Feb. 16, 1943. F. J. SHOOK 2,311,600

INNER TUBE MANUFACTURING DEVICE

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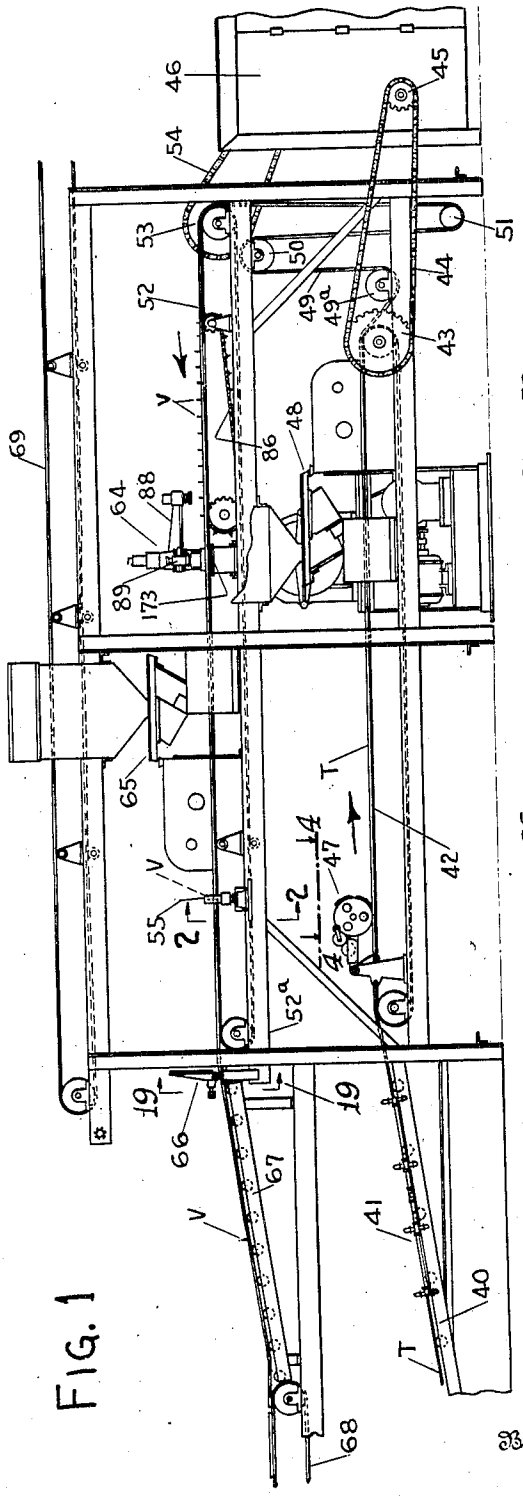


FIG. 1

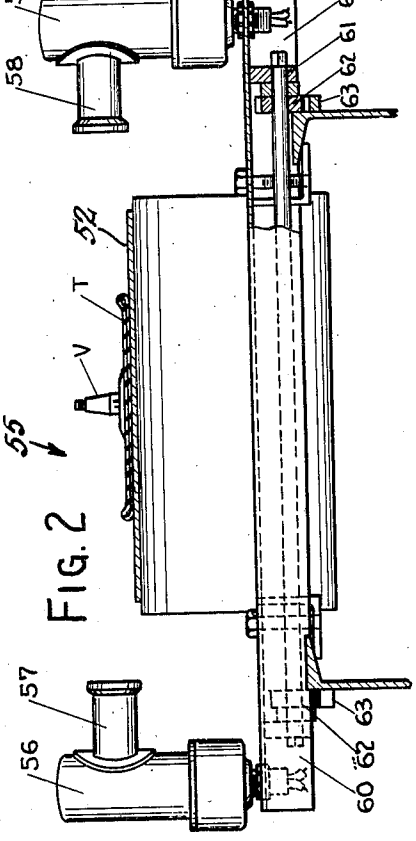


FIG. 2

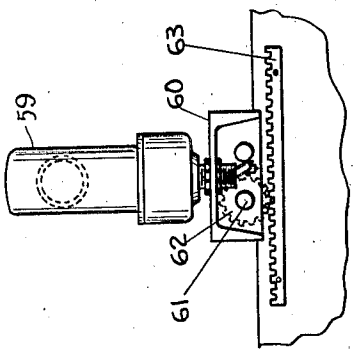


FIG. 3

Inventor
FLORAIN J. SHOOK

By J. Ralph Barrow,
Attorney

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FIG. 4

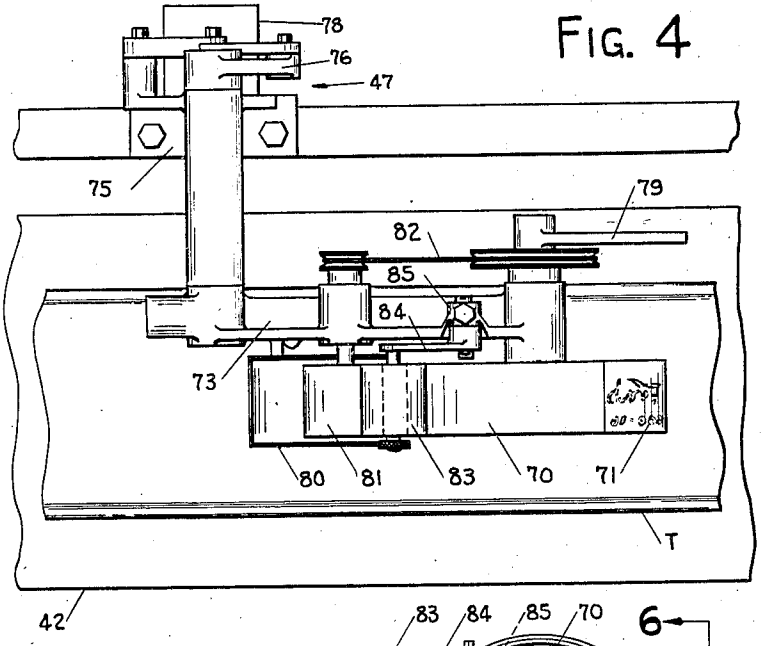


FIG. 5

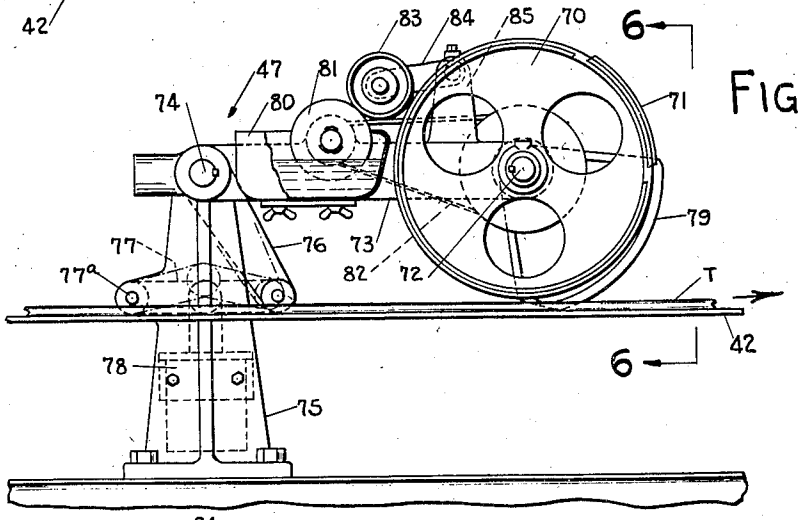
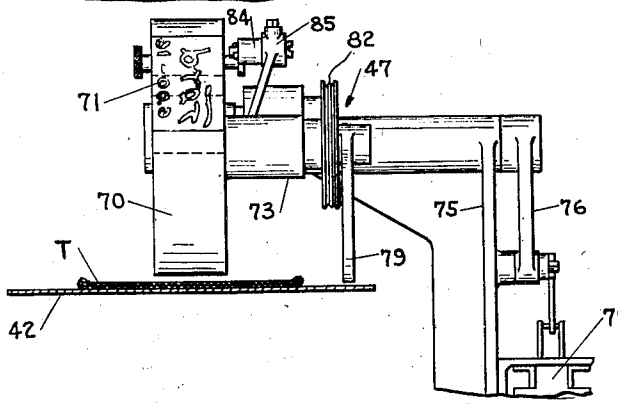


