July 24, 1934. A. M. SCOTT 1,967,374

TUBE FEEDER AND CUTTER

Filed March 15, 1930 6 Sheets-Sheet 1

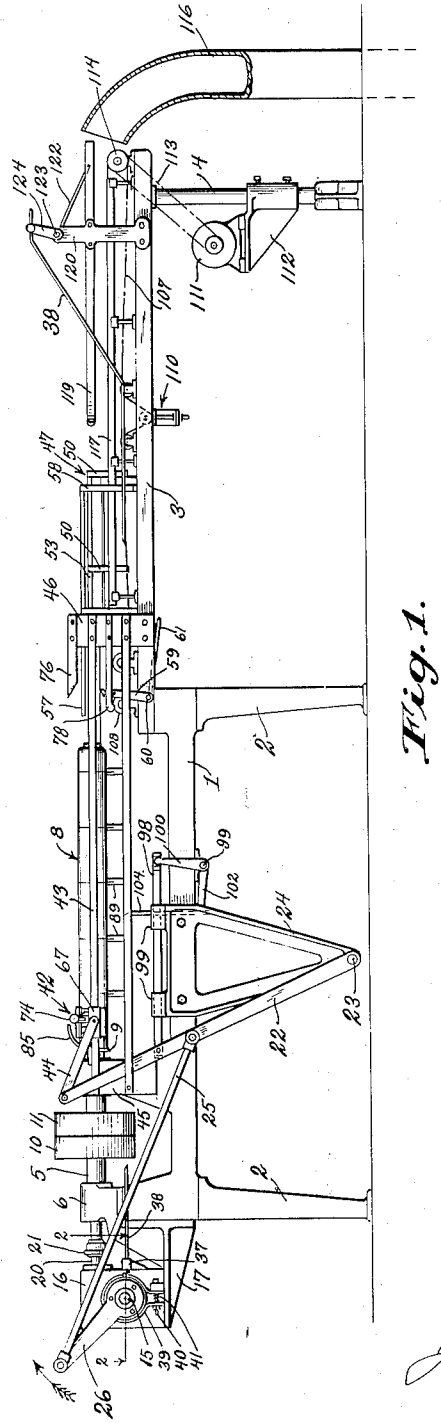

Fig. 1.

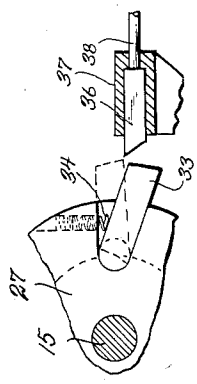

Fig. 4.

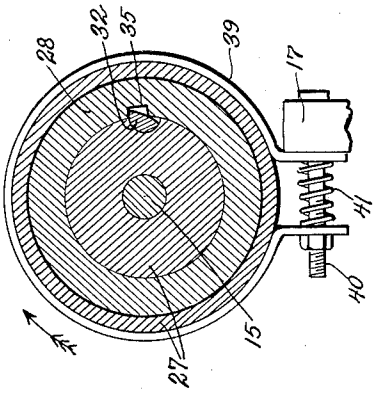

Fig. 3.

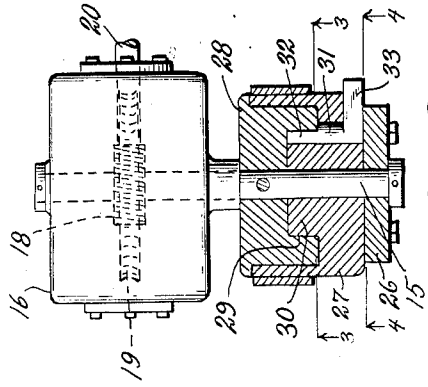

Fig. 2.

Inventor:
Allan M. Scott.

By
Jones, Addington, Ames & Seibold.
Attorneys.

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TUBE FEEDER AND CUTTER

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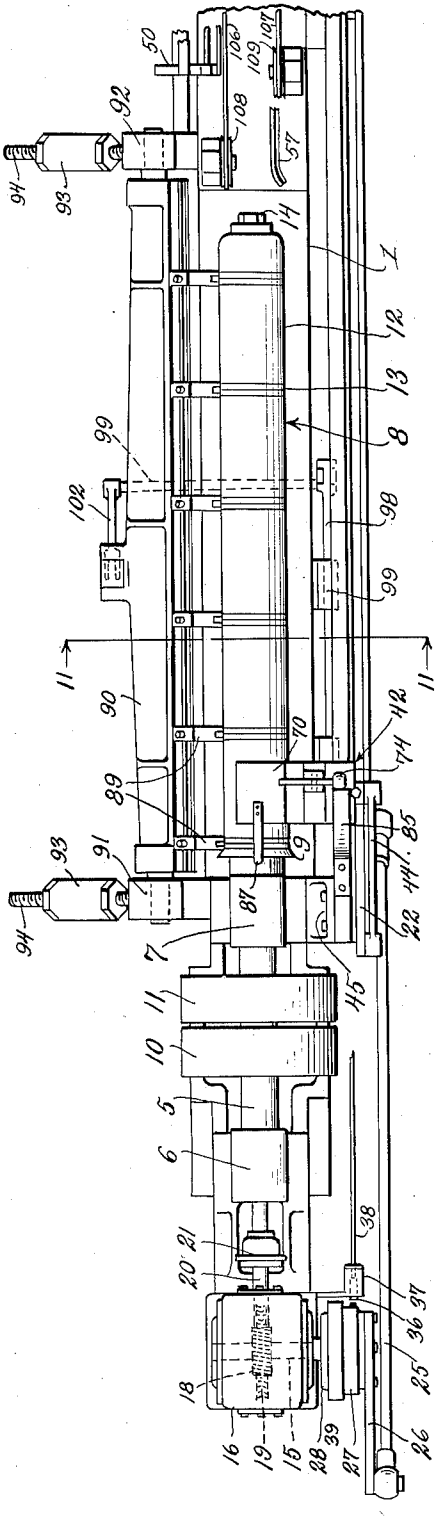

Fig. 5.

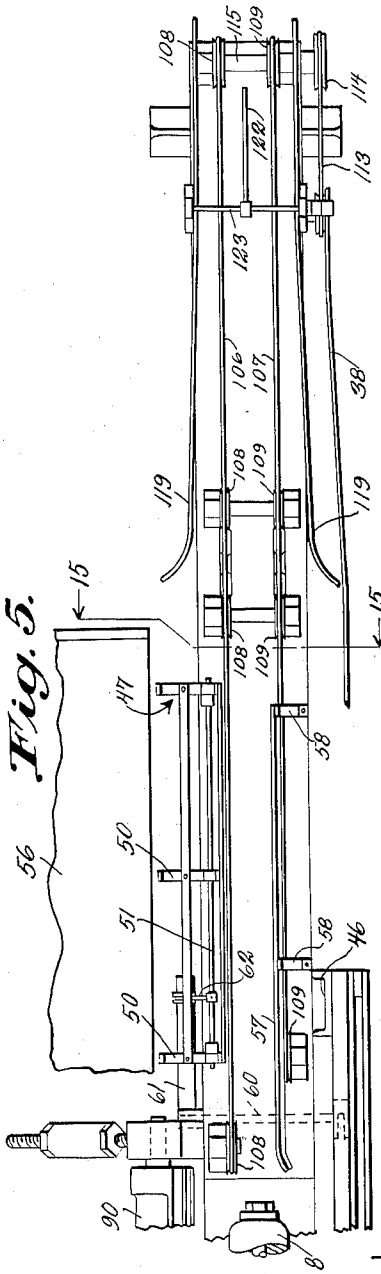

Fig. 6.

