is a supplemental standard or support 72, the upper end of which is preferably bifurcated, and mounted in said bifurcated portion is a flexible bearing 73 (see Fig. 3), in which is journaled one end of a shaft 74, the other end being journaled in a suitable bearing 75 in the support or standard 21. A pinion 76 is carried by the shaft 74, and said pinion is so located that when the shaft or hub 26 is rotated, the pinion 36 on the mandrels 34 will successively engage and mesh therewith. A pulley 77 is carried by the shaft 74, and is located in a direct line with a pulley 78 on the shaft 62, and passing around these two pulleys is a driving belt 79 (shown in dotted lines in Fig. 1), by means of which the shaft 74 will be rotated.

The purpose of the flexible bearing 73 is to permit the engaging pinion 36 to raise the pinion 76 so that the two will properly mesh when the hub or shaft 26 has made one step of rotation. This bearing is yieldingly held in position by means of an arm 80, which is pivotally connected by one end to a supporting bracket 81. This arm is preferably provided with a depending projection 82, which rests upon the bearing 73, and the free end of the arm preferably projects for some distance beyond the bearing. A yielding member 83, preferably in the form of a spring, is connected by one end to the frame of the machine 20. The other end is connected to the free end of the arm 80, in any suitable manner, such as by means

of an eye-bolt 84 passing through the arm, the end of the bolt being threaded and provided with a nut 85 for adjusting the tension of the member 83.

Mounted for sliding movement upon the top of the base of frame 20 are parallel slides 86, 87, which are preferably in the form of racks, spaced from each other, and these slides are retained in position and guided in any suitable manner, preferably by means of dove-tail ribs or projections 88, 89, entering corresponding grooves in the slides. Secured to one end of the slide 86 is an ejecting finger 90, which is preferably provided with an inclined face 91, and secured to the corresponding end of the other slide 87 is an inserting finger 92, which may be straight as at 93, or of any desired configuration.

Journaled to the frame, preferably beneath the shaft or hub 26, in a suitable bearing 94, is a vertical shaft 95. Secured to the upper end of this shaft is a pinion wheel 96, which is located between and meshes with the teeth on the slides 86, 87, so that when the shaft 95 is rotated the pinion will move the slides in opposite directions.

A beveled gear wheel 97 is suitably secured to the other end of the shaft 95, and meshing with this gear wheel is a gear wheel 98, secured to a shaft 99 supported by suitable bearings 100. This shaft is also provided with a suitable pinion 101, which is adapted to be engaged by the teeth 102 of a toothed segment 103. This segment is pivotally supported by bearings 104. A link 105 is connected by one end to the segment, preferably adjacent the pivot point, and by its other end to a crank 106 on the shaft 53, and, if desired, the link may be provided with a turnbuckle 107. When the shaft 53 is rotated, the crank 106 and link 105 will oscillate the segment 103 and shaft 99 to cause the pinion 96 to move the slides 86, 87.

The face 91 of the finger 90 is inclined or beveled for the purpose of permitting the next advancing mandrel 34 to pass into proper position so that the end of said finger will engage the inner face of the gear 36, carried by the adjacent mandrel, and eject the same by longitudinal movement of the finger 90, when motion is transmitted to the rack or slide 86.

The finger 92 is adapted to engage the outer face of the pinion 36 on the ejected mandrel and insert the mandrel 34, at the next step movement of the mandrel, and shove the mandrel longitudinally and into the tube.

The support or standard 23 being cut away or shaped as at 108 (see Fig. 3) to permit the mandrels to be move longitudinally of the shaft or hub 26, and under the bearing 25, and brought into proper position by the next step of rotation. A magazine or runway 109 is supported adjacent one side of the machine, and in such a position as to feed the tubes 110 between the flanges 28, 29, on the hub or shaft 26, and also in such a position as to permit the mandrel 34, which is being inserted, to pass therethrough. The tube is held in proper position by means of fingers or arms 111 provided with upwardly bent front ends 112.