FIG. 6



Inventor

FLORAIN J. SHOOK

Ralph Barrow

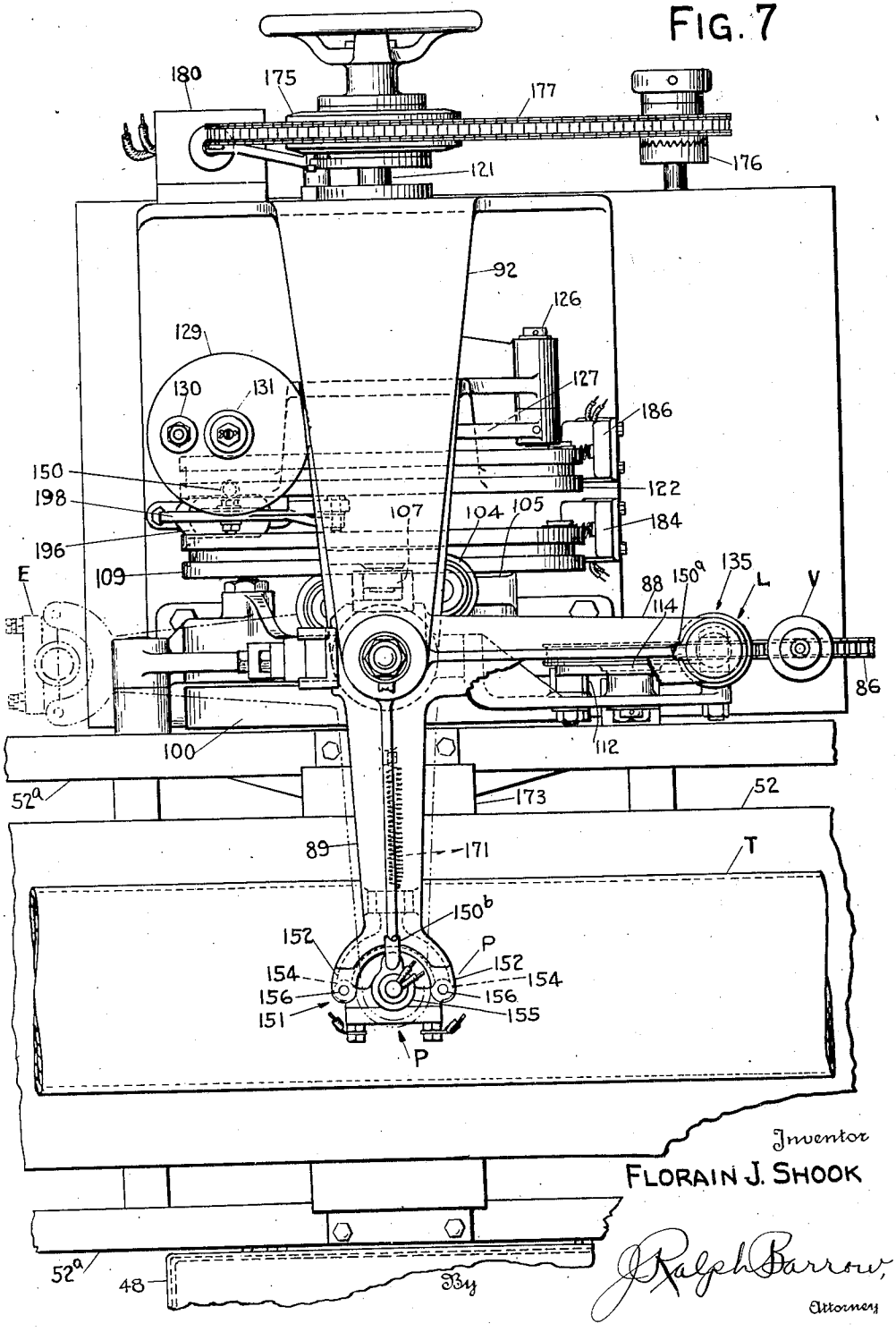
Attorney

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FIG. 7



Inventor

FLORAIN J. SHOOK

J. Ralph Barrow,

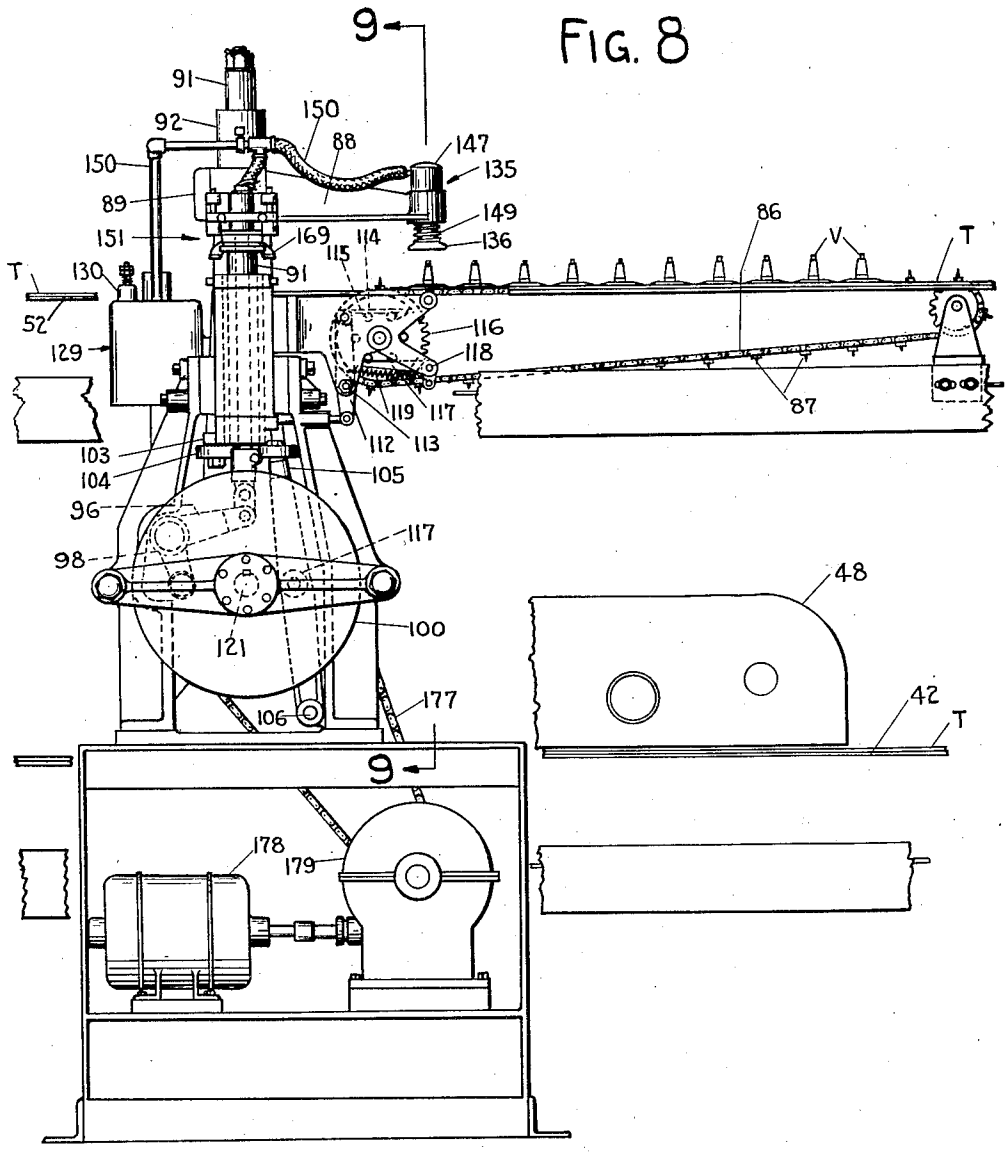
Attorney

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FIG. 8



Inventor

FLORAIN J. SHOOK

By Ralph Barrow

Attorney

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FIG. 11

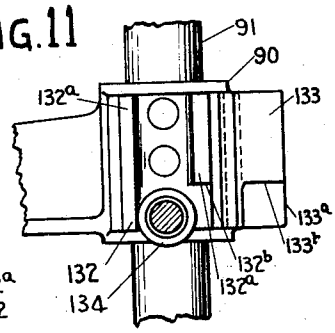


FIG. 9

FIG. 10

Inventor

FLORAIN J. SHOOK

By Ralph Barrow,

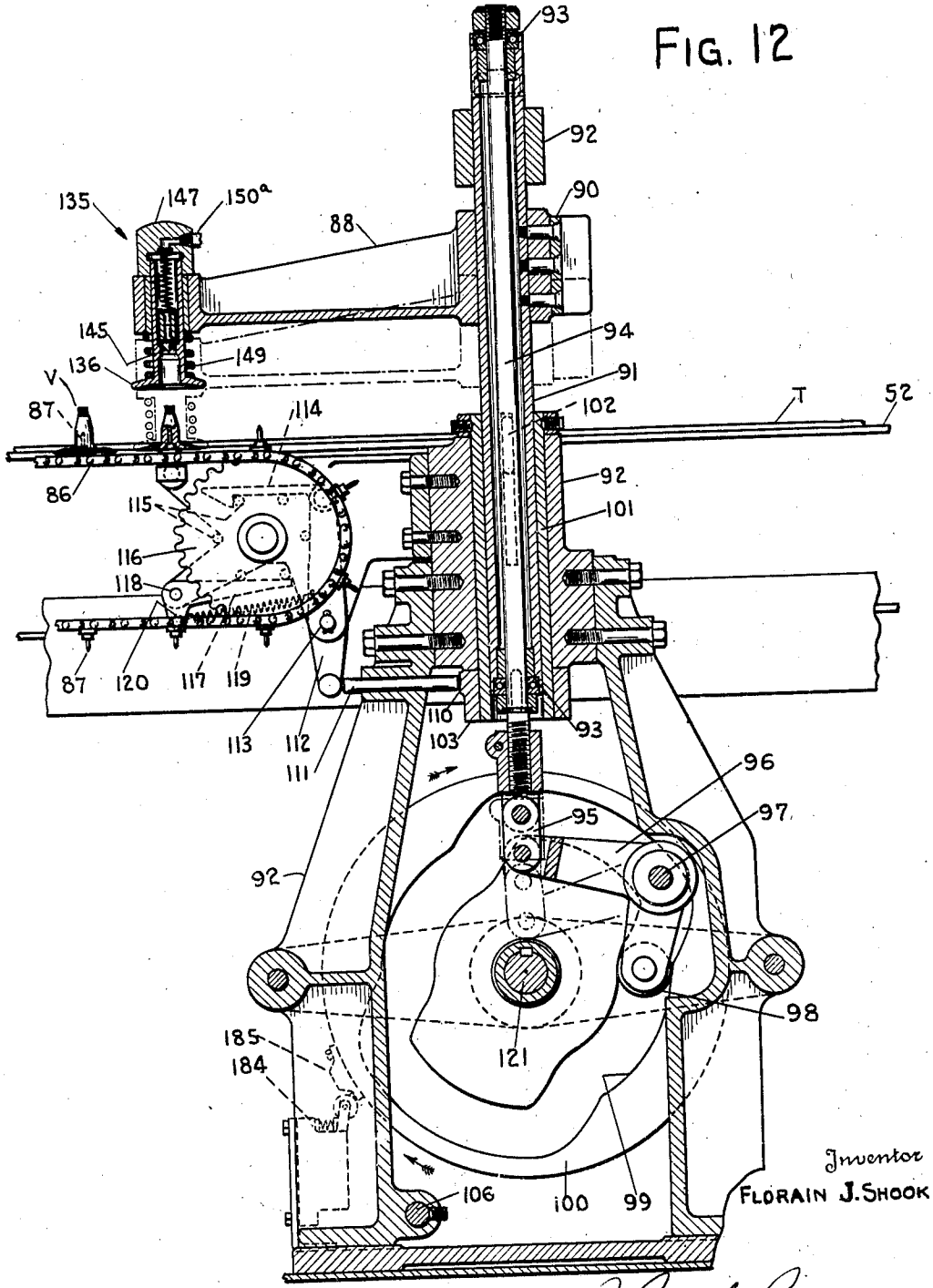
Attorney

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FIG. 12



Inventor
FLORAIN J. SHOOK

By J. Ralph Barrow
Attorney

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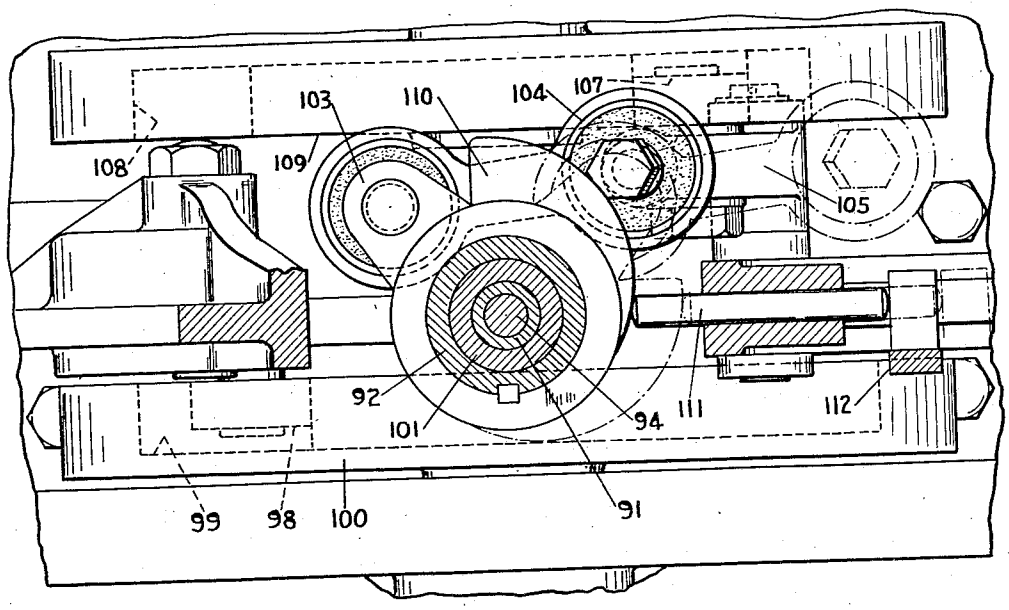