Inventor:
Allan M. Scott.

By
Jones, Addington, Ames & Seibold.
Attorneys.

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TUBE FEEDER AND CUTTER

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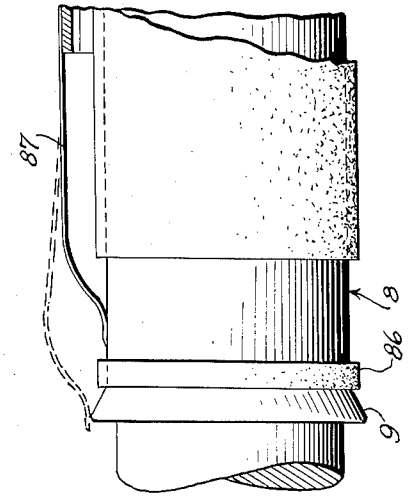

Fig. 8.

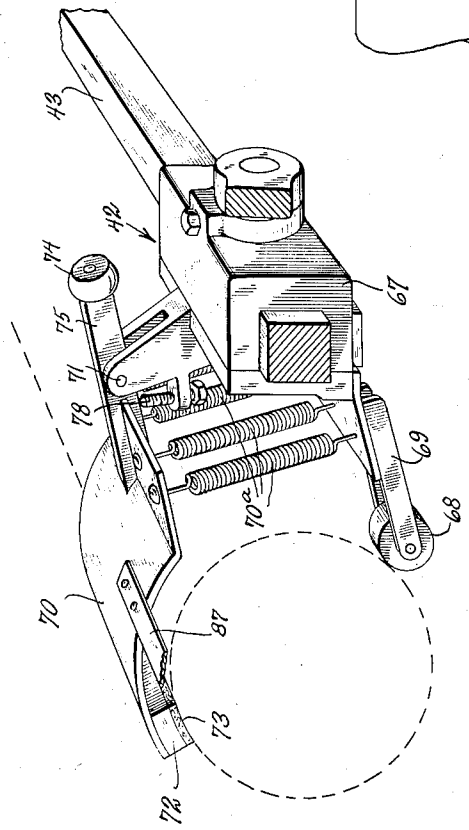

Fig. 7.

Inventor:
Allan M. Scott.

By
Jones, Caddington, Ames & Seibold.
Attorneys

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TUBE FEEDER AND CUTTER

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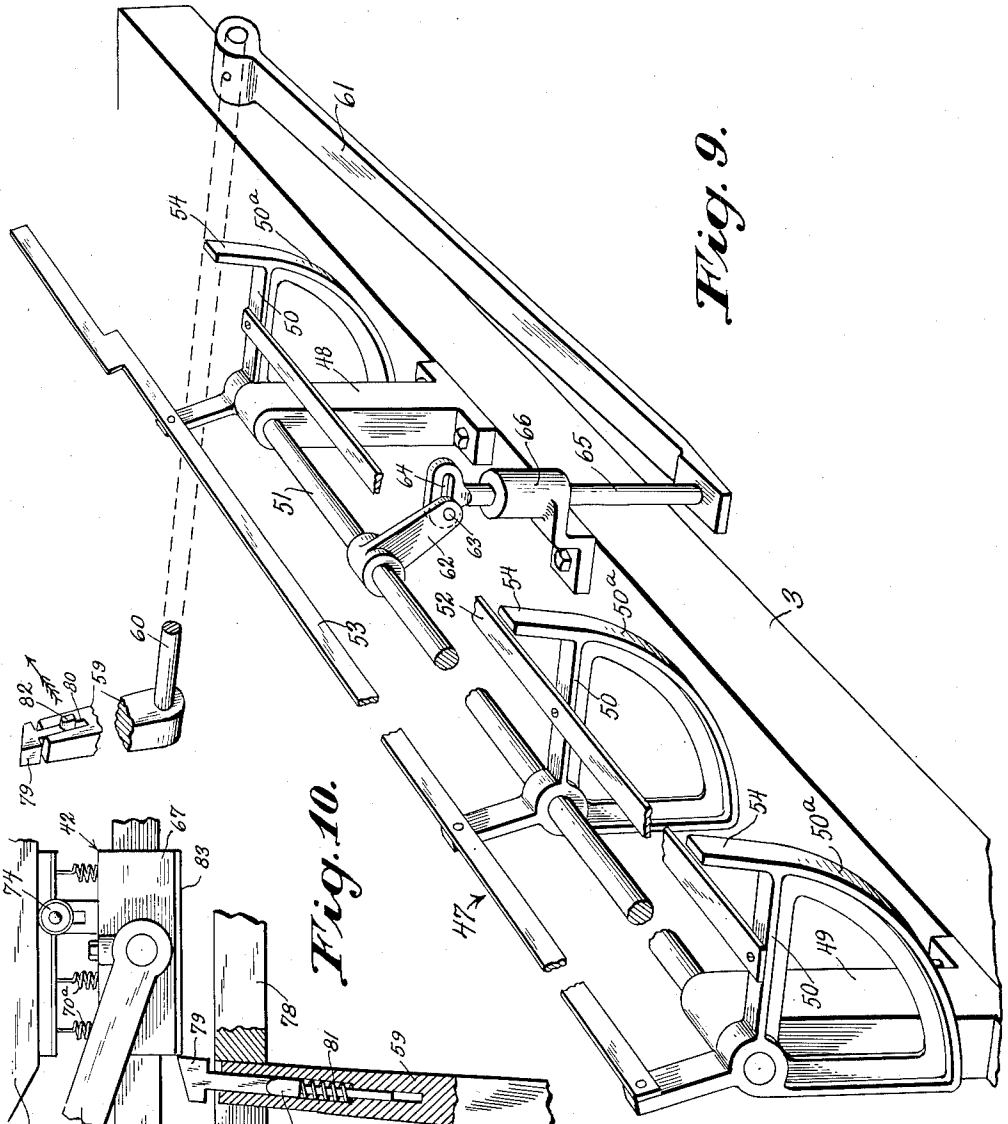

Fig. 9.