A rock-shaft 113 is journaled in suitable bearings 114, preferably above and extending across the magazine or runway 109. Secured to this shaft are arms 115, and supported by the free ends thereof, so as to also extend across the magazine or runway, is a bar or gate 116, which depends below the arms and with its lower edge or extremity beveled or tapered as at 117, so as to permit the bar or gate 116 to readily pass between the tubes 110 to permit the forward tube to advance when released and restrain the remaining tubes.

Journaled in suitable bearings located beneath and extending across the bottom of the magazine or runway 109, is a rock-shaft 118, to which is secured by one end a pair of arms 119, which are located preferably adjacent the sides of the magazine or runway, and are provided with upwardly projecting ends or extremities 120, which are located in advance of the bar or gate 116, and are adapted to assume a position in the path of movement of the tubes 110, to form a stop therefor when the bar or gate 116 is raised and out of operative position. These arms 119 are held in their raised position by means of an arm 121, one end of which is secured to the shaft 118. The other end of the arm is adapted to rest upon the periphery of the cam 42 (see Fig. 12), so that when its extremity rests upon the raised portions 43 thereof, the arms 119 will also be raised, and when the extremity rests upon the depressed portions 44, the arms 119 will be lowered to permit the forward tube 110 to advance. If desired, a suitable anti-friction roller 122 may be provided on the end of the arm 121. The arm 121 is connected to one of the arms 115 by a suitable link 123 in such a manner that when the free end of the arm 121 is raised or lowered the arms 119 and 121 will be simultaneously raised, so that as the gate or bar 116 is raised out of engagement with the tubes 110 to permit the tubes in the magazine or runway 109 to advance, the projection 120 will be moved into the path of movement of the tubes to check their forward movement. When the arm 121 is lowered, the gate or bar 116 will pass between the first two tubes, and the projections 120 will be depressed out of the path of movement of the forward tube, and permit the latter to be fed upon the arms or fingers 111.

From the above description it is thought that the operation of this portion of the machine will be clearly understood, but briefly it is as follows: The mandrel 34 adjacent the lower end of the magazine or runway 109 having been withdrawn, and the inserting finger 90 being located adjacent the standard or support 21 and adjacent the outer face of the pinion 36 on the withdrawn mandrel, the machine is ready for operation. In this position the locking dog or pawl 55 will be in operative position and the dog or pawl 47 will have assumed a position at the limit of its forward movement, and in a position to be returned, so that the depending portion or lip 48 will enter another one of the notches or recesses 40, to rotate the hub or shaft 26 another step. The pulley 64 being rotated from any suitable source of power, motion may be transmitted to the shaft 53 through its intermediate connections by shifting the lever 71 to operate the clutch 67. The rotation of the shaft 53 will rotate the crank 52 to move the dog 47 forward. At the same time, and before the dog 47 reaches the limit of its movement, the pinion 96, through the medium of the crank 106, link 105, segment 103 and pinion 101, will move the slides 86, 87, causing the inserting finger 92 to shove the withdrawn mandrel 34, through the tube 110, which is held in proper position by the fingers 111, between the flanges 28, 29. The movement of the slide 87 will cause the ejecting finger 90 to withdraw the next mandrel. The continued rotation of the shaft 53 will release the locking dog or pawl 55 and cause the dog 47 to advance the shaft or hub 26, together with the tube just secured in position, one step of rotation, and will rock the segment 103 in the opposite direction, or to its normal position. This movement of the segment will cause the fingers 92 and 90 to change their position with relation to each other. That is, with the finger 90 adjacent the support or standard 21, and in a position to permit the pinion on the mandrel to assume a position in front thereof, and with the finger 92 in position to stand in front of the pinion on the next advancing mandrel. If desired, and in order to prevent the mandrels from being withdrawn too far, so as to form a space between the pinion on the mandrel and the support or standard 21 for the finger 90, suitable projections 124 may be provided on the support or standard 21. The upper end of the finger 92 is of any desired shape in order to permit the mandrel to be advanced thereto, and the finger 90 is provided with an inclined face 91 in order to permit the mandrel to pass thereover into the proper position to be ejected. As the shaft or hub 26 is rotated the arm 121 is rocked by the cam 42, which will move the arms 115, 119, to feed, or permit one tube to roll upon the fingers or arms 111 and into such a position between the flanges 28, 29, as to permit the next advancing mandrel 34 to be inserted therethrough.