FIG. 14

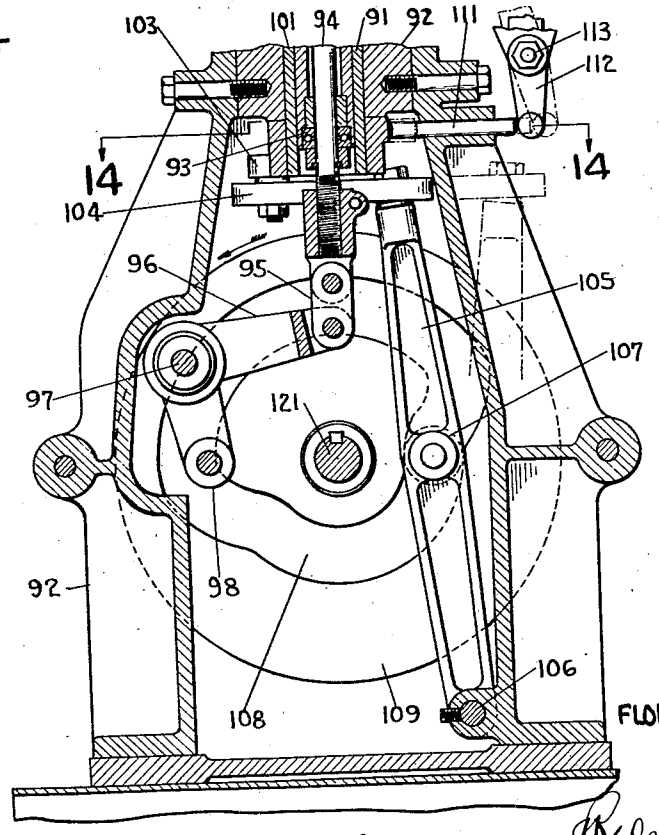


FIG. 13

Inventor
FLORAIN J. SHOOK

By Ralph Barrow
Attorney

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FIG. 15

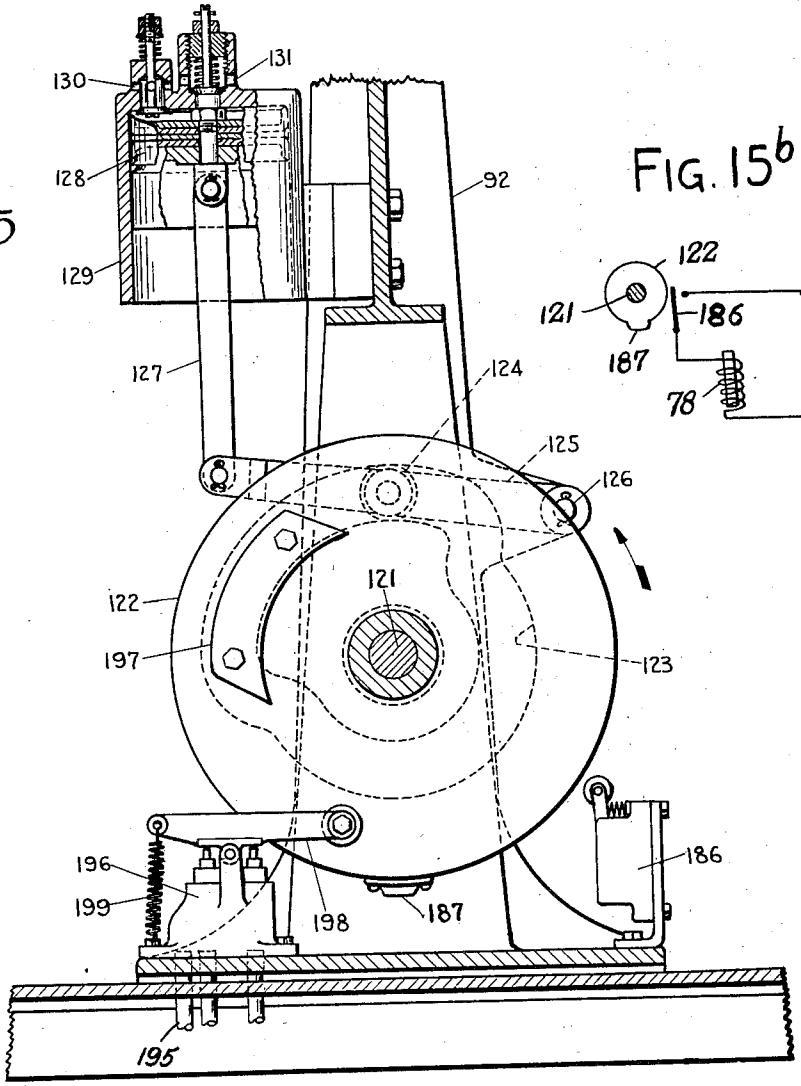


FIG. 15b

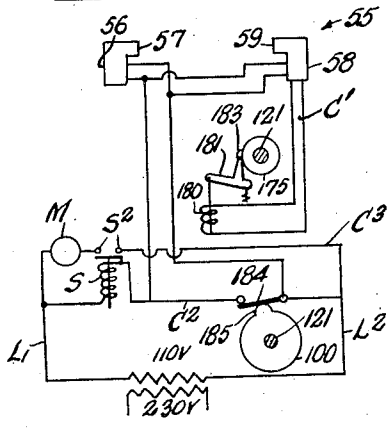


FIG. 15a

Inventor

FLORAIN J. SHOOK

By J. Ralph Barrow,

Attorney

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FIG. 16

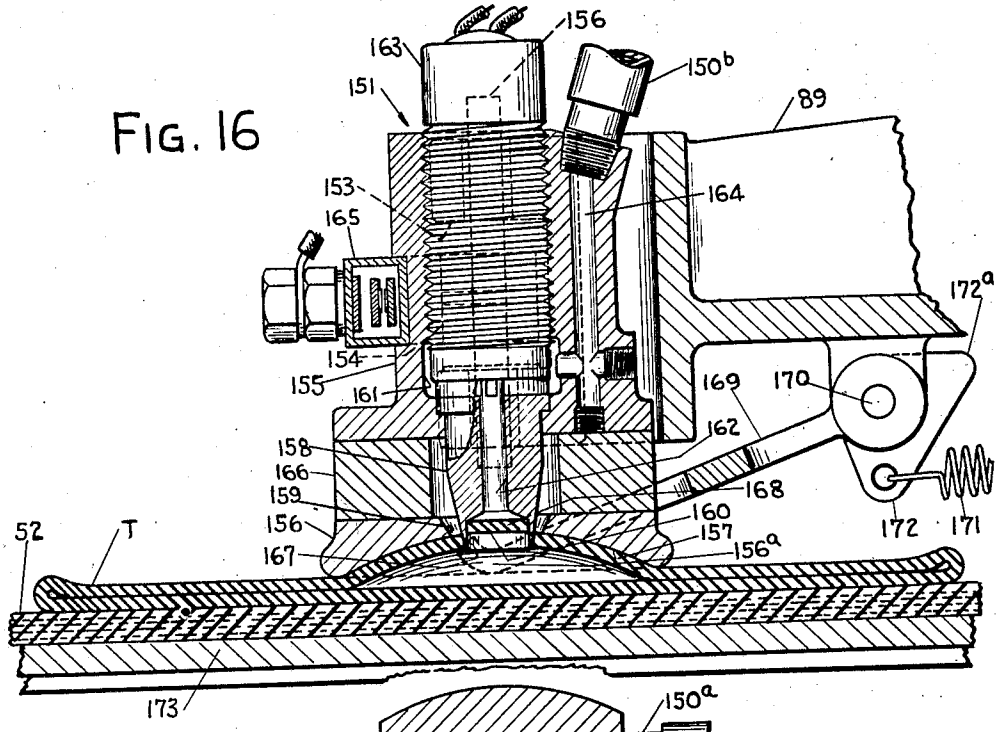


FIG. 17

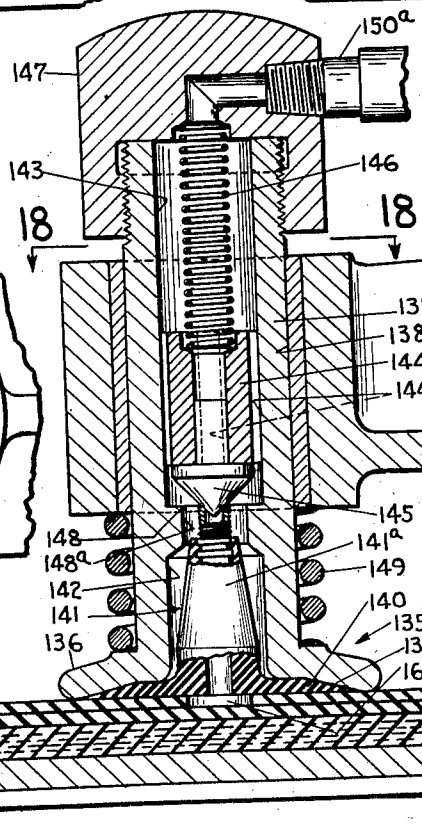
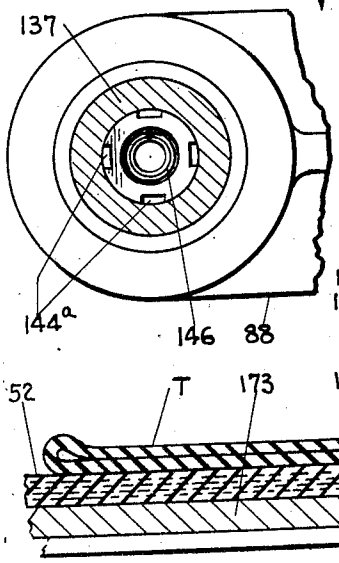


FIG. 18



Inventor
FLORAIN J. SHOOK
Ralph Barrow
Attorney

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INNER TUBE MANUFACTURING DEVICE

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FIG. 20

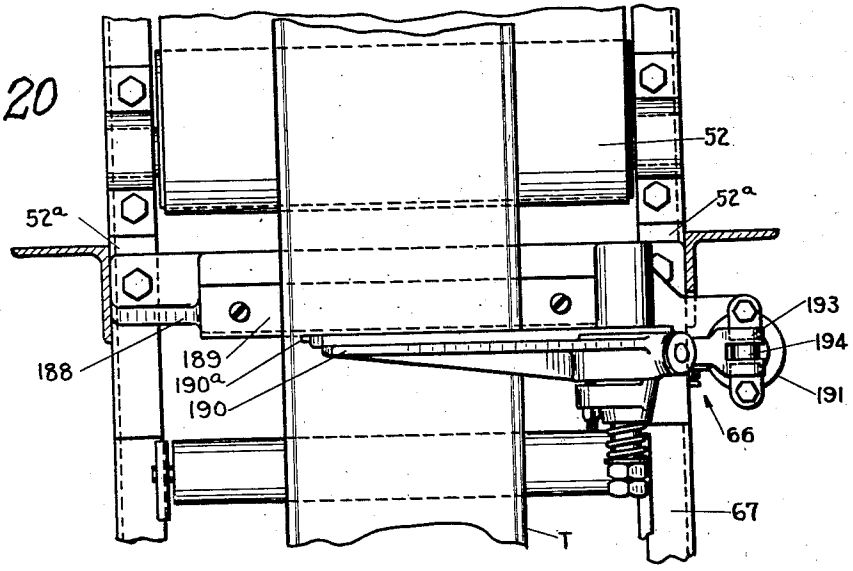
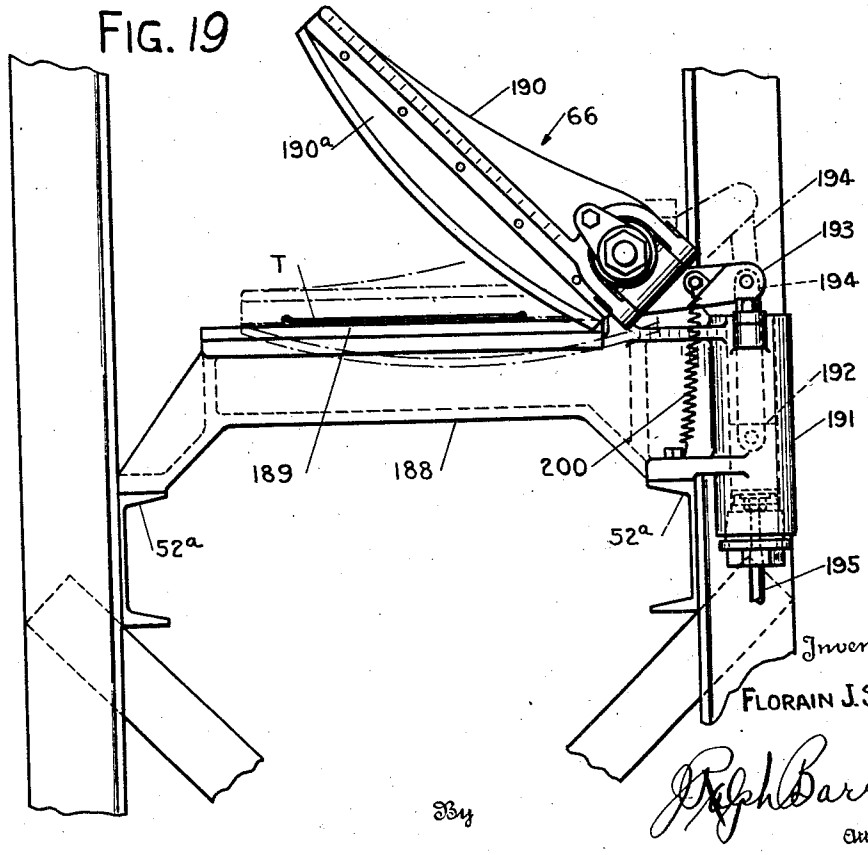