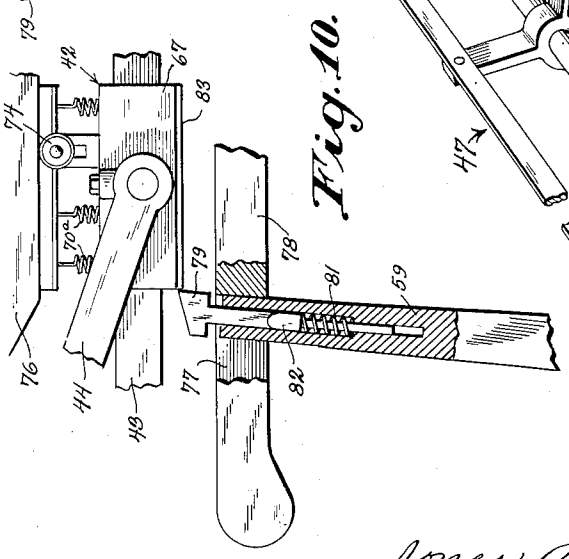

Fig. 10.

Inventor:
Allan M. Scott.
By
Jones, Addington, Ames & Seibold,
Attorneys.

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TUBE FEEDER AND CUTTER

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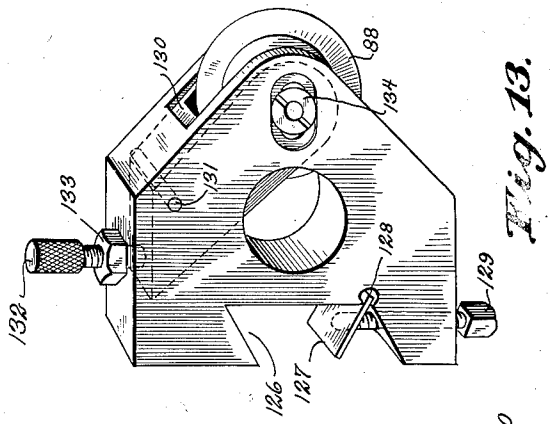

Fig. 13.

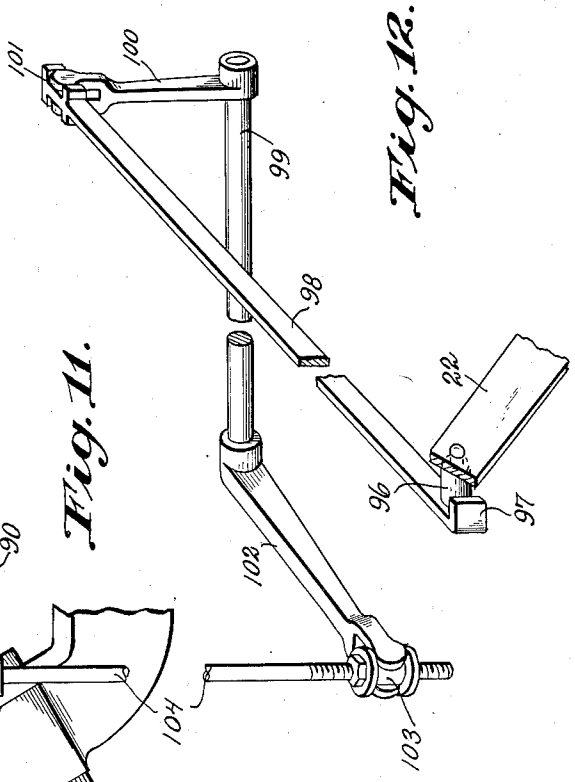

Fig. 12.

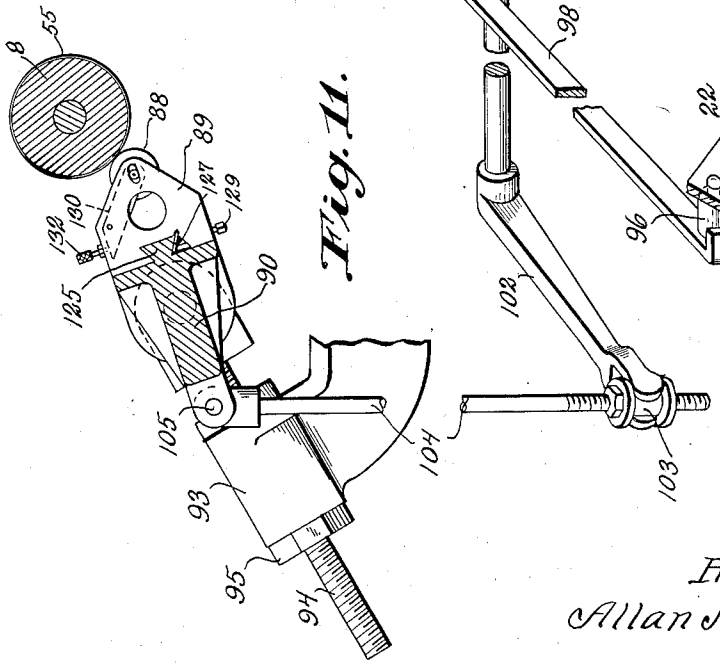

Fig. 11.

Inventor:
Allan M. Scott.

By
Jones, Addington, Ames & Seibold.
Attorneys.

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TUBE FEEDER AND CUTTER

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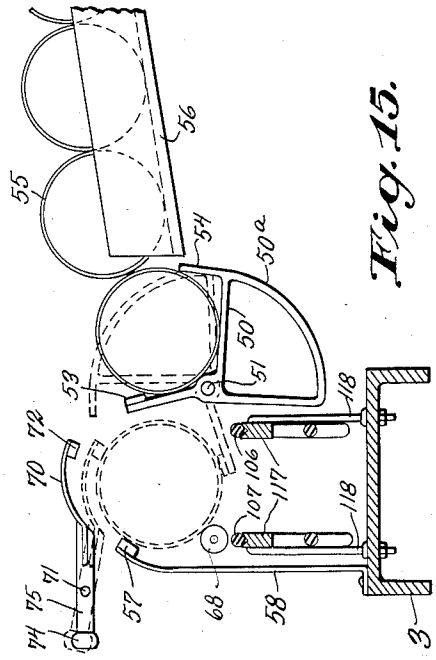

Fig. 15.

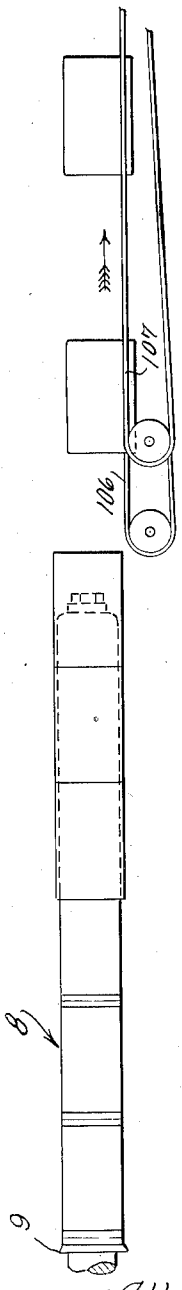

Fig. 16.

