Aug. 29, 1944. J. EHRET, JR., ET AL 2,356,837

MATERIAL TREATING APPARATUS

Filed Aug. 22, 1940 4 Sheets-Sheet 1

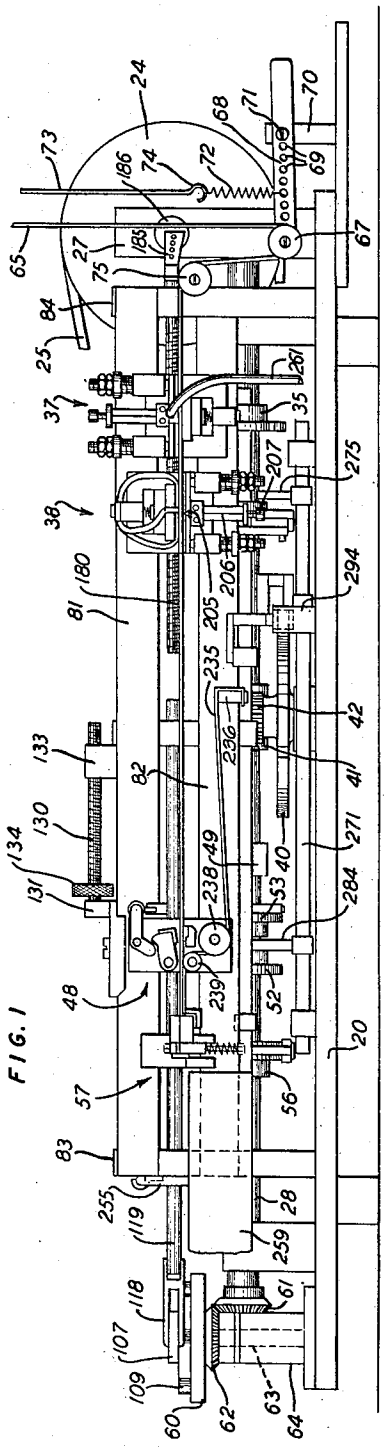


FIG. 1

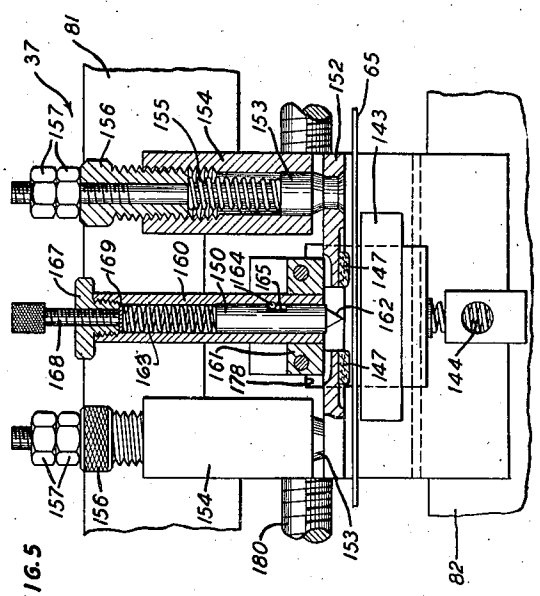


FIG. 5

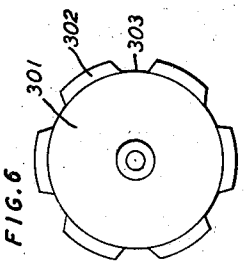


FIG. 6

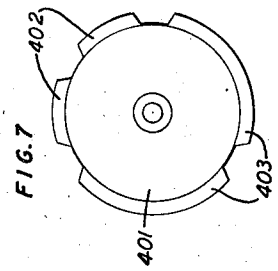