The cutting mechanism preferably comprises a plurality of rotary knives or cutters 124, spaced from each other by suitable spacing blocks or members 125, and mounted upon a rotatable axle 126, the ends of which are preferably journaled in suitable bearings 127, located in the ends of parallel arms 128, which are pivotally supported by suitable standards 129, preferably by means of a rod or bar 130, to which the arms are secured. The arms 128 are of such a length that the cutters 124 will occupy a position directly above and rest upon the tube supported by the upper mandrel. A cam 131 is secured to and rotates with the shaft 53, and secured to the rod or bar 130, in any suitable manner, is an arm 132, which if desired may be adjusted with relation to the arms 128, and held in its adjusted position preferably by means of the ears 133 and the bolt or screw 134 passing through the ears. The free end of this arm 132 extends toward and terminates adjacent the cam 131 and is of such a length as to engage and rest upon the periphery thereof. If desired a suitable anti-friction roller 135 may be provided on the end of the arm 132. The roller 135 remains in contact with the periphery of the cam 131, and when in engagement with the high position thereof, will cause the arms 128 to be rocked or moved downwardly to cause a pressure to be exerted by the cutters 124 upon the tube, and when the low position of the cam presents itself to the end of the arm, the latter will be held in engagement therewith preferably by means of a yielding member 136, in the form of a spring, one end of which is secured to the arm and the other to the frame-work or any other suitable support.

The cutters 124 may be rotated in any desired or suitable manner, such as a driving belt (not shown) passing around a suitable pulley 137 on the axle 126, and located preferably at one end thereof and on the outside of the arms 128. After the mandrel has been inserted into the tube 110, the shaft or hub 26 is advanced one step of rotation, which will bring the gear or pinion 36 on this mandrel into mesh with the gear or pinion on the shaft 74, which is being continuously rotated through the medium of the belt 79. During this operation, or while the mandrel and tube are being positioned, the roller 135 is traveling upon the low portion of the cam 131 to permit the elastic member 136 to exert its tension upon the arm 132 to raise the arms 128 and the cutters 124. After the tube and mandrel have assumed their proper position, the mandrel will be rotated by the shaft 74, and the cam 131 will have

assumed such a position that the high portion thereof will pass under the roller 135 to raise this end of the arm against the tension of the elastic member 136, and lower the cutters 124 upon the tube. These cutters preferably rotate in an opposite direction to the direction of rotation of the mandrel 34. As the cam 131 causes a pressure to be exerted upon the cutters 124, and as the cutters and mandrel rotate in an opposite direction, the tube 110, held between the two, will be quickly cut. At the time when the cutters have completely severed the tube, the low portion of the cam 131 will be presented to the roller 135, and the elastic member 136 will serve to raise the cutters to permit the mandrel and cut tube to advance another step of rotation. While the new tube is being cut in a similar manner, the mandrel containing the cut tube has assumed a position such that the portion thereof adjacent the gear or pinion thereon has assumed a position adjacent the ejecting finger 90, so that said finger will draw the mandrel out of the severed tube in the manner already set forth. The sections of the tube thus released will fall upon a suitable chute or incline 138 and be discharged from the machine.

Thus it will be seen that in this exemplification of the invention, the tube is inserted, cut, and the sections discharged in three steps, and that these steps are simultaneously accomplished or performed upon as many tubes; that is, while one tube is being cut, a new one is being inserted and the sections of the cut tube are being discharged.

In order that the invention might be fully understood, the details of an embodiment thereof have been thus specifically described, but

What I claim is:

1. In a tube cutting machine, the combination of rotatable mandrel-carrying means, mandrels shiftable with relation thereto, means for inserting the mandrel in a tube, means for imparting an intermittent movement to the first said means, cutters, and means for moving the cutters into contact with the tube during the interval of rest of the first said means.

2. In a tube cutting machine, the combination of rotatable mandrel-carrying means, mandrels shiftable with relation thereto, means for inserting the mandrel in a tube, means for imparting an intermittent movement to the first said means, cutters, means for moving the cutters into contact with the tube during the interval of rest of the first said means, and means for withdrawing the mandrel from the tube after the latter has been cut.

3. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the mandrel carrier for feeding a tube to the said carrier, means for inserting a mandrel in said tube, means for imparting an intermittent movement to the first said means, cutters, and means for moving the cutters into contact with the tube during the interval of rest of the first said means.

4. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the mandrel carrying means for feeding a tube into position to receive a mandrel, means for inserting a mandrel into said tube, means for advancing the tube, a cutter, means controlled by the last said means for advancing the cutter to the tube, and means for withdrawing the mandrel from the cut tube.

5. In a tube cutting machine, the combination of mandrel-carrying means, means for supporting a supply of tubes, means for feeding the tubes from said supply to the first said means, means stationary with respect to the mandrel carrying means for receiving the tubes from the supply and supporting said tubes in position to receive a mandrel, means for intermittently advancing the first said means, a cutter, and means controlled by the last said means for advancing the cutter to the tube.

6. In a tube cutting machine, the combination of mandrel-carrying means, means for holding a supply of tubes, means for feeding the tubes from said supply to the first said means, means stationary with respect to the supply holding means for supporting said tubes in position to receive a mandrel, means for intermittently advancing the first said means, a cutter, and means controlled by the last said means for advancing the cutter to the tube, and for holding the cutter in engagement with the tube.

7. In a tube cutting machine, the combination of mandrel-carrying means, a tube hopper, means stationary with respect to the hopper for receiving a tube from the hopper and supporting the same in position to receive a mandrel, means for inserting the mandrel therein, means for intermittently advancing the tube, means for rotating the mandrel, a cutter, and means for advancing the cutter to the tube on the rotating mandrel, and for holding the same in contact therewith, means for retracting the cutter from the tube, and means for withdrawing the mandrel from the cut tube.

8. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the mandrel carrying means for feeding a tube to said means and in a position to receive a mandrel, means for inserting a mandrel in said tube, means for intermittently advancing the first said means, means controlled by the last said means for locking the mandrel-carrying means in each of its positions, a cutter, and means controlled by the advancing means

adapted to advance the cutter to the tube, and for retaining the cutter in contact with the tube.

9. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the mandrel carrier for feeding a tube to said means and in a position to receive a mandrel, means for inserting a mandrel in said tube, means for intermittently advancing the first said means, means controlled by the last said means for locking the mandrel-carrying means in each of its positions, a cutter, means controlled by the advancing means adapted to advance the cutter to the tube and for retaining the cutter in contact with the tube, means for rotating the mandrel during the interval of rest of the carrying means, and means for withdrawing the mandrel from the tube.

10. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the first said means for feeding and supporting a tube in position to receive a mandrel, means for inserting a mandrel, means for advancing the first said means one step, means for locking the mandrel carrier, a cutter, means for advancing the cutter to the tube while the last said means is in a locked position, and for retaining the cutter in contact with the tube, means for returning the cutter to its normal position, means for unlocking the mandrel-carrying means to permit the cut tube to be advanced another step, and means for withdrawing the mandrel from the cut tube.

11. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the first said means for feeding a tube into position to receive a mandrel, means for inserting a mandrel, means for advancing the first said means one step, means for locking the mandrel carrier, means for rotating the mandrel, a cutter, means for advancing the cutter to the tube while the mandrel carrier is in a locked position, and for retaining the cutter in contact with the tube, means for returning the cutter to its normal position, means for unlocking the mandrel carrying means to permit the cut tube to be advanced another step, and means for withdrawing the mandrel from the cut tube.

12. In a tube cutting machine, the combination of mandrel-carrying means, means stationary with respect to the first said means for feeding a tube into position to receive a mandrel, means for inserting a mandrel, means for advancing the first said means one step, means for locking the mandrel carrier, a cutter, means for advancing the cutter to the tube while the last said means is in a locked position, and for retaining the cutter in contact with the tube, means for returning the cutter to its normal position, means for unlocking the mandrel-carrying means to permit the cut tube to be advanced another step, means for withdrawing the mandrel from the cut tube, and means for conveying the tube sections from the machine.