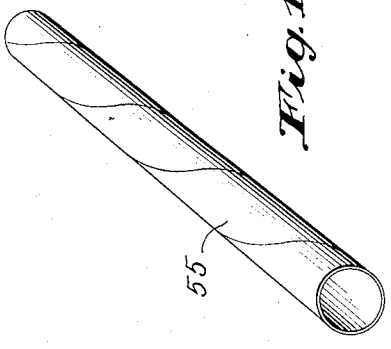

Fig. 14.

Inventor:
Allan M. Scott.

By
Jones, Addington, Ames & Seibold,
Attorneys.

Patented July 24, 1934 1,967,374

UNITED STATES PATENT OFFICE

1,967,374

TUBE FEEDER AND CUTTER

Allan M. Scott, Cedar Rapids, Iowa, assignor to The Quaker Oats Company, Chicago, Ill., a corporation of New Jersey

Application March 15, 1930, Serial No. 436,244

44 Claims. (Cl. 164—69)

My invention relates to means for severing an article into a plurality of sections, and it has particular relation to an apparatus for automatically cutting a tube into a plurality of sections.

A large number of products are at present packed in cylindrical containers commonly known as paper cans. Such containers are formed by placing caps at the top and bottom of a cylindrical section, which latter is usually made of paper or other readily-formable material.

It is an object of my invention to facilitate the production of the cylindrical section portions of such packages by providing a machine to which long tubes may be automatically fed, and in which such tubes may be cut into a plurality of sections, which cut sections may thereafter be expeditiously ejected from said machine.

Another object is to provide a means for automatically cutting tubes into sections of predetermined length and in which all operations of receiving, cutting and ejecting are performed independently of the attention of an operator.

It is also an object to provide a machine for performing the above mentioned operations which will be automatically stopped and started to prevent the cutting and ejecting of the sections faster than they can be conveniently removed.

A further object is the provision of a tube feeding and cutting machine of relatively small dimensions even though it comprehends a feeding zone and a cutting zone, the articles being moved into the latter from the former.

Another object is to provide an automatic tube cutting machine which may be easily adjusted to cut the tubes into substantially any desired number of sections.

Further objects will be apparent from the specifications and appended claims.

In the drawings:

Figure 1 is a side elevation of a machine embodying my invention;

Fig. 2 is a detail sectional view of a clutch mechanism of the machine taken on a line substantially corresponding to line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view taken on a line corresponding to line 3—3 of Fig. 2;

Fig. 4 is a detail sectional view on line 4—4 of Fig. 2;

Fig. 5 is a top plan view of the cutting zone which comprises the left-hand end of the machine;

Fig. 6 is a top plan view of the right-hand end of the machine which includes the feeding zone;

Fig. 7 is a perspective view, partially in section, of a carriage and associated tube gripping mechanism included in the machine;

Fig. 8 is a fragmentary side elevational view of a mandrel included in the machine and means for removing the trimmed end of the tube therefrom;

Fig. 9 is a perspective view of a tube feeding cradle and the cradle operating mechanism;

Fig. 10 is a side elevational view of the carriage and a cradle-operating lever associated therewith, the latter being shown partly in section;

Fig. 11 is a fragmentary transverse sectional view through the mandrel and a knife supporting means taken on a line corresponding to line 11—11 of Fig. 5;

Fig. 12 is a fragmentary perspective view of certain knife operating mechanism;

Fig. 13 is a perspective view of one of the knife supporting blocks and knife adjusting means;

Fig. 14 is a perspective view of a long tube, such as is intended to be fed to, and cut into sections in, a machine of my invention;

Fig. 15 is a fragmentary diagrammatic view partially in transverse section on a line corresponding to line 15—15 of Fig. 6; and

Fig. 16 is a diagrammatic view showing the relative position of the tube sections as they are pushed from the mandrel to the conveyor to be ejected from the machine.

Referring more particularly to the drawings, one portion of my machine may be designated as a cutting zone, which comprises, as the drawings are viewed, practically the entire left hand half of the machine, whilst the right hand portion may be designated as the feeding zone.

It will be understood that the machine is so positioned in use that the feeding zone thereof is adjacent the exit end of a suitable feed chute shown diagrammatically in Figs. 6 and 15. The chute is preferably connected with the tube delivery end of a suitable tube making machine. The tube walls are comparatively thin and made of paper or other suitable material and the tubes are fed into the chute at a point above the exit thereof so that they will roll down therethrough and fall, as they leave the chute, into a suitable cradle, the cradle being pivotally mounted longitudinally thereof so that it may be moved to carry a tube resting therein to a position to be transferred into the cutting zone of the machine, where it will be cut into a plurality of sections and then be transferred back through the feeding zone and ejected from the machine into a suitable discharge chute.

The embodiment illustrated comprises a bed 1, comparatively narrow and somewhat similar to an ordinary lathe bed, and supported on legs 2, which in turn support the mechanism included in the cutting zone. An extension bed 3, which, in the present instance, comprises an inverted channel bar, is secured to the cutting zone bed 1 and supported by the standard 4. The bed 3 supports the mechanism included in the feeding zone.

A longitudinal shaft 5 is mounted in suitable bearings 6 and 7 on the bed 1, (Figs. 1 and 5) and supports a mandrel 8, which is of a suitable length and diameter to receive one of the tubes to be cut. The tubes are easily slipped on and off the mandrel but have sufficient frictional contact therewith when they are forced against beveled end 9 (Figs. 5 and 8), to cause them to be rotated with the mandrel.

The shaft 5 and its associated mandrel may be driven and controlled by any suitable means such as tight and loose pulleys 10 and 11, respectively, the mandrel being constantly rotated during the operation of the machine.

The mandrel 8 is preferably made up of tubular sections 12 and 13, which are slipped on the shaft and secured by the nut 14. The narrow sections 13 are of comparatively soft material to provide a suitable cutting surface and to prevent dulling the rotary cutters, which will be described later. The sections 12 may be of a length corresponding substantially to the length of tube section which it is desired to cut.

A transverse shaft 15 is mounted in the transmission casing 16, on the bracket 17, and is driven from the main shaft 5 for operating the cutting and feeding mechanisms.

The transmission means between the shafts 5 and 15 comprise a worm 18 and a gear 19, the worm being secured on a stub shaft 20 which forms an extension of the main shaft 5 and to which it is connected by a flexible coupling 21. The gear 19 is secured to the shaft 15. The purpose of the transmission mechanism and the transverse shaft 15 is to drive an oscillating lever 22 pivoted at 23 on a bracket 24, which latter is, in turn, secured to the side of the bed 1. The oscillating lever is operatively connected to the transverse shaft 15 by means of a link 25, and a crank arm 26, which latter is secured to a driven member 27 of a suitable clutch on the transverse shaft 15.