FIG. 7

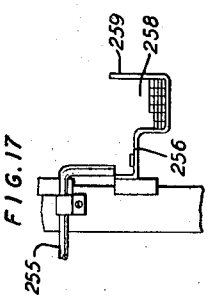


FIG. 17

INVENTORS
J. EHRET, JR.
C. W. MAURER

BY E. R. Mowlan
ATTORNEY

Aug. 29, 1944. J. EHRET, JR., ET AL 2,356,837

MATERIAL TREATING APPARATUS

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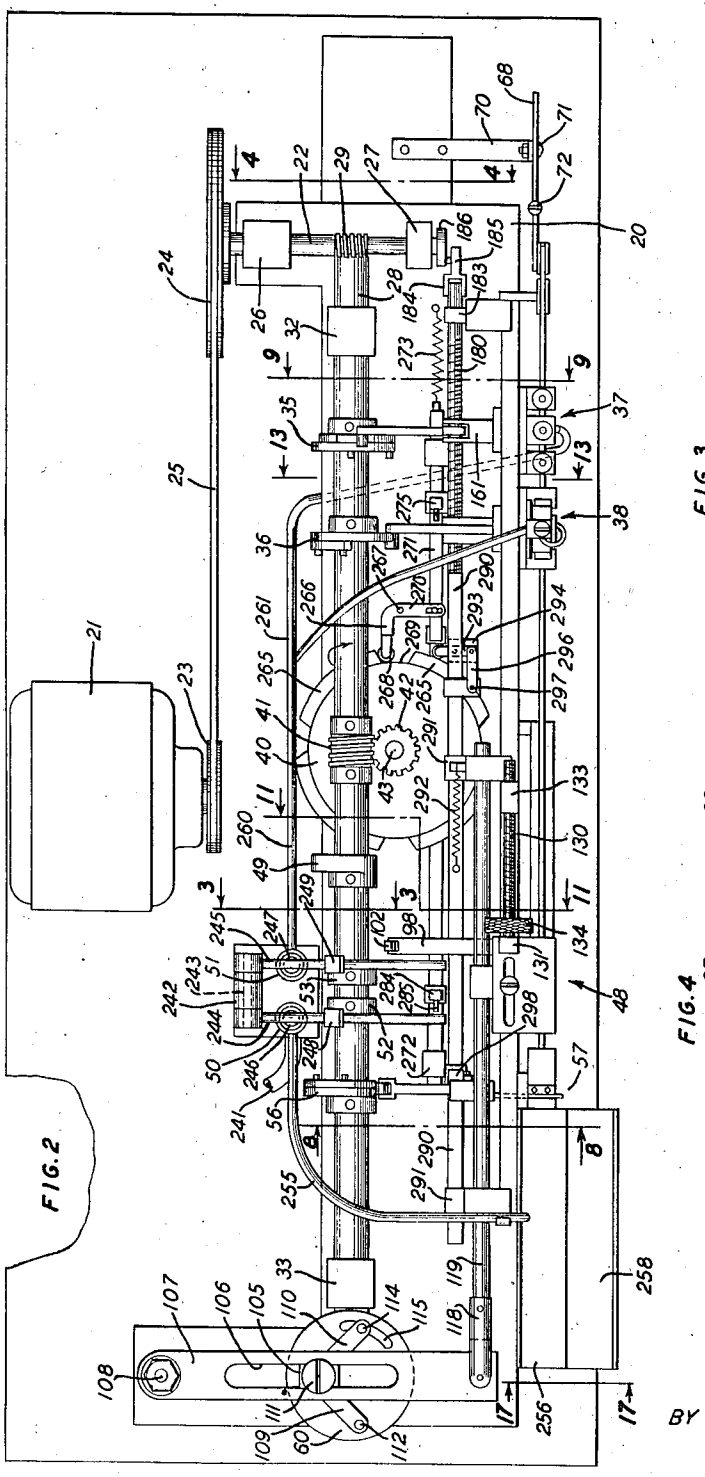