FIG. 19



Inventor

FLORAIN J. SHOOK

By Ralph Barrow,

Attorney

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FIG. 21

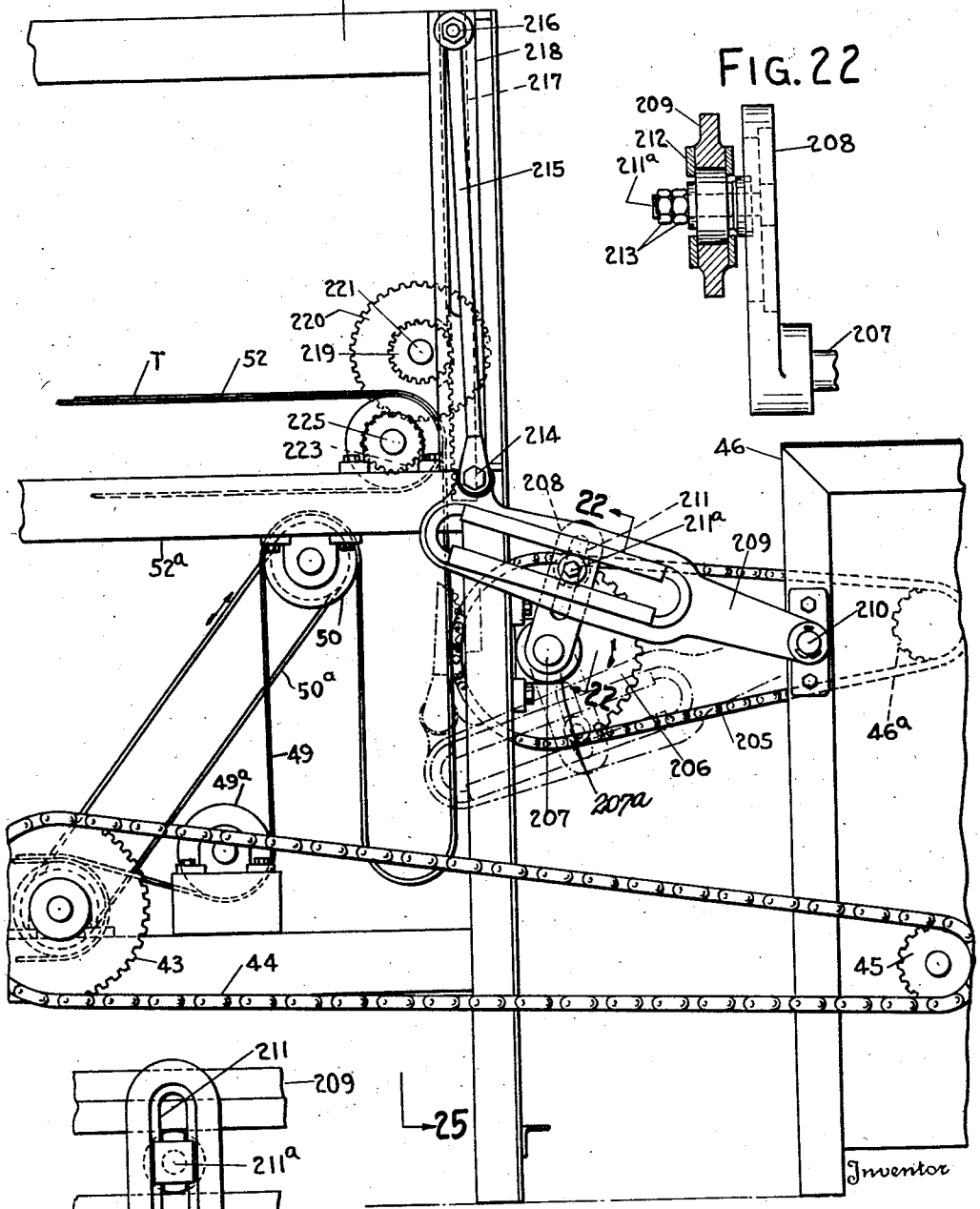
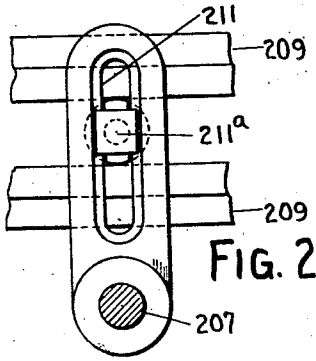


FIG. 22

FIG. 23



Inventor

FLORAIN J. SHOOK

By J. Ralph Barrow,

Attorney

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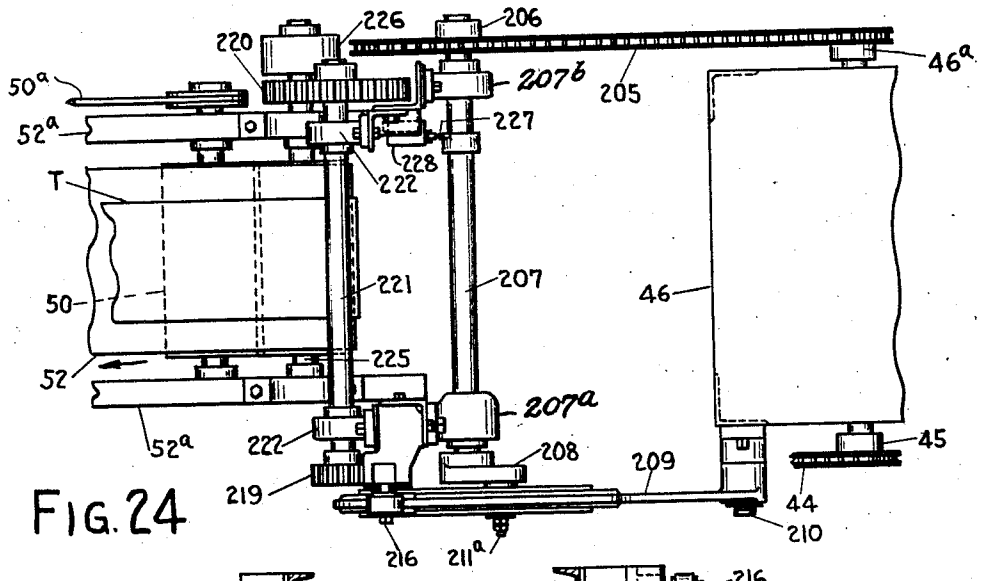


FIG. 24

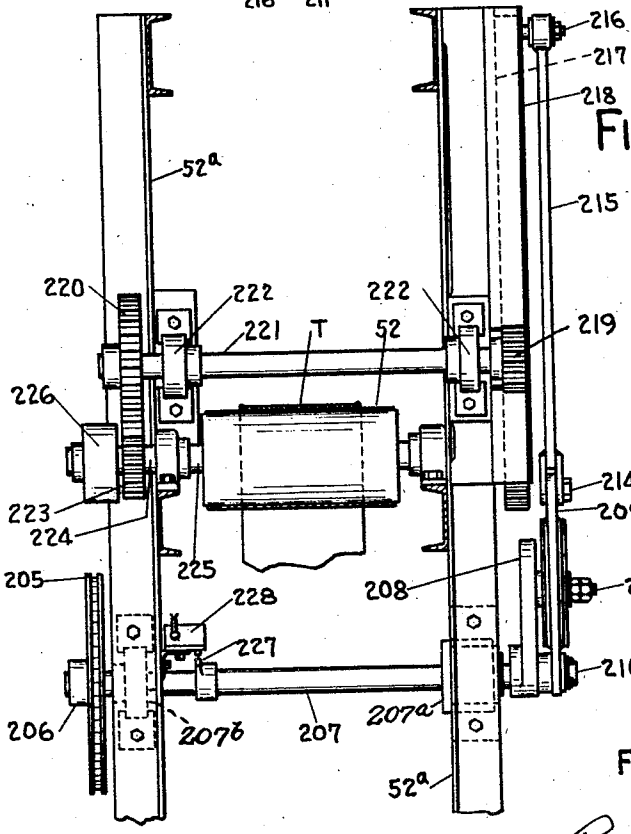


FIG. 25

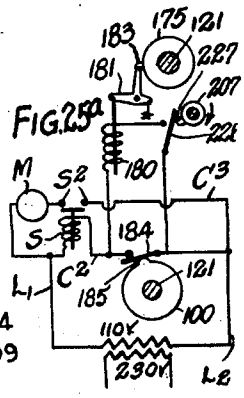


FIG. 25a

Inventor

FLORAIN J. SHOOK

By Ralph Barrow,

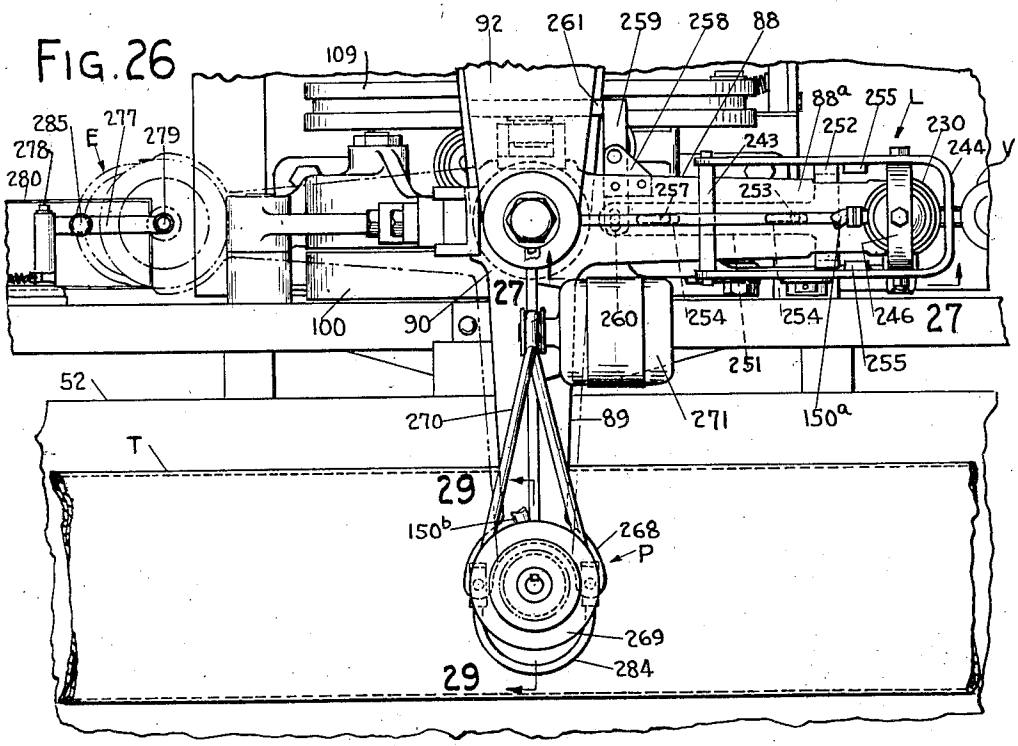
Attorney

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FIG. 26



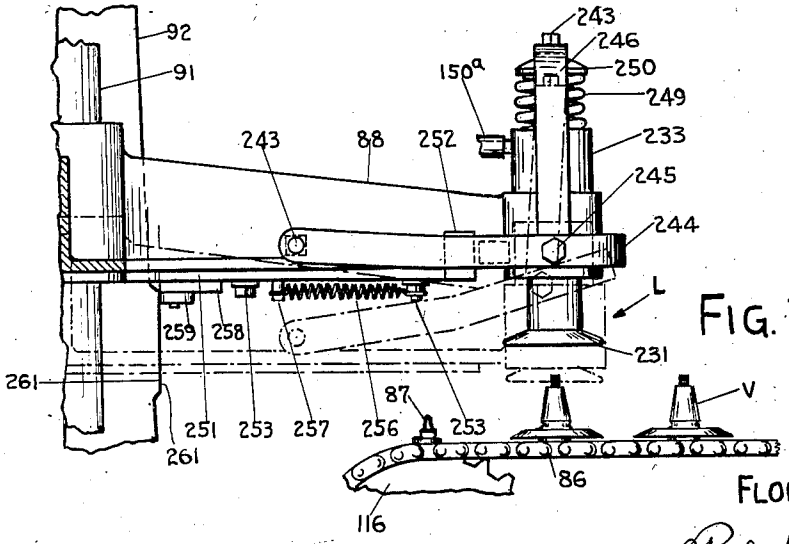


FIG. 27

Inventor

FLORAIN J. SHOOK

By Ralph Barrow,

Attorney

Feb. 16, 1943. F. J. SHOOK 2,311,600

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FIG. 28

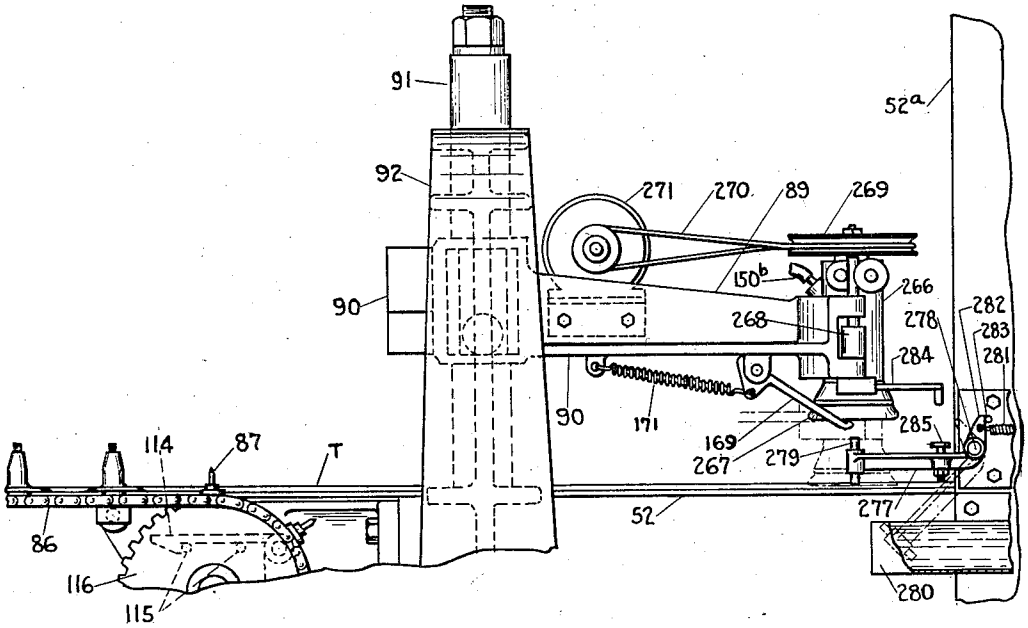


FIG. 30

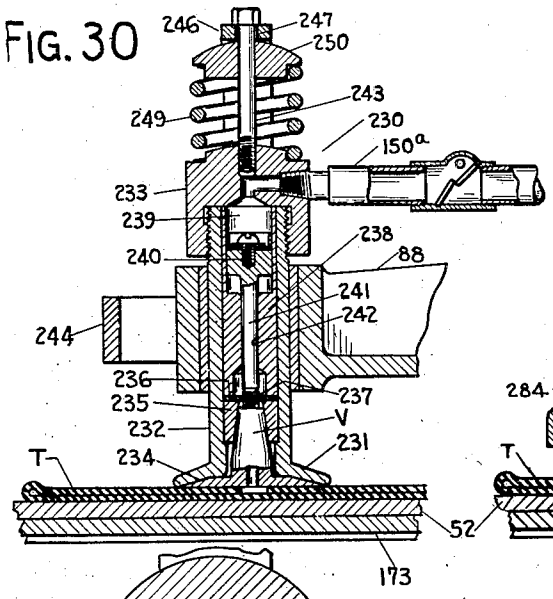
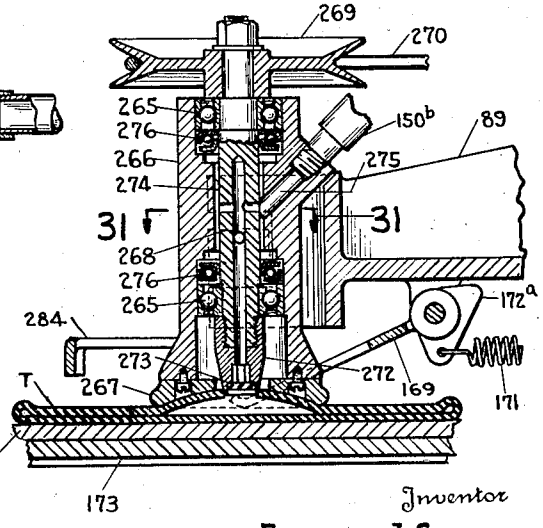