The clutch comprises a driving member 28, which is rigidly secured to the shaft 15 and provided with an annular concentric bore 29 into which extends a reduced cylindrical portion 30 of the driven member 27. The reduced cylindrical portion 30 is machined for a free running fit in the bore 29. A clutch pawl 31 is mounted for oscillation in the driven member 27, a reduced engaging portion 32 being machined on a radius substantially equal to the radius of the reduced cylindrical portion of the driven member. The pawl is provided with an outwardly extending arm 33 and is normally held in the position shown in Figures 3 and 4 by means of a spring 34. In this position the reduced portion 32 is engaged in a slot 35 in the driving member 28. It is obvious that with the pawl in the position shown,—when the shaft 15 and its associated clutch driving member 28 are rotated in the direction of the arrow shown in Fig. 3,—the driving and driven members will be locked together by the pawl and the arm 26 will be rotated to oscillate the lever 22 by means of the link 25. In order to disengage the driving and driven clutch members, a detent 36 is slidably mounted in a bracket 37 and is secured to a rod 38 which extends to a point adjacent the discharge chute of the machine where it may be operated by means which will be later described.

When the detent 36 is moved forward into the path of the pawl arm 33, the pawl will be moved to the position shown by dotted lines in Fig. 4, releasing the reduced portion 32 from the slot 35 in the driving member. The driven member will thus be released and the crank arm 26 and oscillating arm 22 will always stop in the position shown in Fig. 1, as only one slot is provided in the driving member. In order to prevent back lash of the driven member and its associated mechanism, a brake band 39 is secured to the bracket 17 by a bolt 40. The brake band is normally held in position to allow the free rotation of the driven member, by means of the spring 41. Any back lash of the driven member causes the brake band to be immediately engaged thereby.

A tube carriage 42 is mounted for longitudinal movement on a guide bar 43 and is connected to the oscillating lever 22 by means of a link 44. The guide bar 43 is mounted on upright brackets 45 and 46 and extends adjacent to and in parallel relation to the mandrel 8. The carriage is provided with engaging means for the purpose of engaging the tube in the feeding zone of the machine and moving it onto the mandrel where it is cut into sections, which sections are then removed from the mandrel by the same engaging means during the return movement of the carriage to the feeding zone, these operations being accomplished during the oscillation of the lever 22.

A tube receiving cradle 47 is positioned in the feeding zone of the machine, being mounted on suitable brackets 48 and 49 on the extension feeding zone bed 3. The cradle comprises a plurality of skeleton frame members 50, secured to a shaft 51, and on which are supported two guide bars 52 and 53. The frame members 50 are provided with upwardly extending tube engaging portions 54. Tubes 55 are fed to the cradle through a chute 56 (see Figs. 6 and 15) and drop by gravity into the cradle as shown. When the cradle is oscillated to the position shown by dotted lines in Figure 15, the tube is moved into alignment with the mandrel 8 and rests against a stationary guide bar 57, which is mounted on suitable brackets 58. The arcuate portion 50a of the cradle frame members 50 serves to retain the succeeding tubes in the chute during the oscillation of the cradle. The tube is then in a position to be engaged by the carriage 42 when it is moved to the extreme rearward position by the oscillating lever 22.

The cradle 47 is oscillated to move the tube into alignment with the mandrel by means of an arm 59, a transverse rock shaft 60 and a lever 61 mounted on said rock shaft. An arm 62 is secured to the cradle shaft 51 and provided with a pin 63 engaging in a slot 64 in a rod 65, which latter is slidably mounted in a bearing 66 and arranged to be operably engaged by the lever 61. It will be seen from Fig. 9 that a movement of the arm 59 in the direction of the arrow will cause the oscillation of the cradle to bring the tube therein into alignment with the mandrel. The arm 59 is moved by engagement with the tube carriage as will be described later.

The carriage 42 comprises a block 67 arranged to slide on the guide bar 43, and which carries a

roller 68 mounted on a bracket 69. An arcuate tube clamping member 70 is pivotally mounted at 71 on the carriage and provided with a tube clamping portion 72 preferably having a lining 73 of felt or other suitable material. Springs 70a are secured to the bracket 69 and the clamp member 70 for the purpose of holding the latter member in clamping position. An adjustable stop 78 is provided to allow the clamping member to be accurately so adjusted that the tube may be clamped but the clamping member will clear the mandrel during its longitudinal movement when a tube is not engaged.

A roller 74 is mounted on an arm 75 and, during the extreme rearward movement of the carriage, is engaged by a cam bar 76 on the bracket 46 (Figs. 1 and 10), this engagement causing the clamping member to be raised to the position shown in Fig. 15 so that the tube may be received from the cradle between the roller 68 and the clamping member 70. The cradle operating lever 59 extends through a slot 77 in a suitable cam bar 78, which is also secured to the bracket 46. A dog member 79 is slidably mounted in a slot in the lever 59 and normally forced upwardly by means of a spring 81, ears 82 being in slidable engagement with the cam bar 78.

When the carriage is moved to the extreme rearward position shown in Fig. 10, a plate 83 secured to the carriage 42 is engaged behind the dog member 79. As soon as the carriage starts its return movement, the lever 59 will be moved to oscillate the cradle and move the tube into position, to be clamped in the carriage. At the same time the roller 74 will be released from the cam bar 76 and the springs 70a will cause the tube to be clamped between the clamping member 70 and the roller 68. The tube will be clamped a short distance from the left-hand end approximately as shown in Fig. 8, and when it is carried onto the mandrel during the return movement of the carriage, it will engage a beveled flange 9 on the mandrel, where it will be frictionally held for rotation therewith. At approximately the same time that the tube engages the beveled flange, the roller 74 will be engaged by a cam member 85 mounted on the guide bar 43 and the clamping member 70 will be raised to allow the free rotation of the tube with the mandrel.

In Fig. 8, a narrow ring or tube section 86 is illustrated, which section remains on the mandrel after the sections of the previously-cut tube are removed. The tubes as received at the loading zone usually have rough ends, which it is necessary to trim by one of the cutter knives to be later described, the trimmed ring remaining on the mandrel as shown. In order to remove this ring so that the succeeding tube may engage the inclined flange 9, a spring 87 is secured to the carriage clamping member 70 and extends to a point adjacent the mandrel, where it is in a position to engage the ring section 86 and be raised by the beveled flange during the movement of the carriage, thereby breaking and removing the ring from the mandrel.

During the time that the carriage clamping means is disengaged from the tube by means of the cam member 85 engaging the roller 74, the tube is cut into suitable length sections by a plurality of rotary cutters 88, each supported in a suitable block 89 mounted on a cutter bar 90, which is pivoted for oscillation in bearings 91 and 92. These bearings are adjustably supported in suitable brackets 93 by means of threaded members 94 and lock nuts 95. The cutter bar 90 and associated cutters 88 are normally in a lowered position so that the cutters will not engage the tube while it is being moved onto the mandrel.