FIG. 2

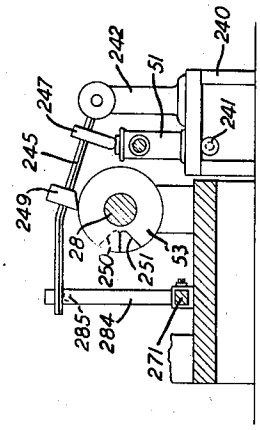


FIG. 3

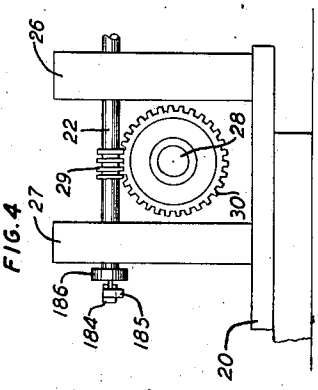


FIG. 4

INVENTORS
J. EHRET, JR.
C. W. MAURER

BY E. R. Nowlan
ATTORNEY

Aug. 29, 1944. J. EHRET, JR., ET AL 2,356,837

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FIG. 8

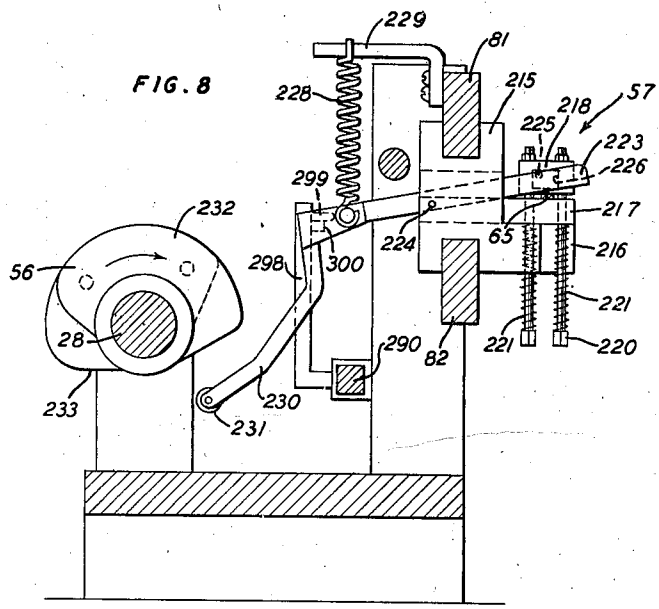


FIG. 9

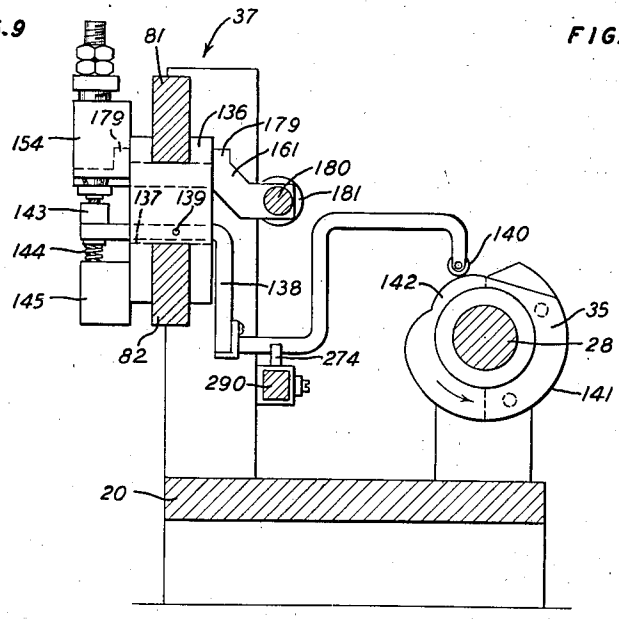


FIG. 16

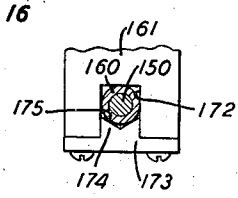
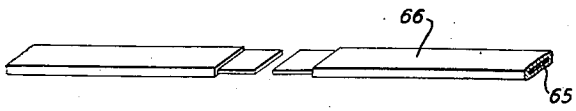