FIG. 29



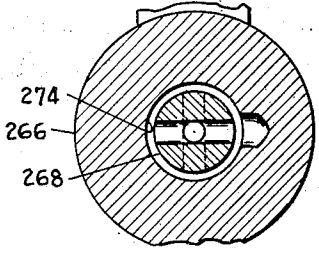


FIG. 31

Inventor

FLORAIN J. SHOOK

By Ralph Barrow,

Attorney

Patented Feb. 16, 1943

2,311,600

UNITED STATES PATENT OFFICE

2,311,600

INNER TUBE MANUFACTURING DEVICE

Florian J. Shook, Akron, Ohio, assignor to National Rubber Machinery Company, Akron, Ohio, a corporation of Ohio

Application July 19, 1938, Serial No. 220,160

21 Claims. (Cl. 154—9)

This invention relates to inner tube and like manufacturing equipment of that type for preparing from continuous rubber tubing, as it issues from the tubing or die-expressing machine, lengths of valved, unvulcanized inner tubes ready to be spliced into annular form and vulcanized.

The general purpose of the invention is to provide in such equipment improved means for applying a name-mark or other legend to the tubes, improved means for punching valve apertures in the tubes, improved means for applying valves to the tubes and improved means for cutting the tubing to inner tube lengths.

A particular object of this invention is to provide in such equipment a device for effectively incorporating rubber valves with the tubing and to provide an effective combined valve hole-punching and valve-applying device having parts so associated and operable in succession on the tubing as to first cut the valve hole at the desired point and then apply the valve in proper registry with the valve hole.

The foregoing and other objects of the invention are attained in the equipment illustrated in the accompanying drawings. It is to be understood that the invention is not to be limited to the specific form thereof shown and described, and also that each of the associated or combined devices illustrated is capable of independent use for the same, or other purposes, as those particularly set forth.

Of the accompanying drawings:

Figure 1 is a side elevation of a portion of an inner tube manufacturing plant embodying the invention.

Figure 2 is an enlarged section on line 2—2 of Figure 1.

Figure 3 is an elevation of the equipment shown in Figure 2 and of the right side thereof.

Figure 4 is an enlarged plan view of the tube marking equipment, taken substantially at 4—4 in Fig. 1.

Figure 5 is an enlarged front elevation thereof.

Figure 6 is a section on line 6—6 of Figure 5.

Figure 7 is an enlarged plan view of the tube-valving equipment.

Figure 8 is an enlarged front elevation thereof.

Figure 9 is a section on line 9—9 of Figure 8.

Figure 10 is a section on line 10—10 of Figure 9.

Figure 11 is an enlarged section on line 11—11 of Figure 9.

Figure 12 is an enlarged section on line 12—12 of Figure 9.

Figure 13 is an enlarged section on line 13—13 of Figure 9.

Figure 14 is a section on line 14—14 of Figure 13.

Figure 15 is an enlarged section on line 15—15 of Figure 9.

Figure 15[a] is a schematic wiring diagram illustrating the connections to the electric eye device.

Figure 15[b] is a schematic wiring diagram illustrating the electrical connections between the tube-valving equipment and the tube-marking equipment.

Figure 16 is a transverse vertical section through the valve-hole punching equipment in operative position.

Figure 17 is a similar sectional view through the valve-applying device.

Figure 18 is a section on line 18—18 of Figure 17.

Figure 19 is an enlarged section of the tube shearing mechanism, taken substantially on line 19—19 of Figure 1.

Figure 20 is plan view of Figure 19.

Figure 21 is an enlarged elevation showing another form of intermittent drive, dispensing with the electric eye.

Figure 22 is a cross-section on line 22—22 of Figure 21.

Figure 23 is an enlarged right elevation of the parts shown in Figure 22.

Figure 24 is a plan view of the device shown in Figure 21.

Figure 25 is a section on line 25—25 of Figure 21.

Figure 25[a] is a schematic wiring diagram, similar to Figure 15[a], illustrating connections to control the tube-valving equipment from the intermittent drive shown in Figure 21.

Figure 26 is a plan view of a modified form of valving equipment.

Figure 27 is an enlarged section on line 27—27 of Figure 26.

Figure 28 is a rear elevation, partly broken away, of the modified valving equipment.

Figure 29 is an enlarged section on line 29—29 of Figure 26 showing the punching mechanism in operative position.

Figure 30 is a view similar to Figure 29 of the valve placing device in operative position to apply a valve to a tube.

Figure 31 is an enlarged section on line 31—31 of Figure 29.

Referring to Figures 1 to 20, inclusive, of the accompanying drawings, the numeral 40 designates a conveyor over which may be passed tub-

ing T issuing from a tubing machine (not shown) and with which conveyor may be associated air-sprays 41 for drying the tubing T as it leaves the cooling tank (not shown), the tubing being hot when it leaves the tubing machine and wet when it leaves the cooling tank.

Arranged to receive tubing T from conveyor 40 is a continuously driven conveyor 42 which may be driven by a sprocket 43 in turn driven by a chain 44 from a sprocket 45 driven by a suitable source of power, housed at 46.

A tube-marking device is shown generally at 47 in association with conveyor 42. This device is illustrated in detail in Figures 4, 5 and 6 and will be described in succeeding paragraphs of this specification. Also associated with conveyor 42 is a suitable soap-stone applying device 48.

Arranged to receive tubing T from conveyor 42 is a suitable festooning device 49 comprising roller 49a, roller 50, and a floating or festooning roller 51. An intermittent conveyor 52 receives tubing T from the festooning device.

Conveyor 52 is preferably arranged over conveyor 42 and carries tubing T back over its path on conveyor 42, supporting the tubing on its opposite side, or what was previously its top side as it issued from the tubing machine. Conveyor 52 is driven intermittently by a sprocket 53 and chain 54 from the power source M (see Figure 15a) in housing 46, said power source being controlled by an electric eye device indicated at 55 and shown in detail in Figures 2 and 3, and a switch operable by a cam on the valving machine as will later be described.

The electric-eye device may comprise a light-source in a housing 56 having a beam-directing tube 57 for directing a beam into an opposite tube 58 for affecting a light-sensitive element housed at 59, this device being mounted on a carriage 60 supported on a shaft 61 having pinions 62, 62 thereon, riding on fixed racks 63, 63 whereby device 55 is adjustable lengthwise of conveyor 52 to adjust the equipment to make inner tubes of different diameters. Tubes 57 and 58 are so arranged as to cause the beam of light between them to be intercepted by a valve V mounted in place on the tubing T, to cause a suitable solenoid or switch S (Figure 15a) to be operated, as will be described, to stop conveyor 52 for a predetermined length of time after which the switch S is automatically operated to start the conveyor running until another valve T intercepts the light beam of the electric eye. The periods during which conveyor 52 is stopped are utilized for valving and cutting operations on tubing T on the conveyor. Conveyor 52 is driven somewhat faster than conveyor 42 to utilize the stock continuously conveyed by conveyor 42, floating roll 51 of festooner 49, arranged between conveyors 42 and 52, taking up the slack of the stock between the two conveyors as will be understood.

Associated with conveyor 52 is the valving mechanism illustrated generally at 64, a soap-stone device at 65 and a cutting device at 66 of which the valving mechanism and cutter will be described in detail.

A conveyor 67 receives the tubing T from the conveyor 52 after it is cut and conveys it to conveyor 68 which may carry the tube to a splicing station (not shown). At the splicing station the tubes are spliced and a conveyor 69 may be provided over conveyor 52 for carrying the spliced tubes to the vulcanizer (not shown).

The tube-marking device 47, as shown best in Figures 4, 5 and 6, comprises a printing roller 70 carrying a printing die 71 and rotatably mounted by a shaft 72 on an arm 73 secured to a shaft 74 journaled on a bracket 75 and operable by an arm 76 connected to a toggle 77 fixedly pivoted at 77a and operable by a solenoid 78. Associated with roller 70 is a lifting cam 79 designed to ride on conveyor 42 and to lift the roller 70 off tubing T at the end of a printing operation, cam 79 rotating with roller 70 when roller 70 moves down into contact with tubing T.

Associated with roller 70 is an ink-supply vessel 80 carried on arm 73, in which is a partly submerged roller 81 arranged to be driven, as by belt 82 from roller 70. Riding on roller 81 is a die-inking roller 83 carried on an arm 84 freely pivoted on a bracket 85 on arm 73 so that roller 83 will ride by gravity on roller 81 excepting when die 71 rotates under roller 83, lifting it slightly and causing ink applied to roller 83 by roller 81 to be applied to die 71. Solenoid 78 may be timed to print a mark on the tubing so located as to appear on each length of the cut tube lengths supplied by the present equipment. The timing device may be associated with the valving mechanism to be described so as to apply the marking on the tubing corresponding with each valving operation.

The soap-stone applicators 48 and 65 may be of any suitable type similar to devices of this sort heretofore used and form per se no part of the present invention. The device 48 applies soap-stone to one side of the tubing and 65 to the other, as will be apparent because the tubing is reversed in passing through festooner 50—51 and onto conveyor 52. This reversal brings the marking applied by marker 47 onto the outer periphery of the finished tube (the valve being applied on conveyor 52 on what becomes the inner periphery of the finished tube).

Associated with conveyor 52 at the valving mechanism 64 is a conveyor 86 having spaced pins 87, 87 for receiving valve structures V, V placed thereon and carrying them to the valve-applying mechanism to be described. Conveyor 86 may be arranged to be intermittently driven to position valves V in succession in the valving device by operation of the valving device as will be set forth in succeeding paragraphs.

The valving mechanism comprises a valve pick-up and applying arm 88 and a valve-hole punching arm 89 carried by a single reciprocating head 90 supported for vertical sliding and horizontal swinging movement by a vertical tube or hollow shaft 91 mounted in a supporting frame 92 so as to slide vertically and rotate therein.

Hollow shaft 91 (see Figure 12) is journaled at 93, 93 on a vertically reciprocable central rod 94 so as to reciprocate with and also to revolve about said rod. Rod 94 is connected by link 95 to one arm of a bell-crank lever 96 pivoted at 97 and the other arm of which has thereon a roller 98 engaged in the groove 99 of a revolving grooved-cam 100.

Surrounding shaft 91 in the central portion of frame 92 below the head 90 is a non-reciprocating sleeve 101 journaled in frame 92 and keyed as at 102 to rotate with but to permit relative sliding movement of hollow shaft 91. Sleeve 101 has thereon an arm 103 (see Figures 13 and 14) to which is connected a link 104 connecting said arm with a head-turning lever 105 pivoted in frame 92 at 106 and operable by a roller 107 thereon engaged in a cam-groove 108 in a revolving groove-cam 109.