During the time that the carriage clamping means releases the tube through the cooperation of the cam member 85 with the roller 42, the cutters 88 are raised into engaging cutting position with the tube by means of the mechanism illustrated in Figs. 1 and 12. Said mechanism comprises a roller 96 on the oscillating bar 22, the roller being positioned to engage an outwardly extending lug 97 on a slide member 98. The slide member is mounted in suitable guides 99 on the bracket 24. A transverse rock-shaft 99 is mounted in suitable bearings on the bed 1 and provided with an arm 100 engaging in slots 101 in the slide member 98. The opposite end of the rock shaft 99 is operably connected to the cutter bar 90 through an arm 102 engaging a spool 103, which latter is adjustably mounted on a link 104, pivoted at 105 on the cutter bar.

It will be understood from Figs. 11 and 12 that,—when the roller 96 on the oscillating lever 22 engages the lug 97,—the cutters 88 will be raised to cutting position, as shown, and the tube will be cut into sections of predetermined length. As soon as the lever 22 starts its rearward movement, the cutters 88 are lowered out of engagement with the tube. At the same time, the roller 74 on the carriage is released from the cam 85, thereby again clamping the first section of the tube so that,—during the rearward movement of the carriage,—all of the sections will be pushed from the mandrel. The last, or furthest to the left, section (Fig. 5 and 6) is released from the carriage by the engagement of the carriage roller 74 with the cam member 76 and the consequent raising of the clamping member 70.

In order to remove the sections from the machine as they are pushed from the mandrel, a suitable conveyor is provided comprising belts 106 and 107 mounted on pulleys 108 and 109, respectively, said pulleys being supported on suitable brackets on the extension bed 3. Suitable belt tighteners are provided as at 110. These conveyor belts are driven at relatively high speed by means of a motor 111 mounted on a bracket 112, the latter being adjustably supported on the standard 4. A belt 113 connects the motor with a drive pulley 114 on a conveyor drive shaft 115. The conveyor belts travel in the direction of the arrow shown in Figure 16 and are positioned somewhat below the center line of the mandrel, so that the tubes as they are pushed from the mandrel fall on these conveyor belts as shown and are moved to the rear of the machine, where they are ejected into a chute 116. Conveyor belt supporting guide bars 117 are supported on suitable brackets 118 to guide the belt and prevent sagging or lateral movement. Out-turned side guide bars 119 are supported on upright brackets 120, in order to retain the tubes on the conveyor. One of the conveyor belts is shorter than the other and at a greater distance from the mandrel, as shown, thereby permitting the short, trimmed section of the tube adjacent the end of the mandrel to drop from the machine without being engaged by the conveyor.

It will be understood that all of the operations of the machine are synchronized in order that they occur in proper sequence. The cradle 47,—after a tube drops thereinto,—is rotated through approximately 90° to move the tube into alignment with the mandrel. The tube is then

clamped in the carriage and is moved onto the mandrel. After the tube is released from the carriage the cutting operation is performed. The first cut section of the tube is again grasped in the carriage, the cradle is returned to its original position, and the sections are pushed from the mandrel by the return movement of the carriage. During the operation of the cradle, the succeeding tubes are held in the chute 56 by means of the arcuate portions 50a of the cradle frame members 50.

In order that the feeding and cutting operations may be stopped in case the sections are not removed from the chute 116 as fast as they are supplied thereto, an arm 122 is secured to a rock shaft 123, which is mounted in the brackets 120. The rock shaft 123 is connected to the clutch detent rod 38, previously mentioned, by means of an upwardly extending arm 124. When the chute 116 is filled with tube sections, the arm 122 will be raised, thereby pushing the detent 36 into engaging position with the clutch pawl arm 33 and stopping the feeding and cutting operations by releasing the clutch driven member as previously described.

As previously mentioned, the rotary cutters 88 are mounted on the blocks 89 on the cutter bar 90. Each block is longitudinally adjustable on the cutter bar by means of a dovetail connection therewith, said connection comprising tongue 125 on the bar, and a groove 126 in the block (Fig. 13). The block is clamped to the tongue 125 by a clamping plate 127 pivoted at 128, and arranged to be clamped against the tongue by a screw 129.

A lever 130 is pivoted at 131 and engages the bearing portion of the rotary cutter 88 for adjusting the relative position of the cutter, the adjustment being accomplished by a thumb screw 132 in cooperative engagement with the lever 130. The screw is provided with a lock nut 133 and the cutter is secured in adjusted position by a bearing screw 134.

The adjusting means just described makes possible the cutting of sections of any desired length within the capacity of the machine, and the accurate adjustment of the cutters relative to the mandrel surface.

From the foregoing description, it will be apparent to those skilled in the art that the aforedescribed machine may be varied in its physical embodiment without departing from the spirit of the invention, and I desire, therefore, that the same be limited only by the scope of the prior art and the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a tube cutting machine, a mandrel, a relatively short carriage adjacent said mandrel and longitudinally movable relative thereto to move a tube onto said mandrel, means for cutting the tube on said mandrel, spring-controlled means on said carriage for alternately grasping and releasing a tube, and means to cause said grasping means to be released at each end of the carriage movement and to be engaged during the intermediate part of the movement.

2. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, a tube supply, means for receiving a tube from said supply and placing it on said mandrel, said last-named means including a cradle into which tubes are fed and movable into alignment with said tube supply to receive a tube and out of alignment to form barrier against further tube feed.

3. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, a tube supply, means for automatically receiving a tube from said supply and placing it on said mandrel, said last means including a movable cradle into which a tube is fed from the tube supply, clamping means engaging said tube near the end adjacent said mandrel to move said tube onto said mandrel, and means releasing said clamping means during cutting on the mandrel whereby said clamping means both applies and removes the tube.

4. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being divided, means for feeding tubes laterally from a tube supply and for aligning successive tubes with the mandrel, said last means being adapted to intermittently constitute a barrier against further tube feed, and means for placing the tubes one by one on said mandrel.

5. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, a tube supply, means for automatically receiving a tube from said supply and placing it on said mandrel, said last means comprising a cradle into which a tube is fed, means for shifting said cradle so that the tube will be in axial alignment with said mandrel, means for transferring said tube from said cradle to said mandrel, the cradle further comprising means for stopping the tube supply during said transfer, cutting means, and means for removing the tube sections after cutting.

6. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, a tube supply, means for automatically receiving a tube from said supply and placing it on said mandrel, said last means comprising a cradle into which a tube is fed, which cradle is pivotally mounted longitudinally of its length, means for rotating said cradle about its pivotal mounting to bring said tube into position to be transferred to said mandrel, the cradle during said rotation constituting a barrier against further tube feed, means for grasping said tube and moving it longitudinally onto said mandrel, cutting means adapted to be moved into cutting relation with said tube on said mandrel, and means for removing the cut tube.