FIG. 10



INVENTORS
J. EHRET, JR.
C. W. MAURER

BY E. R. Nowlan
ATTORNEY

Aug. 29, 1944. J. EHRET, JR., ET AL 2,356,837

MATERIAL TREATING APPARATUS

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FIG. 11

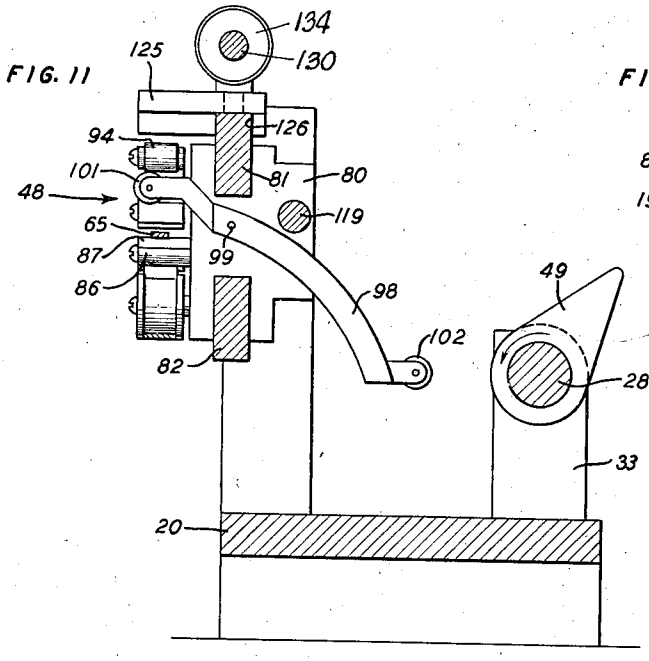


FIG. 15

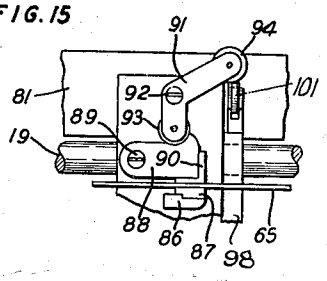


FIG. 12

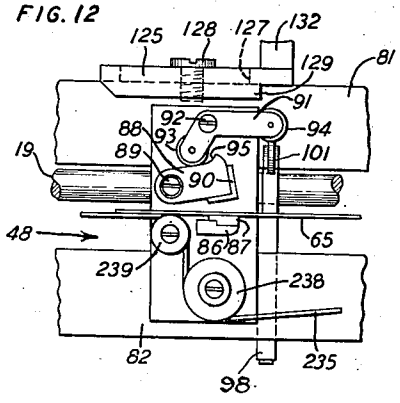


FIG. 13

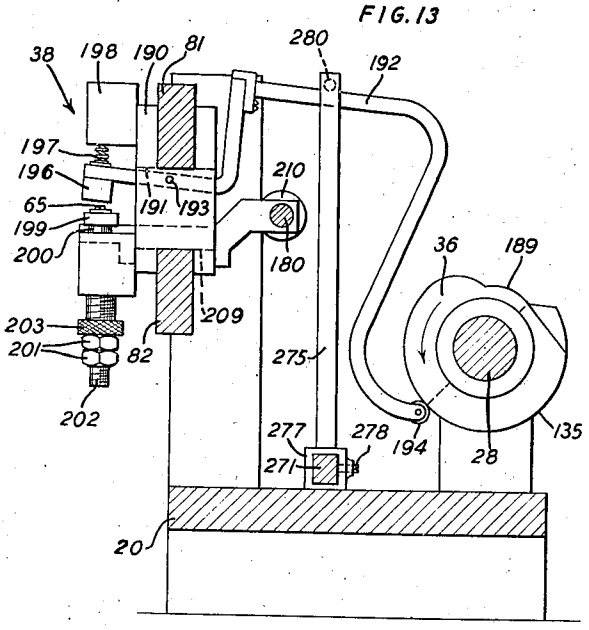
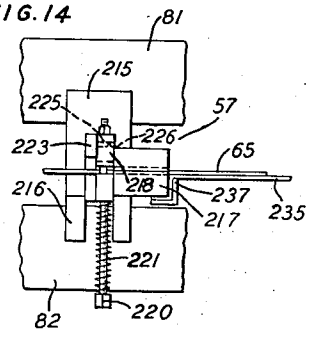


FIG. 14



INVENTORS
J. EHRET, JR.
C. W. MAURER

BY

E. R. Dowlan

ATTORNEY

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UNITED STATES PATENT OFFICE

2,356,837

MATERIAL TREATING APPARATUS

John Ehret, Jr., Trenton, N. J., and Carl W. Maurer, Freeport, N. Y., assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application August 22, 1940, Serial No. 353,686

14 Claims. (Cl. 81—9.51)

This invention relates to material treating apparatus, and more particularly to apparatus for treating vacuum tube filaments.