Sleeve 101 carries a cam 110, which may be integral with arm 103, engageable with a rod 111 horizontally slidable in frame 92 and engaging with a lever 112 pivoted at 113 (see Figure 12) and connected to a pawl 114 engageable with pins 115, 115 on sprocket 116 for intermittently driving valve-conveyor 86. A dog 117 pivoted at 118 is held against bottom pins 115, 115 on sprocket 116 to hold the valve pins 87 in proper registry with the valve pick-up and applying device on arm 88 which will be described. A tension spring 119 extended between an arm 120 on dog 117 and lever 112 serves to urge lever 112 against rod 111 and also to hold dog 117 against pins 115.

Cams 130 and 109 are secured on a drive shaft 121 on which is also secured a pump-operating cam 122 having a groove 123 therein in which is engaged a roller 124 (see Figure 15) on a lever 125 pivoted at 126 and connected by a pitman 127 to a combined vacuum and pressure pump piston 128. Piston 128 is reciprocable in cylinder 129 mounted in frame 92 which cylinder is provided with a suitable vacuum relief valve 130 to prevent development of excessive suction on the down stroke of the piston and with a suitable pressure relief valve 131 to prevent development of excessive pressure on the up-stroke of the piston.

The valve pick-up and applying head 90 is provided with channel members 132 and 133, the outwardly extending flanges 132a, 132a and 133a, 133a respectively, of which are arranged and shaped to slidably engage a roller 134, rotatably mounted on frame 92, to guide the head 90 as it is reciprocated up and down for the tube punching, valve pick-up, and valve placing operations. Adjacent sides 132a and 133a of the channel members are provided at the bottoms thereof with cut-away portions 132b and 133b to permit head 90 to rotate with the shaft 91, through a predetermined angle, from one station of operation to another, the bottom portions of the outermost sides of the channel members cooperating with roller 134 as stops for the extreme positions of the head 90 (see Figures 7, 9 and 11). This arrangement insures accurate centering of pick-up arm 88 and punching arm 89 in the various operating positions thereof.

As is best shown in Figures 7, 12 and 17, the free end of valve pick-up arm 88 has mounted thereon a valve pick-up mechanism, indicated generally at 135. A valve pad 136 has an upwardly extending shank portion 137 adapted to be slidably received in a bore 138 in the arm 88. The bottom of pad 136 is recessed at 139 to receive the base 140 of a rubber inner-tube valve 141, and shank 137 is apertured at 142 adjacent recess 139 for receiving the valve stem 141a. The upper portion of shank 137 is provided with a bore 143 adapted to slidably receive a plug 144 which carries a tapered valve 145, these being urged downwardly by a compression spring 146 interposed between plug 144 and a cap 147 preferably adjustably secured on the upper end of shank 137. A wall 148 between the aperture 142 and bore 143 has a communicating opening 148a therein, the tapered valve 145 being normally urged, by spring 146, against the upper edge of opening 148a to close the same when the head 90 is in the upper position (see Figure 12), or at other times when there is no valve stem in the aperture 142. Valve pad 136 may be normally urged downwardly by a compression spring 149 extending between the arm 88 and valve pad 136, the downward movement being limited by the bottom of cap 147 contacting with the arm 88. Plug 144 is provided with vertically extending grooves 144a, 144a on the outer periphery thereof to permit passage of air therethrough as cylinder 129 is operated, through a suitable conduit 150 and a flexible extension 150a, either to apply suction to hold valve 141 in the relative position with respect to valve pad 136 shown in Figure 17, or to release the valve from the valve pad 136 onto the tube stock T, as will be described later, to position the valve in cooperation with a hole previously punched in said tube stock (see Figure 17).

Valve 145 being preferably conical in shape, readily seats itself in the opening 148a in wall 148 to close the same in position in which there is no valve stem in the valve pick-up mechanism. Valve 145 also serves to close the opening in valve 141 when the latter is held within the valve pick-up mechanism by means of suction, to prevent destroying the effect of the suction.

The valve pick-up mechanism 135 is constructed and arranged to pick up a valve V from the conveyor 86 at the beginning of each valving cycle. At this stage of the operation the head 90 will be lowered so that valve pad 136 descends directly over one of the valves V previously placed on studs 87 on the conveyor 86. As pad 136 descends, valve 145 closes the valve stem opening and suction from cylinder 129 draws the valve stem base into sealing relation with the recess 139 in the pad. This suction is maintained while head 90 is raised and swung from the full-line to the chain dotted positions shown in Figure 7, and again lowered to move arm 88 to the valve placing position thereof. When the valve pick-up mechanism 135 is about to be raised from this valve placing position, best shown in Figure 17, the suction is released and sufficient pressure is applied to release the valve 141 from the pad 136, whereupon said pick-up mechanism is raised to leave the valve stem accurately centered over a hole previously punched in the tube stock T. If necessary to make the valve base adhere to the tubing T, a suitable adhesive, such as rubber cement, may be applied to the bottom of the base at the valve pick-up station L.

The tube punching mechanism, indicated generally at 151, (see Figures 7, 9 and 16) is mounted on the free end of the punching arm 89. The end of arm 89 is formed with a U-shaped portion 152 the outer extremities of which are bifurcated at 153, 153 to receive lugs 154, 154 on a holder 155 for a suction pad 156. Holder 155 may be vertically movable to a limited extent, to allow for variations in the thickness of the tube stock T for example, by being secured to pins 156, 156 slidably mounted in the bifurcated ends of the U-shaped portion 152 of arm 89. In the raised position of arm 89 the lugs 154 of holder 155 will rest on the lower projections of the bifurcated ends 153.

Suction pad 156 is provided with a concave recess 157. A heated annular knife element 158, suitably supported within holder 155, projects through a central opening 159 in pad 156 past the inner face of recess 157 to a distance substantially equal to the wall thickness of the tube stock T. Knife 158 is shaped and arranged to provide a recess 160 of substantially the diameter of a hole to be punched in the tube stock T, and this recess communicates with a chamber

161 in holder 155, through a central bore 162 in element 153 and radial slots in the top face thereof leading from said bore and opening into the chamber 161. A suitable electric heater 163 adjustably secured in holder 155 may be provided to heat the knife 158 either by direct contact with the top face of knife element 158 or by close proximity thereto. The knife is heated to make it more efficient for cutting the rubber tubing T. A passage 154 extends from chamber 161 to a conduit 150b which, through conduit 150, connects with the combined suction and pressure pump 129. A thermostat 165 may be connected to the holder 155 to control the heat in the knife element 158. A suitable heat insulation block 166 may be interposed between holder 155 and 155, to prevent heating the pad and avoid any pre-vulcanization of the tube stock T by contact therewith.

The above arrangement is such that when the arm 89 on head 90 is lowered to contact the tube stock T at the same time suction is applied by means of pump 129, through conduit 150 and a flexible extension 150b, to draw the upper layer of tube stock into recess 157. The heated annular edge of knife 158 is forced through the layer to punch a valve opening 167 therein, and the plug 168 formed by the punching operation is drawn into the knife recess 160. The plug is held in recess 160 until ejected at the plug ejecting station E, upon application of pressure from pump 129. As the punching arm 89 moves upwardly away from the stock T, the effect of the suction on the stock is destroyed by the blocking of passage 162 by the plug 168.

A stripper-lever 169, forked at its free end to extend around pad 156 and ending in upwardly curved portions 156a at diametrically opposite sides of the pad, is pivotally connected at 170 to the arm 89. The free end of lever 169 is normally urged downwardly by a spring 171 connected between arm 89 and a web 172 on lever 169, the web 172 being shaped to provide a projection 172a for engaging the under side of arm 89 to limit downward movement of lever 169. Lever 169 acts to aid separation of the tube stock T from the suction pad 156 as the latter moves upward after a punching operation and the suction from within the pad is released.

When the head 90 has been rotated, from the position shown in full lines in Figure 7 to the chain-dotted position, to carry the valve pick-up mechanism 135 from the valve pick-up station L to the tube-punching and valve-placing station P, at the same time the tube punching mechanism 151 is carried on arm 89 to the plug ejecting station E. At the latter station cam 122 actuates pump 129 to apply pressure, through conduit 150 and flexible extension 150b to eject a plug 168 retained in recess 157 of knife 158 after the valve hole punching operation. The plugs 168 may be ejected into any suitable receptacle (not shown). When plug 168 is being ejected, valve 141 has been placed on tube stock T over a punched hole 167, as shown in Figure 17, and the same pressure action from pump 129 will release valve 141 from the valve pad 136, leaving the valve stem accurately centered over the hole 167 as arm 88 is raised to move back to the valve pick-up station L for the succeeding valving cycle.

At the tube punching and valve placing station P an anvil 173, extending transversely across the frame of conveyor 52, is provided to support the conveyor belt against downward pressure of the tube-punching and valve placing mechanisms during the tube punching and valve placing operations.

For revolving the cam shaft 121, with the cams 100, 109, and 122 thereon, a full revolution for each cycle of the valving mechanism 64, there may be provided a one-revolution clutch 175 keyed to the shaft 121. Clutch 175 may be of any suitable type having a gear 176 continuously driven through a drive chain 177 by a motor 178 and reduction gearing 179 (see Figures 7 to 10). A cycle of operation is started by a valve V coming directly in the path of the beam of electric eye units 56 and 58, causing a solenoid 180 to be momentarily energized, which solenoid actuates a bell-crank lever 181 pivotally mounted on the valving machine frame 92 (see Figures 10 and 15a). An arm 182 on lever 181 is thereby disengaged from under a finger 183, which finger is yieldingly connected to mechanism (not shown) within the clutch 175, and the clutch is engaged with the shaft 121 to drive the same. As soon as the finger 183 has been allowed to pass the end of the arm 182 a spring 184a urges the lever 181 back to the position shown in Figure 10. This sets the arm 182 in position to trip the finger 183, when the latter has completed one revolution with the clutch, which disconnects clutch 175 until another valve V on tube stock T crosses the path of the light beam of the electric eye units. The electric eye units are energized during intermittent movements of the tube stock in readiness for initiating each succeeding cycle of the valving mechanism, by a switch 184 actuated by a suitable block 185 on cam 100 at substantially the end of a valving cycle.

In Figure 15a is illustrated, schematically, the electrical connections to the electric eye device 55, by which is controlled the intermittent operation of conveyor 52 and, through one-revolution clutch 175, the valving device 64. The beam-directing and beam-receiving tubes 57 and 58, respectively, of the electric eye device may each be connected in parallel to normally closed switch 184 in a circuit C^2 across lines L_1 and L_2, from a suitable source of electrical supply. A valve stem coming between tubes 57 and 58, as described, momentarily cuts off the beam, closing an output circuit C^1, from the beam-receiving tube 58, to energize solenoid 180, and actuating bell-crank lever 181 (Figure 10) to disengage the finger 183 of one-revolution clutch 175. This causes shaft 121 to be driven for one revolution, for a cycle of operation of the valving mechanism 64.

The instant shaft 121 starts to rotate, block 185 on cam 100 mounted on the shaft 121, opens switch 184, thereby actuating a suitable solenoid S in said circuit C^2. This closes contacts S^2 in a circuit C^3, across lines L_1 and L_2, to operate the magnetic brake, or similar device M associated with a motor or other driving means (not shown) in housing 46, and stopping conveyor 52 for as long as switch 184 is open, which is during a cycle of operation of the valving device.

After solenoid 180 is energized to start said valving cycle, switch 184 being opened, the flow of current to the electric eye device is broken. At the end of the cycle, however, switch 184 is again closed to reset the electric eye device 55 for another cycle of operation, the closing of said switch also deenergizing solenoid S to open contacts S^2 in circuit C^3, thereby operating magnetic brake M for starting conveyor 52. The one-rev-

olution clutch automatically resets itself during said cycle of operation, as previously described.

It is understood that the foregoing is a description of a simplified wiring diagram, and that other wiring connections may be utilized without the exercise of invention. As for example, with the use of known electrical equipment, such as relay switches or the like, the device M may be a motor instead of a magnetic brake or clutch associated with a motor.

As is best shown in Figures 7, 15, and 15[b] a switch 186, operable by a block 187 adjustably secured on the outer periphery of cam 122, is provided for momentarily actuating solenoid 78 (see Figure 15[b]) of the tube-marking mechanism 47 (see Figures 4, 5 and 6), to start the latter mechanism for a cycle of operation thereof, as previously described. The arrangement and timing are such that although the marking mechanism 47 may be located a relatively remote distance from the valving machine each length of tubing, as it emerges from the cutting device 66, will have the desired marking or indicia printed on the side which later becomes the outer periphery of the tube.