13. In a tube cutting machine, the combination of mandrel-holding means, means for inserting and means for ejecting the mandrel, a driven shaft, means operatively related to the shaft for intermittently advancing the mandrel holder to the ejecting means, means also operatively related to the shaft for locking and unlocking the holder, a cutter, means for operating the cutter, means also operatively related to the shaft for intermittently advancing the cutter to the tube, and for holding the same in its advanced position, means for returning the cutter to its normal position, and means also operatively related to the shaft for operating the inserting and the ejecting means.

14. In a tube cutting machine, the combination of means for supporting a tube, a driven shaft, means operatively related to the shaft for intermittently advancing the supporting means, means also operatively related to the shaft for locking and unlocking the last said means, a pivotally supported cutter frame, a cutter, means for operating the cutter, an arm operatively related to the cutter frame, a cam on the shaft adapted to be engaged by the arm, said cam being adapted to rock the arm to advance the cutter to the tube and to retain the latter in such position, and separate means for returning the cutter to its normal position.

15. In a tube cutting machine, the combination of mandrel carrying means, a gear on said mandrel, a flexible bearing, a continuously rotating journal in said bearing, a gear on said journal, means for intermittently advancing the mandrel-carrying means to cause the gear on the mandrel to engage and be driven by the gear on the continuously rotating journal, a cutter, and means for advancing the cutter to the rotating mandrel.

16. In a tube cutting machine, the combination of a support, a plurality of mandrels journaled therein, a gear on each of said mandrels, a flexible bearing, a continuously rotating shaft in said bearing, a gear on said shaft, means for intermittently advancing the support to cause the gears on the respective mandrels to successively engage and be driven by the gear on the rotating shaft, a cutter, and means for advancing the cutter to the rotating mandrel.

17. In a tube cutting machine, the combination of a support, a plurality of mandrels journaled therein, a gear on each of said mandrels, a flexible bearing, a continuously rotating shaft in said bearing, a gear

on said shaft, means for intermittently advancing the support to cause the gears on the respective mandrels to successively engage and be driven by the gear and the rotating shaft, a cutter, means for advancing the cutter to the rotating mandrel, and for holding the same in such position until the tube is cut, and separate means for returning the cutter to its normal position to permit the advancement of the mandrel support.

18. In a tube cutting machine, the combination of rotatable tube-holding means, means for advancing said holder, and means controlled by the holder for feeding the tubes to the holder.

19. In a tube cutting machine, the combination of rotatable tube-holding means, means for intermittently advancing the same, and means controlled by the holder for feeding the tubes to the holder.

20. In a tube cutting machine, the combination of a rotatable tube holder, means for containing a supply of tubes, and means controlled by the said holder for releasing the tubes from the container.

21. In a tube cutting machine, the combination of tube-holding means, a container for a supply of tubes, means for advancing the tube holder, means controlled by the holder for releasing the tubes from the container, and means stationary with relation to the container for delivering the released tubes to the said holder.

22. In a tube holder, the combination of tube-holding means, a container for a supply of tubes, means for advancing the holder, means controlled by the holder for individually releasing the tubes from the container, and means stationary with relation to the container for delivering the released tube to the said holder.

23. In a tube cutting machine, the combination of rotatable tube-holding means, a runway for a supply of tubes, means for retaining the tubes in the runway, means for advancing the tube holder, and an operative connection between the tube holder and the retaining means for moving the latter to release the tubes.

24. In a tube cutting machine, the combination of rotary tube-holding means, means for advancing the same, means for holding a supply of tubes adjacent the first said means, and having an outlet, means for closing said outlet, means for operating the last said means, and means operatively related to said holder for controlling the last said operating means.

25. In a tube cutting machine, the combination of tube-holding means, means for advancing the same, means for holding a supply of tubes adjacent thereto, and having an outlet, means for closing the outlet, means controlled by the tube-holder for operating the closing means to release the tubes, and means located adjacent the tube holder and stationary with respect thereto for receiving the released tube.

26. In a tube cutting machine, the combination of tube-holding means, means for advancing the same, means for holding a supply of tubes adjacent thereto, and having an outlet, a gate for closing the outlet, a cam on the tube holder, and an arm connected to the gate and engaging the cam, for operating the gate to release the tubes when the tube holder is advanced.