Vacuum tube filaments are generally cut from a strand or ribbon of suitable material coated, for example, with a barium-strontium mixture baked to a hard surface. The necessary treatment to condition such filaments for welding, to support wires of the mounting structures of the various types of vacuum tubes, includes the cutting of the filament material into definite lengths and removing the coating from the ends of each length. Heretofore such treating processes have been carried out by hand, cutting the filament from a supply of material and with the aid of a razor blade or similar tool, scraping the coating from the ends thereof. This has required painstaking efforts and considerable time of the individuals carrying out the process, due to the delicate structure of the material.

An object of the invention is to provide a material treating apparatus which is highly efficient in treating filaments for vacuum tubes and accurately variable for treating filaments of various lengths.

With this and other objects in view, the invention comprises mechanism to advance covered material predetermined variable distances intermittently, scrape the cover for a variable distance from opposite sides of the material at predetermined variable spaced distances and sever the material at the scraped positions.

Other objects and advantages will be apparent from following detailed description when taken in conjunction with the accompanying drawings, wherein

Fig. 1 is a front elevational view of the apparatus;

Fig. 2 is a top plan view of the apparatus;

Fig. 3 is a vertical sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary end elevational view taken along the line 4—4 of Fig. 2;

Fig. 5 is an enlarged fragmentary detailed view of the upper scraping unit, portions thereof being shown in section;

Figs. 6 and 7 are detailed views of the various forms of control cams;

Fig. 8 is an enlarged vertical sectional view taken along the line 8—8 of Fig. 2;

Fig. 9 is an enlarged vertical sectional view taken along the line 9—9 of Fig. 2;

Fig. 10 is an enlarged fragmentary perspective view illustrating the filaments and the results of the apparatus thereon;

Fig. 11 is an enlarged vertical sectional view taken substantially along the line 11—11 of Fig. 2;

Fig. 12 is an enlarged front elevational view of the feeding unit in open position;

Fig. 13 is an enlarged vertical sectional view taken along the line 13—13 of Fig. 2;

Fig. 14 is a front elevational view of the shearing unit shown in Fig. 8;

Fig. 15 is a fragmentary front elevational view of a portion of the feeding unit in closed position;

Fig. 16 is a fragmentary sectional view of the clamp for one of the scraping elements, and

Fig. 17 is a fragmentary detailed view taken along the line 17—17 of Fig. 2.

Referring now to the drawings, particularly Figs. 1 and 2, the general structure of the apparatus includes a base 20 upon which a power means, such as a motor 21, is mounted to drive a shaft 22 through the aid of pulleys 23 and 24 and a connecting belt 25. The shaft 22 is rotatably supported in bearings 26 and 27 and rotates a cam shaft 28 in the direction of the arrow, through the aid of a worm 29 of the shaft 22, interengaging a worm gear 30 of the cam shaft 28. The cam shaft is rotatably journalled in bearings 32 and 33 and has, adjustably mounted thereon, cams 35 and 36 conditioned to operate upper and lower scraping units indicated, respectively, at 37 and 38, the cam shaft also driving a control cam 40 through a worm 41 and a worm gear 42, the worm gear being mounted upon a vertical shaft 43 journalled in a suitable bearing supported by the base 20. The cam shaft further actuates a feeding unit, indicated generally at 48, through a cam 49 and also valves 50 and 51, through cams 52 and 53, respectively. A cam 56 mounted upon the cam shaft controls the shearing unit shown in Figs. 8 and 14 and indicated generally at 57, while at the farthest end of the cam shaft, that is, the extreme left (Figs. 1 and 2), an eccentric 60 is driven through bevelled gears 61 and 62, the former being mounted upon the cam shaft while the latter is mounted upon a vertical shaft 63 journalled in a bearing 64 supported by the base 20.

Material feeding unit

The material to be treated may be of any desired type, that in the present embodiment being suitable material 65 for filaments of vacuum tubes having a coating 66 of other substance or material such as barium-strontium. This coated material may be previously wound upon a supply reel (not shown) and fed downwardly, as illustrated in Fig. 1, around a roller 67 of a tension

arm 68. The tension arm is provided with a plurality of apertures 69 through which the arm may be mounted adjustably upon a vertical support 70 through the aid of a screw 71 receivable in any of the apertures and also in a threaded aperture (not shown) in the support. Resilient means such as a spring 72 having one end receivable in one of the apertures 69 and the other end supported by a fixed member 73 with a hooked end 74, assists the tension arm against jerking movement during the feeding of the material and to cushion the arm in its movements, particularly its downward movement. The material being fed passes over a roller 75, which aligns the material for horizontal movement, through the scraping units 37 and 38 and through the feeding unit 48.