Between the leading end of conveyor 52 and the adjacent end of conveyor 67 may be the tube shearing mechanism 66, shown in detail in Figures 19 and 20. A bracket 188 having a horizontal fixed shear-plate 189 thereon extends transversely between the extended side frames 52[a], 52[a] of conveyor 52. Pivotally mounted on a support 189 extending upwardly from bracket 188 there is a swingable holder 190 for a shearing knife 190[a] operable by a fluid pressure cylinder 191 secured to frame 188. A piston 192 in cylinder 191 is connected to an arm 193 on knife-holder 190 by means of a link 194. The piston 192 is actuated upwardly by fluid pressure applied through a conduit 195, from valve 196 actualted by a plate 197 on cam 122. The plate 197 is preferably arranged to depress a lever arm 198 for a short period against the action of a spring 199 (see Figure 15) to cause knife 190[a] to swing to the position shown in dotted lines in Figure 19. As soon as the plate 197 releases the arm 198 the pressure fluid in cylinder 191 will exhaust out and a spring 200, connected between bracket 188 and holder arm 193, will cause the knife-holder 190 to swing back to the full line position shown in Figure 19. The cutting mechanism 66 may be synchronized with the valving mechanism 64 to shear the stock T at any time during the interval that conveyor 52 is stopped for the valving cycle.

For convenience and clearness the general operation of the tube manufacturing equipment will be described briefly. The conveyors 42 and 68 are continuously driven and conveyor 52 is intermittently driven, as previously described, to convey a continuous strip of tube-stock T, supplied from an extruding machine (not shown). As the stock T leaves the drying sprays 41 it passes under the tube-marking device 47, actuated periodically by block 187 on valving cam 122 tripping the switch 186, the latter being wired to the solenoid 78 of the marking device. Continuing along the conveyor, the stock T passes under the soapstoning device 48 which applies soapstone to the printed or marked side of the stock.

Before passing on to the intermittently operated conveyor 52, the tubing T may be fed through the festooning device 49 which is adapted to store up stock coming from continuously driven conveyor 42 while conveyor 52 is stationary for each valving cycle of the valving machine 64. Conveyor 52 is stopped for a valving operation by a valve V, placed on tubing T by a previous valving operation, cutting off the beam from the electric eye device 55 to operate the control switch S (Figure 15[a]) which cuts off the power source M in housing 46 for driving conveyor 52.

At substantially the same time that the electric eye device 55 operates to stop conveyor 52, the solenoid 180 on the valving machine 64 is actuated to operate the one revolution clutch 175 to start a cycle of operation of the valving machine. When the cycle starts, the reciprocating head 90 is in the position shown best in full lines in Figures 7, 9 and 12, with the valve pick-up mechanism 135 at station L and the tube-punching mechanism 151 at station P. As the cams 100, 109, and 122 carried by shaft 121 start to rotate, shaft 121 being driven through the continuously driven sprocket 176 and the engaged one-revolution clutch 175, cam 100 actuates bell-crank lever 96 to pull the rod 94, carrying shaft 91 which in turn carries the head 90, downwardly to the chain-dotted positions best shown in Figures 12 and 16. While the head 90 is maintained in the down position for a short period by cam 100, the valve pick-up and tube-punching operations previously described in detail are performed. As the shaft 121 continues to rotate cam 100 causes the reciprocating head 90 to be raised to the top of its stroke, at which time cam 109, through lever 105 and link 104, will cause the non-reciprocating sleeve 101 to rotate approximately a quarter revolution. Since the hollow shaft 91 is slidably keyed to sleeve 101 the head 90 will also be rotated, bringing it to the position shown in chain-dotted lines in Figure 7. This places the valve pick-up mechanism 135 at station P, directly over the previously punched hole 167 in tubing T, and places the punching mechanism 151 at the plug ejecting station E.

With shaft 121 still turning cam 100 now causes head 90 to be lowered to the bottom of its stroke for bringing valve pick-up mechanism 135 to the position shown in Figure 17, thereby placing a valve 141 on tubing T in cooperating relation with the punched hole 167. As head 90 starts to move back to the top of its stroke, pressure from pump 129 prevents valve stem 141 from sticking in the valve pad 136, and at the same time the plug 168 from the previous tube-punching operation is ejected at station E by pressure.

While still at the top of its stroke, head 90 now swings back to the starting position, shown in full in Figure 7. When shaft 121 has completed a revolution arm 182 on lever 181 (see Figure 10) trips the finger 183 to release clutch 175 and thereby stop the valving mechanism.

At the end of the valving cycle block 185 on cam 100 actuates switch 184 (see Figure 12) to start conveyor 52 and set the electric eye for the next valving cycle. The next succeeding valving cycle will be started when the valve previously placed as described above starts to cross the path of the beam of the electric eye device 55.

After tubing T passes the valving machine, soap-stone applying device 65 applies soapstone to the side of tubing which later becomes the inner peripheries of the finished tubes. Upon each shearing operation by the cutting device 66 the severed length of tubing is carried by the conveyor 68 to the tube splicing and other operations (not shown).

Figures 21 to 25, inclusive, of the drawings, show a modified form of apparatus for intermittently driving conveyor 52. This mechanism, to take the place of electric eye device 55, is preferably located intermediate supporting frame 52a of conveyor 52 and the housing 46 (see Figure 1). A sprocket 46a, continuously driven by the power source (not shown) in housing 46, drives a chain 205 which in turn drives a sprocket 206 keyed to a shaft 207 journaled in brackets 207a, 207b at the sides of frame 52a. The shaft 207 has at one end thereof a crank-arm 208 arranged to oscillate an arm 209, pivotally mounted at 210 to housing 46.

Arm 208 is provided wtih a longitudinal slot 211 adapted to adjustably, but non-rotatably, receive a pin 211a upon which is journaled a roller 212 arranged to be slidably retained in a longitudinal slot in lever arm 209. Adjustment of the pin 211a is made by releasing nuts 213 and sliding the pin along slot 211, and then tightening the nuts 213 to non-rotatably clamp pin 211a on arm 208.

Pivotally connected at 214 to the extended outer end of lever arm 209 is a link 215, the other end of which is pivoted at 216 to a rack-gear 217 slidable in a casing 218 secured to frame 52a. Rack 217, through suitable gears 219 and 220 keyed to a shaft 221 journaled in brackets 222, 222 on frame 52a, drives a gear 223 keyed on a sleeve 224, which in turn is rotatably mounted on the drive shaft 225 of conveyor 52. This, of course, drives sleeve 224 in alternately reversed directions as the rack is reciprocated up and down by the crank 208. Mounted on the end of shaft 225 adjacent sleeve 224 is a one-way clutch 226, which being of known construction is not shown in detail. The clutch 226 is preferably associated with sleeve 224 in such a manner that conveyor 52 will be driven in a direction toward the valving machine for a predetermined distance (or time) with each down-stroke of rack 217. On the up-stroke of rack 217 clutch 226 is inactive and the conveyor 52 is stationary for the period of the stroke, which may be substantially equal to the time required to complete a cycle of operation of the valving machine 64. The driven period of conveyor 52 may be shortened or lengthened to determine the cut length of the tubing, by changing the position of pin 211a with respect to the slot 211 in crank 208 to correspondingly shorten or lengthen the stroke of rack 217.

The roller 50 may be suitably driven by a friction belt 50a to prevent the tubing T from gathering slack between the rollers 49a and 50.

For setting the valving mechanism 64 in motion to perform a complete cycle for each intermittent stopping of conveyor 52, there is provided on the continuously driven shaft 207 a cam 227 adapted momentarily to trip a suitable switch 228 (see Figures 21, 24, and 25) upon the conveyor stopping, which switch in turn energizes the solenoid 180, through the normally closed switch 184, (Figures 7 and 25a) to actuate the one-revolution clutch 175 and start the valving cycle, as before described. The description of the valving cycle in connection with Figure 25a, after solenoid 180 is energized to start the cycle, is substantially the same as the description above in connection with Figure 15a, like parts being given like numerals. At the end of the valving cycle block 185 on cam 100 (see Figure 12) actuates switch 184 to set the wiring circuit (Figure 25a) in condition so that cam 227 may actuate switch 228 for the succeeding valving cycle.

Figures 26 to 31, inclusive, show modified forms of valve pick-up and tube-punching mechanisms. These may be used in place of the similar mechanisms previously described without necessarily modifying the general operating structure or sequence of the valving machine.

Carried on the end of arm 88 of the reciprocating head 90 is a valve pick-up mechanism 230. A valve pad 231 may have an upwardly extending sleeve 232 arranged to slide vertically in arm 88, the bottom face of a cap 233 screwed on the top of the sleeve normally resting on arm 88 to limit downward movement of the pad with respect to arm 88. The bottom of pad 231 may be provided with a recessed portion 234 for receiving the base portion of a rubber valve V, and a block 235 suitably secured within sleeve 232 may be provided with a tapered hole therein for receiving the stem portion of the valve. A disc 236 of flexible material such as rubber, suitably arranged within sleeve 232, may be provided with an opening therein for tightly receiving the screw portion 237 of valve V, to hold the valve in pad 231 while it is being moved for the valve placing operation. This arrangement is such that when arm 88 is brought down over an upright valve V on conveyor 86 at station L, the stem of the valve is guided through the tapered hole of block 235 and is held by disc 236 until the valve is later ejected for placing it on the tube stock T at station P.

Between the block 235 and cap 233, there may be arranged in fixed position in sleeve 232 a block 238 having a chamber 239 for a pressure and suction operated piston 240. An ejector stem 241 extends downwardly from piston 240, through a bore 242 in block 238, and preferably has a tapered or pointed end adapted to engage in the valve opening of the valve stem. The upper part of chamber 239 communicates with pump 129 through the extension 150a of conduit 150, so that when pad 231 descends over a valve V on conveyor 86 suction may be caused to be applied to hold the ejector stem 241 out of engagement with the end of the valve stem. When pad 234 is about to be lifted from the tubing T, at station P after the valve placing operation (see Figure 30), pump 129 is caused to apply pressure in chamber 233 to thereby force ejector stem 241 downward against valve-stem V, to eject the latter from the valve pick-up mechanism and leave it properly centered over the previously punched hole in tubing T as the arm 88 moves upwardly.

A safety device may be provided in association with the pick-up mechanism 230 to prevent fouling thereof with a valve-stem at station L in case the valve pad 231 should descend when it is not exactly centered over said valve-stem. To this end there may be pivoted on arm 88, curving horizontally around the end thereof, a U-shaped member 244, and pivotally connected to member 244 at 245, 245 may be another U-shaped member 246, which is arched over the vertical center of the pick-up mechanism. Extending loosely through an opening 247 at the top of member 246 is a bolt 243 which screws into cap 233 and the head of which limits upward swing of member 244 with relation to valve-pad 231. A coil spring 249, extending between the cap 233 and a washer 250 under the arched portion of member 246, normally urges cap 233 against the arm 88 when the latter is in raised position and U-member 244 is in locked position. For locking the safety mechanism a T-shaped member, having a longitudinal plate 251 and a cross-piece 252, is

slidably secured to the under side of arm 88 by means of head-screws 253, 253 extending through slots 254, 254 into arm 88. The ends of the cross-piece 252 are normally urged over the top of lugs 255, 255 on U-member 244, into locking engagement therewith, by a spring 256 between one of the screws 253 and a pin 257 in plate 251. Pivotally mounted intermediate its ends on a bracket 258 secured to the arm 88 is a trip-lever 259, one end of the latter being pivotally connected at 260 to the slide-plate 251, at the end thereof adjacent the vertical center of the valving machine.

The free end of the trip-lever is arranged to contact a cam 261 on frame 92 to thereby slide cross-piece 252 out of engagement with lugs 255 whenever arm 88 is in the valve pick-up position at station L, thus allowing U-shaped member 244 to swing upward with the valve pad 231 should it for some reason become fouled on a valve stem. The fouled position of the safety mechanism has been indicated in chain-dotted lines in Figure 27. As soon as arm 88 moves away from station L the spring 256 urges cross-piece 252 into locking engagement with the lugs 255. In this locked condition any relative movement of valve pad 231 in relation to arm 88, caused by pressure of the valve pad against the tubing T, will be against the yielding action of spring 249 (see Figure 30).

Figures 26, 28, 29 and 31 best illustrate the modified form of the tube punching mechanism, which outside of the hole forming element is substantially the same in general construction and operation as the punching mechanism previously described. Vertically journaled in bearings 265, 265 in holder 266 for suction pad 267, the latter being mounted on arm 89 as previously described, is a shaft 268 having a sheave 269 keyed to its upper end arranged to be constantly driven, through a suitable belt 270, by a motor 271 mounted on arm 89. An annular knife element 272, formed with a recess 273 adjacent its sharp edge for receiving the plug from the hole punching operation, is suitably secured to the lower end of shaft 268.

Shaft 268 is suitably apertured to communicate recess 273 with a chamber 274 in holder 266, and chamber 274 communicates, through a passage 275 in holder 266 and conduits 150[b] and 150, with the combined suction and pressure cylinder 129 on frame 92. Suitable sealing rings 276, 276 may be provided to effectively close the chamber 274 against leakage of air through the bearings 265.