7. In an apparatus for dividing a tube into predetermined lengths, a mandrel to receive the tube, transfer means automatically operable to engage one end of said tube and movable to place said tube on said mandrel and to later remove it therefrom, means for dividing the tube on said mandrel, means interrupting tube engagement during the dividing operation, and means for causing a reengagement of said tube whereby the transfer means both applies and removes said tubes.

8. In an apparatus for dividing a tube into lengths, a mandrel to receive the tube, means for consecutively positioning tubes, transfer means for automatically placing a positioned tube on said mandrel and comprising a reciprocable carriage having tube carrying means thereon arranged to be pressed against the surface of the tube, rotary tube cutters movable to contact with said tube, and means releasing the tube carrying means during the cutter contact and allow-

ing reengagement to strip the lengths from the mandrel.

9. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel corresponding in shape with the tube to be severed, transfer means for automatically placing a tube on said mandrel including a cradle into which the tubes are initially fed, means for moving said cradle to bring said tube into axial alignment with said mandrel, reciprocal means having a frictionally engaging finger for grasping a tube and moving it lengthwise onto said mandrel, and means for causing an element of said transfer means to strip the cut tube sections from said mandrel on its return stroke.

10. An automatic machine for receiving and cutting tubes and having included therein a cutting zone and a feeding zone, means for receiving a tube in the feeding zone, means for moving the tube to the cutting zone, means for cutting the tube, means for moving the cut tube to the feeding zone, means for ejecting the cut tubes, and automatic means associated with the ejecting means for controlling the tube feeding means.

11. An apparatus for dividing a tube into predetermined lengths, said apparatus including a feeding zone and a cutting zone, means for moving a tube from a supply to the feeding zone, a reciprocating means for engaging and pulling the tube from the feeding zone to the cutting zone, means in the cutting zone for cutting the tube, and means for reengaging and pushing the cut tube to the feedinz zone.

12. A tube cutting device including a cutting zone and a feeding zone in substantially axial relation, means for moving a tube from a supply into said feeding zone, a reciprocating member having tube-surface-engaging means for automatically engaging and moving the tube from the feeding zone to the cutting zone and automatically releasing the tube in the cutting zone, means for causing the release and reengagement of the tube in the cutting zone, means for cutting the tube into sections during the disengagement, means whereby the cut sections are removed from the cutting zone to the feeding zone during reengagement, and ejecting means for moving the sections from the feeding zone, all of the movements of said tube and said sections through said zones being on substantially the same axial line.

13. A tube cutting machine comprising a rotating mandrel, means for bringing a tube into alignment with said mandrel, reciprocating means for engaging the side of said tube and placing it on said mandrel, means for releasing said engaging means and means for cutting said tube into sections, said reciprocating means automatically operating during movement in the opposite direction to reengage the side of said tube to remove the sections from said mandrel after the cutting operation.

14. An automatically operable tube cutting apparatus comprising a rotatable mandrel, means for moving tubes into axial alignment with said mandrel, means for engaging and moving a tube onto said mandrel, means for disengaging the engaging means, means for cutting the tube while disengaged, and means including the engaging means for reengaging and removing the tube from said madrel.

15. A tube trimming device comprising a mandrel, a longitudinally movable tube carriage for carrying a tube onto said mandrel, means for trimming the end of said tube, and longitudinally operable means for removing the trimmed end of the tube tranversely from said mandrel.

16. A tube trimming device comprising a mandrel, a longitudinally movable carriage for carrying a tube onto said mandrel, means for trimming the end of said tube, and means on said carriage for automatically engaging inside said trimmed end and removing the trimmed end of the tube from said mandrel.

17. A tube trimming device comprising a mandrel, a longitudinally movable carriage for placing a tube on said mandrel, means for trimming the end of said tube, and automatic means for rupturing the trimmed end of the tube and causing it to be removed from said mandrel during the movement of the succeeding tube onto the mandrel.

18. A tube cutting machine comprising a mandrel, means for receiving a tube and moving it transversely into alignment with said mandrel, a mechanism for clamping said tube and longitudinally moving said tube onto the mandrel, means for cutting the tube, means to release and reengage said tube during and after cutting respectively for longitudinally removing the cut tube from the mandrel, means for operating said receiving means, and means for operating said cutting means, both of said last means cooperating with said tube-moving mechanism for synchronizing all of the said operations.

19. An automatic tube cutting machine comprising a transversely oscillatable tube receiving means, a transversely oscillatable tube cutting means, means for moving tre tube from the receiving means to a position adjacent the cutting means, means for rotating the tube trip means cooperating with said tube moving means for moving said receiving means, and trip means cooperating with said tube moving means for transversely oscillating the cutting means to engage the tube, the tube moving means being adapted to remove the tube after the cutting is effected.

20. In an apparatus for dividing a tube into a plurality of predetermined lengths, an oscillating cradle for receiving a tube, means for supplying tubes to said cradle by gravity, a mandrel, means for oscillating said cradle to allow said tube to move by gravity into alignment with said mandrel, a longitudinally movable tube gripping means for moving the tube onto said mandrel, said cradle including a guide for guiding said tube while it is being moved onto said mandrel, means for cutting said tube into lengths, said gripping means being adapted to remove the tube lengths from said mandrel after said cradle has been returned to tube receiving position.

21. In an apparatus for dividing a tube into sections of predetermined length, an oscillating cradle for receiving a tube, means for supplying tubes to said cradle by gravity, means on said cradle for retarding the tubes in said supplying means while said cradle is being oscillated, means for oscillating said cradle to allow the tube therein to move by gravity into alignment with said mandrel, an oscillating tube gripping means for gripping the tube adjacent its ends and moving it onto the mandrel, means for releasing the tube gripping means to allow the tube to rotate with the mandrel, and means for cutting the tube into sections, said gripping means being adapted to grip one of the sections and thereby remove all of the sections from the mandrel during the return movement of the gripping means.

22. A tube cutting machine comprising a movable means for receiving a tube from a tube supply, a tube supporting means, means for moving said tube from said receiving means to said supporting means, movable means for cutting the tube, means cooperating with said tube moving means during the initial part of its forward movement to move said receiving means, and means cooperating with the tube moving means during the latter part of its forward movement to operate said cutting means.

23. A tube cutting machine comprising a tube receiving means, a tube supporting means, a longitudinally movable carriage for moving said tube from the receiving means to the supporting means, a tube clamping means on said carriage, and means independent of said carriage and cooperative therewith during its initial movement to operate said clamping means.

24. A tube cutting machine comprising a tube receiving means, a tube supporting means, a longitudinally movable carriage for moving said tube from said receiving means to said supporting means, a tube engaging means on said carriage, means cooperating with said carriage during its initial movement for operating said engaging means, and means cooperating with said carriage during the latter part of the carriage movement to release said engaging means.