The feeding unit shown in Figs. 1, 2, 10, 11 and 14 has a substantially H-shaped slidable support 80 disposed between parallel spaced rails 81 and 82, these rails extending between uprights 83 and 84 and having their ends fixed thereto, the uprights being rigidly mounted upon the base 20. The slidable support 80 has a stationary gripping member 86 mounted upon the front face thereof with a suitable resilient pad 87 carried thereby having an upper surface lying adjacent the path of travel of the material and upon which the material rests. A movable gripping member 88 pivotally mounted at 89 on the slidable support 80, has a resilient pad 90 angular in cross section which extends in front of and beneath the movable gripping member and cooperates with the resilient pad 87 to firmly grip the material sufficiently to advance the material yet avoid damage thereto.

A latch 91 in the form of a bellcrank lever is pivotally supported at 92 upon the slidable support 80, and carries rollers 93 and 94 at the ends thereof, the roller 93 being positioned to ride upon the upper surface of the movable gripping member 88 including a cam portion 95 by the aid of which the roller 93 may cause the movable gripping member to move into gripping relation with the material. Suitable means such as a spring (not shown) is provided to normally urge the movable gripping member 88 counterclockwise about its pivot when released by the latch 91.

The means to move the latch 91 into its holding position, shown in Fig. 15, includes a cam lever 98 pivoted at 99 on the slidable support 80 and having rollers 101 and 102 mounted at the ends thereof. The roller 101 is positioned to engage the roller 94 to move the latch counterclockwise when the cam lever 98 is moved clockwise (Fig. 11). The roller 102 is positioned so that when it has been moved with the slide in the path of the cam 49, the roller will be engaged by the cam and caused to move the cam lever a sufficient distance in a clockwise position, to move the latch 91 into the position shown in Fig. 1. The cam lever 98, however, moves with the slidable support 80 during the reciprocal movement of the latter, and will not be actuated until the feeding unit has been moved to the right (Fig. 2) on its return movement so that the roller 102 will be brought into the path of the cam 49.

The eccentric 60 and associated parts constitute the means to cause reciprocal movement of the feeding unit. The eccentric 60 is rotated continuously through rotation of the cam shaft 28 and the bevelled gears 61 and 62, rotating the eccentric clockwise (Fig. 2). A control block 105 slidably disposed in an elongate aperture 106 of an oscillating lever 107 pivotally supported at 108, is adjustably mounted upon the eccentric and supported thereon by arms 109 and 110. The arms 109 and 110 are of a lever pivotally connected to the block 105 by a screw 111, while the outer end of the arm 109 is pivotally mounted at 112 upon the eccentric adjacent the outer edge thereof. The mounting for the outer end of the arm 110 includes a bolt 114 extending through the arm 110 and through an elongate arcuate aperture 115 in the eccentric. The purpose of this structure is to enable the operator to control the effective movement of the lever 107 by moving the control block 105 toward or away from the center of the eccentric through the adjustment of the arms relative to the aperture 115. This adjustable means conditions the feeding unit to feed variable lengths of the material through the apparatus.

The forward end of the lever 107 is connected through a pivotal yoke 116 to a pull rod 119, the latter extending through and secured to the slidable support to cause reciprocal movement of the feeding unit 48 during the oscillatory movement of the lever 107.

Means has been described to cause movement of the latch 91 through the actuation of the cam 49, to move the gripping member 88 from the position shown in Fig. 12 to the position shown in Fig. 15, to grip the material for the advancement of the material through the apparatus a definite predetermined distance during movement to the left (Fig. 1) of the feeding unit. Means is provided to trip the latch 91 as the feeding unit reaches the end of its feeding stroke so as to release the gripping member 88 and condition the feeding unit to move to the right for another feeding cycle. This latch tripping means includes an element 125 grooved, at 126, to straddle the upper rail 81 and extend forwardly, as illustrated in Fig. 11, over the path of the roller 94. An elongate aperture 127 in the element 125 extends longitudinally of the element above the rail 81, to receive a screw 128 threadedly disposed in an aperture in the rail to firmly hold the element in any desired position relative to the rail. A shoulder 129 of the element 125 is positioned to be engaged by the roller 94 when the feeding unit is moved to the left, to cause the latch 91 to move clockwise about its pivot 92 to release the gripping member 88 at the end of the feeding movement of the unit.