The above punching mechanism is operated substantially in the manner previously described, with the exception that the knife element 272, rotated at a suitable rate of speed to effectively cut a hole in tubing T, is used instead of the heated knife element 156.

For applying a suitable lubricant, such as water, to knife element 272, to aid the tube punching operation, an arm 277 pivotally mounted on frame 52[a] at 278 may be provided with a suitable device, such as a felt wick 279, for picking up lubricant from a tank 280 located beneath arm 277. A spring 281 attached to a lug 282 on arm 277 urges the lug against a pin 283 on frame 52[a] to normally hold arm 277 in a horizontal position. A finger 284 is arranged on punching-arm 89 to contact an adjustable button 285 on arm 277 as reciprocating head 90 moves downward during the valve-placing stroke, to force wick 279 down into tank 280. As head 90 moves back to the top of its stroke the spring 281 quickly urges arm 277 back to its horizontal position, thereby imparting a whipping action to the wick 279 and causing a sufficient amount of lubricant to be sprayed around the cutting edge of knife element 272. When the lubricating arm 277 is in the chain-dotted position shown in Figure 28 the plug from the previous hole punching operation may be ejected from recess 273 by the same pressure action of cylinder 129 previously described for a similar purpose.

The equipment described provides improved means for effectively applying a name-mark or other legend at predetermined spaced intervals on continuous rubber tubing as it issues from the tubing machine, soapstoning both sides of the tubing, incorporating rubber valves on the tubing at predetermined spaced intervals, and cutting the tubing to lengths preparatory to splicing the lengths of valved, unvulcanized, tubing into annular form and vulcanizing the same. It will be apparent that the invention is not limited to the exact detail shown and described. Accordingly, modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said device, means actuated by a valve placed on said tubing by a previous valving operation for stopping said conveyor at predetermined intervals and for starting a valving cycle, means on said valving device for punching a valve hole in said tubing, means on said device for placing a valve on said punched hole, and means on said device for starting said conveyor at the end of said valving cycle.

2. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said device, means actuated by a valve placed on said tubing by a previous valving operation for stopping said conveyor at predetermined intervals and for starting a valving cycle, means on said valving device for punching a valve hole in said tubing, means on said device for placing a valve on said punched hole, means on said device for starting said conveyor at the end of said valving cycle, and means coordinated with said valving cycle for cutting said tubing to predetermined lengths.

3. Apparatus of the character described comprising, in combination, a conveyor for progressively moving a continuous strip of tubing material, means for applying a name-mark or other legend to the tubing at predetermined intervals, means coordinated with said legend-applying means for intermittently holding a section of said tubing stationary whereby each section will have a complete legend thereon, and means for valving said tubing at predetermined distances apart during the stationary periods of said sections.

4. Apparatus of the character described comprising, in combination, a conveyor for progressively moving a continuous strip of tubing material, means for applying a name-mark or other legend to the tubing at predetermined intervals, means coordinated with said legend-applying means for intermittently holding a section of tubing stationary whereby each section will have a complete legend thereon, means for valving said tubing at predetermined distances apart during the stationary periods of said sections, and means

coordinated with said valving means and legend-applying means for cutting said tubing to predetermined lengths having requisite valves and marking thereon.

5. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said device, means actuated by a valve placed on said tubing by a previous valving operation for stopping said conveyor at predetermined intervals and for starting a valving cycle, means on said valving device for punching a valve hole in said tubing, means on said device for placing a valve on said punched hole, means on said device for starting said conveyor at the end of said valving cycle, means associated with said valving machine for cutting said tubing to predetermined lengths, and compensating means for temporarily storing said moving strip as it approaches said valving means when said section is stationary.

6. Apparatus of the character described comprising, in combination, a conveyor for progressively moving a continuous strip of tubing material, means for continuously supplying tubing material to said conveyor, means for applying a name-mark or other legend to predetermined lengths of the tubing, means coordinated with said legend-applying means for intermittently stopping said conveyor for holding a section of said tubing stationary whereby each section will have a complete legend thereon, means for valving said length of tubing at predetermined points during the stationary periods of said sections to apply a valve to each of said lengths of tubing, and compensating means intermediate said conveyor and said supplying means for temporarily storing said moving strip as it approaches said valving means when said section is stationary.

7. Apparatus of the character described comprising, in combination, means for continuously supplying tubing material to said conveyor, a conveyor for progressively moving a continuous strip of tubing material, means for applying a name-mark or other legend to predetermined lengths of the tubing, means coordinating with said legend-applying means for intermittently stopping said conveyor for holding a section of said tubing stationary whereby each section will have a complete legend thereon, means for valving said lengths of tubing at predetermined points during the stationary periods of said sections, means coordinated with said valving means and said name-mark applying means for cutting said tubing to said predetermined lengths having requisite valves and marking thereon, and compensating means intermediate said conveyor and said supplying means for temporarily storing said moving strip as it approaches said valving means when said section is stationary.

8. Apparatus of the character described comprising, in combination, a conveyor for progressively moving a continuous strip of tubing material, means for continuously supplying tubing material to said conveyor, means for applying a name-mark or other legend to predetermined lengths of one side of said tubing, means coordinated with said legend-applying means for intermittently stopping said conveyor for holding a section of said tubing stationary whereby each section will have a legend thereon, means for applying a lubricant to the marked side of said tubing, said tubing being supplied from said supplying means to said conveyor with the unmarked side up, a compensating device intermediate said conveyor and supplying means for temporarily storing tubing material while said intermittent conveyor is stationary, means associated with said intermittent conveyor for valving said tubing on said unmarked side at predetermined distances apart while said intermittent conveyor is stationary to apply a valve to each of said lengths of tubing, and means for applying lubricant to said unmarked side of the tubing material after said valving operations.

9. Apparatus of the character described comprising, in combination, a conveyor for progressively moving a continuous strip of tubing material with one side of the tubing exposed, means for applying a name-mark or other legend within predetermined lengths of said tubing on the exposed side thereof, means associated with said conveyor for applying a lubricant to said exposed side of said tubing after it is marked, an intermittently operated conveyor arranged to receive said tubing from the first named conveyor with the unmarked side up, means coordinated with said legend applying means for intermittently stopping said intermittent conveyor to hold a section of said tubing stationary whereby each section will have a legend thereon, a compensating device intermediate said first and second named conveyors for temporarily storing tubing material while said intermittent conveyor is stationary, means associated with said intermittent conveyor for valving said tubing on said unmarked side at predetermined distances apart while said intermittent conveyor is stationary to apply a valve to each of said lengths of tubing, means for applying lubricant to said unmarked side of the tubing material, and means coordinated with said valving means and said marking means for cutting said tubing to predetermined said lengths having requisite valves and marking thereon.

10. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said device, a light sensitive device adapted to be affected by a previously placed valve on said tubing to stop said conveyor and start a valving cycle of said valving device, means on said valving device for successively punching a hole in said tubing and placing a valve on said tubing in cooperation with said hole, and means operable by said valving device to start said conveyor at the end of said valving cycle.

11. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said device, a light sensitive device adapted to be affected by a previously placed valve on said tubing to stop said conveyor and start a valving cycle of said valving device, means on said valving device for successively punching a hole in said tubing and placing a valve on said tubing in cooperation with said hole, means operable by said valving device to start said conveyor at the end of said valving cycle, and a cutter operable by said valving device to cut said tubing to predetermined lengths with valves thereon.

12. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said valving device, mechanism for intermittently driving said conveyor to feed predetermined lengths of tubing past said valving device and for holding said conveyor stationary

for a predetermined period of time to present a length of tubing in association with said valving device, means operable in synchronism with the intermittent action of said driving mechanism for starting said valving device to perform a valving cycle thereof while said conveyor is stopped, and means on said valving device operable during a valving cycle thereof for successively forming a hole in said tubing and positioning a valve on said tubing in cooperation with said formed hole.

13. Apparatus of the character described comprising, in combination, a valving device, a conveyor for moving a continuous strip of tubing material past said valving device, mechanism for intermittently driving said conveyor to feed predetermined lengths of tubing past said valving device and for holding said conveyor stationary for a predetermined period of time to present a length of tubing in association with said valving device, means operable in synchronism with the intermittent action of said driving mechanism for starting said valving device to perform a valving cycle thereof while said conveyor is stopped, means on said valving device operable during a valving cycle thereof for successively punching a hole in a length of said tubing on the conveyor and placing a valve on said tubing in cooperation with said punched hole, and a cutter in association with said conveyor operable in synchronism with said driving means to make a transverse cut in said tubing each time the conveyor is stopped and thereby cut the tubing into predetermined lengths with valves thereon.

14. A machine for placing valves on tubing for inner tubes and the like comprising, in combination, means for supporting a length of tubing, a hole-punching mechanism, a valve pick-up device, means for mounting said mechanism and said device to be independently shiftable toward said supporting means, means for feeding valves to said pick-up device, means on said pick-up device for releasably retaining a valve fed thereto by said feeding means, means for actuating said mechanism to shift the same toward and from said supporting means to punch a hole in a wall of said tubing thereon, and means for shifting said device toward and from said supporting means to release a valve from the device onto said tubing in cooperative relation to said punched hole.

15. A machine for placing valves on tubing for inner tubes and the like comprising, in combination, a reciprocating head, means for reciprocating said head, a hole-punching mechanism and a valve pick-up device on said head, means for feeding valves to said device, means for rotating said head, said head being adapted to be reciprocated to punch a hole in said tube and to pick up a valve from said feeding means, and said head being adapted to be rotated and reciprocated to place said valve on said tubing in cooperating relation to said punched hole.

16. A machine for placing valves on tubing for inner tubes and the like, comprising, in combination, a shaft, means for reciprocating said shaft, means for rotating said shaft, a tube-punching mechanism and a valve pick-up device carried by said shaft, means for supporting a length of tubing in association with said shaft, a conveyor for progressively feeding valves to said pick-up device, means in said pick-up device for releasably retaining a valve fed thereto by said feeding conveyor, means for reciprocating said shaft toward and from said supporting means to cause said mechanism to punch a hole in a wall of said tubing and to cause said device to pick up a valve from said feeding conveyor, and means for rotating said shaft and reciprocating the same toward and from said supporting means to cause said device to release a picked-up valve therefrom onto said tubing in cooperating relation with said punched hole.

17. A valve applying device for inner tube manufacturing equipment, comprising means for supporting the tubing, a holder having a recess for receiving a valve with the stem thereof extending inwardly, means for shiftably supporting said holder in association with said tubing support, means for releasably retaining said valve in said holder, means for shifting said holder toward and from proximity to the tubing, and means for releasing a valve from the holder onto the tubing while the holder is in proximity thereto.

18. A valve applying device for inner-tube manufacturing equipment, comprising means for supporting the tubing, a holder having a recess for receiving the stem of a valve therein, means for shiftably supporting said holder in association with said tubing support, suction means for applying suction within said holder recess to retain a valve in the holder, and pressure means for applying pressure within said holder recess to eject the valve from the holder onto the tubing.

19. In inner-tube manufacturing equipment a device for applying rubber valves to tubing comprising, a supporting arm, a holder yieldably supported in said arm, said holder having a recess therein for receiving the stem portion of a valve, means for retaining a valve in said holder, means for ejecting said valve from said holder, a conveyor for progressively feeding valves to said device, means for moving said holder into association with a valve on said conveyor and also into association with said tubing, said holder being movable into yielding association with a valve on said conveyor to receive and retain a valve in said recess, said holder being then movable to yieldingly urge said valve against said tubing and place said valve thereon as the valve is ejected from the holder.

20. In inner-tube manufacturing equipment a device for applying rubber valves to tubing comprising a supporting arm, a holder supported in said arm, said holder having a recess therein for receiving the stem portion of a valve, means for retaining a valve in said holder, means for ejecting said valve from said holder, a conveyor for progressively feeding valves to said device, means for moving said holder into association with a valve on said conveyor and also into association with said tubing, said holder being movable into association with a valve on said conveyor to receive and retain a valve in said recess, said holder being then movable to urge said valve against said tubing and place said valve thereon as the valve is ejected from the holder.

21. In inner-tube manufacturing equipment a device for applying rubber valves to tubing comprising a supporting arm, a holder supported in said arm, said holder having a recess therein for receiving the stem portion of a valve, means for retaining a valve in said holder, means for ejecting said valve from said holder, a conveyor for progressively feeding valves to said device, means for moving said holder into association

with a valve on said conveyor and also into association with said tubing, said holder being movable into association with a valve on said conveyor to receive and retain a valve in said recess, said holder being then movable to urge said valve against said tubing and place said valve thereon as the valve is ejected from the holder, releasable means on said arm for retaining said holder in normal relation to said arm, and means for releasing said holder retaining means to allow the holder to move relative to said arm to prevent fouling with a valve-stem on said conveyor in case said holder does not properly register with said valve-stem.

FLORAIN J. SHOOK.