25. A tube cutting machine comprising a movable tube receiving means, a tube supporting member, a movable tube engaging means for moving said tube from said receiving means to said supporting means, means for disengaging the engaging means, a movable cutting means for cutting said tube into sections, means for reengaging the engaging means to remove the cut tube from the supporting means, all of said means being synchronously controlled for continuous consecutive operation.

26. A tube cutting machine including a cutting zone and a feeding zone in substantially axial relation, a longitudinally movable carriage for moving a tube into and out of said cutting zone, and means on said carriage for engaging and disengaging said tube during one directional movement of the carriage and for reengaging and disengaging said tube during the opposite directional movement.

27. A tube cutting machine including a cutting zone and a feeding zone in substantially axial relation, a longitudinally movable carriage for moving a tube into and out of said cutting zone, means on said carriage for engaging and disengaging said tube during one directional movement of the carriage and for reengaging and disengaging said tube during the opposite directional movement, and means for cutting the tube during the disengagement of the engaging means.

28. A tube cutting machine including a cutting zone and a feeding zone in substantially axial relation, a longitudinally movable carriage for moving a tube into and out of said cutting zone, means on said carriage for engaging and disengaging said tube during one directional movement of the carriage for reengaging and disengaging said tube during the opposite directional movement, means for cutting said tube into sections during disengagement of the engaging means, and means for ejecting the sections through the feeding zone at a speed relatively greater than the speed of the carriage.

29. A tube cutting machine including a cutting zone and a feeding zone in substantially axial relation, a longitudinally movable carriage for moving a tube into and out of said cutting zone, means on said carriage for engaging and disengaging said tube during one directional movement of the carriage and for reengaging and disengaging said tube during the opposite directional movement, means for cutting said tube into sections during disengagement of the engaging means, means for ejecting the sections through the feeding zone at a speed relatively greater than the speed of the carriage, and means operable by the sections for controlling the operation of the carriage.

30. A tube cutting machine including a tube receiving zone and a tube cutting zone in substantially axial alignment, a drive shaft, a mandrel on said shaft and extending into said cutting zone, a longitudinally movable carriage adjacent said mandrel for moving a tube from said receiving zone onto and off from said mandrel, means operably connected with said drive shaft for moving said carriage, means for cutting said tube while on said mandrel, means on said carriage for engaging and disengaging said tube during one directional movement of the carriage and for reengaging and disengaging said tube during the opposite directional movement, and ejector means for ejecting the cut tube.

31. In a tube cutting machine, a mandrel, means for placing tubes on said mandrel comprising a longitudinally movable carriage, a tube engaging stop member on said carriage, means for moving a tube against said stop and into alignment with said mandrel, a frictionally-engaging means on said carriage for engaging said tube between said stop and said engaging means, and means for moving said engaging means to disengaging position adjacent each end of the longitudinal movement of the carriage.

32. A tube cutting machine including a feeding zone and a cutting zone in substantially axial alignment, a tube supporting means in said cutting zone, means for transferring a tube from the feeding zone to the supporting means, means for cutting the tube into sections, means for removing the cut sections from said supporting means, and means for moving the sections through the receiving zone below the axial line thereof.

33. A tube cutting machine including a feeding zone and a cutting zone, a mandrel in said cutting zone, a driving means for said mandrel, means for moving a tube from said feeding zone onto said mandrel, means for cutting said tube into sections, said moving means being adapted to remove the sections from said mandrel, a transmission means between said driving means and said moving means, a clutch in said transmission means, and means for controlling said clutch by said removed sections.

34. In a tube cutting machine, a mandrel, a transfer means for automatically placing a tube on said mandrel comprising a carriage movable longitudinally of said mandrel, spring-controlled means on said carriage for alternately engaging and disengaging the cylindrical surface of said tube, means for cutting said tube into sections while said spring-controlled means is disengaged, and means for moving said carriage to move said tube while said spring-controlled means is engaged.

35. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, clamping means for pulling a tube onto said mandrel and

for pushing the cut sections off of said mandrel after said tube has been divided, and means to effect the release of said clamping means while the tube is being cut.

36. In an apparatus for dividing a tube into a plurality of predetermined lengths, a mandrel for supporting a tube while being cut, an oscillatable means for disposing a tube in position to be transferred to said mandrel, and clamping means comprising a member engaging said tube to pull it onto said mandrel, said means also functioning after said tube has been subdivided to push the divided sections off of said mandrel, and means to effect the release of said clamping means while the tube is being cut.

37. An apparatus for dividing a tube into lengths and having a feeding zone and a dividing zone, means in said feeding zone for isolating a tube from a supply, means for making a positive connection with the side of said tube for movement thereof, said last means being reciprocable to move said tube to and from said dividing zone, and means for dividing said tube in said dividing zone.

38. An apparatus for dividing a tube into lengths comprising a mandrel, a tube cutter, means for moving a tube from a tube supply into alignment with said mandrel, means for positively engaging the side of the tube and operable for reciprocating the tube to and from a position on said mandrel, and means to cause relative cooperative cutting movement between the cutter and tube while the tube is on said mandrel.

39. An apparatus for dividing a tube into lengths, means for segregating a tube from a supply, dividing means, reciprocable means for positively engaging the cylindrical surface of said tube and moving the tube longitudinally into and out of dividing position, and means for causing the dividing means to divide said tube while the tube is in dividing position.

40. A tube dividing machine comprising means for segregating a tube from a supply, means movable transversely of the axis of said tube to positively engage said tube for longitudinal movement and movable to carry said tube to a dividing position, dividing means operable to divide said tube in said dividing position, and means to discharge said tube.

41. An apparatus for dividing a tube into lengths and having a feeding zone and a dividing zone, means in said feeding zone for isolating a tube from a supply, means for making a positive connection with the side of said tube for movement thereof, said positive connection means being movable to reciprocate said tube on its longitudinal axis, and means for dividing said tube at a predetermined point in its reciprocal movement.

42. A continuously operable tube dividing machine comprising a mandrel, a reciprocable means for moving a tube onto said mandrel from a position substantially in alignment therewith, and means controlled by said reciprocable means for transferring a tube from a supply into alignment with the mandrel, said last means being returnable by gravity to receive a subsequent tube.

43. A continuously operable tube dividing machine comprising a mandrel, reciprocable means for engaging a tube and moving it onto the mandrel from a position substantially in alignment therewith, means controlled by said reciprocable means during the initial part of its forward movement to transfer a tube in said alignment from a supply, said reciprocable means being arranged to engage said tube and substantially simultaneously release said transferring means whereby it will move to a position to receive a succeeding tube when the engaged tube is moved therefrom.

44. In a tube dividing machine of the character described, the combination of a constantly rotating mandrel in a fixed location, means for moving a tube from a supply into alignment therewith, means for moving said tube onto said mandrel, said mandrel rotating said tube by friction, means for dividing said tube, and means for discharging said tube, all of said means being synchronized for continuous operation in the order recited.

ALLAN M. SCOTT.