27. In a tube cutting machine, the combination of tube-holding means, means for advancing the same, means for holding a supply of tubes, and having an outlet, means for closing the outlet, means controlled by the tube holder, and operatively related to the closing means, for releasing the tubes, and means adapted to check the tubes when the closing means is out of position.

28. In a tube cutting machine, the combination of tube-holding means, means for securing the tubes in the holder, means for advancing the holder, means for holding a supply of tubes, said means being provided with an outlet, means for controlling the outlet, means operatively related to the tube holder for operating the controlling means to discharge the tubes, means for receiving the discharged tube, said means being adapted to hold the tube in position to be engaged by the securing means, and means for operating the securing means.

29. In a tube cutting machine, the combination of tube-holding means, means for advancing the same, means for holding a supply of tubes, and being provided with an outlet, means for controlling the outlet, means operatively related to the first said means for operating the last said means to feed the tubes to the tube holding means, and means also operatively related to the tube holding means and adapted to assume a position in the path of movement of the tubes when the outlet controlling means is out of operative position.

30. In a tube cutting machine, the combination of tube-holding means, means for advancing the holder, means for holding a supply of tubes, and being provided with an outlet, a gate for controlling the outlet, an operative connection between the tube-holding means and the gate for opening the latter to permit the tubes to be fed to the tube holder, a second gate, and an operative connection between the two gates whereby the second gate will assume a position in the path of movement of the tubes when the first gate is out of operative position.

31. In a tube cutting machine, the combination of tube-holding means, means for advancing the holder, means for holding a supply of tubes to be fed to the first said holder, said means being provided with an outlet, a

gate for the outlet, means operatively related to the first said holder for opening the gate, and means operatively related to the gate, adapted to assume a position in the path of movement of the tubes when the gate is opened, the last said means being adapted to be moved out of the path of movement of the tubes when the gate is closed, whereby the tubes will be individually discharged from the second said holder.

32. In a tube cutting machine, the combination of tube-holding means, means for advancing the holder, means for holding a supply of tubes to be fed to the first said holder, the last said holder being provided with a discharge opening, alternately operated means for controlling the discharge of the tubes, and means operatively related to the first said holder for operating the last said controlling means.

33. In a tube cutting machine, the combination of tube-holding means, means for advancing the holder, means for holding a supply of tubes to be fed to the first said holder, said means being provided with a discharge opening, oppositely disposed members adapted to control the discharge of the tube, an arm operatively related to the said members, and a cam on the first said member adapted to move the arm to alternately place said members in operative position with relation to the discharge opening.

34. In a tube cutting machine, the combination of a rotary tube holding means, means for intermittently rotating said holder, means for holding a supply of tubes to be fed to the first said holder, the last said means being provided with a discharge opening, oppositely disposed and pivotally supported members adapted to control the discharge of the tubes, an arm operatively related to said members, and a cam operatively related to the first said holder and adapted to move the arm to alternately place the said members in operative position with relation to the discharge opening.

35. In a tube cutting machine, the combination of a rotary tube holder, means for holding a supply of tubes, and having a discharge opening, pivotally supported and oppositely disposed members adapted to control the discharge of the tubes through the opening, an arm operatively related to said members, a cam operatively related to the rotary holder and adapted to be engaged by the arm, and means for intermittently rotating the first said holder, whereby the cam will move the arm to simultaneously operate the members and alternately place said members in operative position with relation to the opening, for individually feeding the tubes to the first said holder.

36. In a tube cutting machine, the combination of a shiftable mandrel, means for shifting the mandrel, means for positioning a tube to receive the mandrel, means for inserting the mandrel in the tube, means for shifting the tube when the mandrel is inserted therein, means for retaining the mandrel in the last said position, cutters, means for causing the cutters to sever the tube into sections, means for moving the cutters away from the tube when severed, and means for releasing the cut sections of the tube.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 22 day of October A. D. 1906.

ANTON MILL.

Witnesses:
SIMON ROSS, Jr.,
ED FROHLIGER.