Due to the fact that the control block 105 of the eccentric 60 is variable through the adjustment of the arm 110 of the lever to vary the distance of movement to the feeding unit, the element 125 must necessarily be variable to vary the point in the travel of the feeding unit in which the gripping member 88 is released, to release its hold on the material through the aid of the gripping member 86. The adjusting means associated with the element 125 in addition to the screw 128 and the elongate aperture 127, includes an adjusting screw 130 (Figs. 1, 2 and 11) connected at 131 to a vertical integral portion of the element 132 for rotation, yet against longitudinal movement, while the threaded portion of the screw is disposed in a nut 133 fixed to the rail 81. When the screw 128 is made loose the adjusting screw 130 may be rotated in either direction by the aid of a knurled wheel 134 to cause movement of the element 125 in either direction.

Scraping units

The scraping units 37 and 38 are substantially identical in structure excepting that they are mounted in reverse order so that the scrap-

ing unit 37 will remove the coating 66 from a desired length of the upper portion of the material, while the scraping unit 38 will in a similar manner remove the coating from the same portion beneath or at the under side of the material. Referring first to the unit 37, attention is directed to Figs. 1, 2, 5 and 8. This unit includes a slidable support 136 which is H-shaped in cross section and mounted for adjustment between the rails 81 and 82. The support 136 is apertured, at 137, to receive a cam lever 138 pivoted at 139 in the support. The cam lever is of a contour shown in Fig. 8 and supports a roller 140 at one end positioned to ride upon the cam 35. The cam 35, which is rotated counterclockwise (Fig. 9) with the cam shaft 28 has a high portion 141 and a low portion 142, the latter allowing movement of the cam lever into what might be termed the scraping position, while the former moves the cam lever out of and holds the cam lever out of scraping position. The forward or outer end of the cam lever 138 supports a backing block 143 above which the material travels while being fed through the apparatus. A compression spring 144 partially housed in a projection 145 of the support 136 provides the force to move the cam lever 138 with the backing block and the material into scraping position. During this movement the spring 144 will move the backing block 143 into engagement with the material and the material into engagement with spaced pads 147 disposed upon each side of a scraping element 150. The pads 147 serve to cooperate with the backing block 143 in firmly holding the material against movement during the scraping operation to avoid injury to the material. Furthermore, the pads 147 are mounted upon the under surface of a member 152 which has its ends fixed to spring pressed plungers 153, the plungers 153 extending vertically through internally threaded upright portions 154 integral with the support 136 and through helical compression springs 155 and adjusting nuts 156. The adjusting nuts 156 are threadedly disposed on the portions 154 to vary the force of the springs 155, counteracting and thus varying the force of the spring 144 holding the material in engagement with the scraping element 150. Sets of nuts 157 mounted upon the upper ends of the threaded portions of the plungers 153 provide means to vary the normal or lower position of the member 152.

The scraping element 150 is movably disposed in a sleeve 160 removably supported by a reciprocating arm 161. The lower end of the scraping element 150 has a scraping portion 162 substantially V-shaped in cross section and terminating in an edge positioned to be engaged by the material to be treated. A compression spring 163 disposed in the sleeve 160 backs up the scraping element 150 and serves as a cushioning means therefor during the scraping operation. A pin 164 extending through the sleeve 160 is positioned in an elongate recess 165 to limit the vertical movement of the scraping element and to hold the element at a normal position when the element is not scraping the material. A nut 167 is threadedly disposed in the upper end of the sleeve 160 and is internally threaded to receive an adjusting screw 168, the latter engaging a plate 169 at its inner end to be moved by the adjusting screw to vary the tension of the spring 163.

The end of the reciprocating arm 161 is notched, as at 172 (Fig. 16) to receive the lower end of the sleeve 160 and a gripping block 173 is fixed to the outer end of the arm and has an inwardly projecting portion 174 with a V-shaped groove 175 in its inner surface to cooperate with the walls of the notch 172 to firmly yet removably hold the sleeve in place. The reciprocating arm 161 is slidably disposed in an aperture 178 in the support 136 and extends inwardly as illustrated in Fig. 9, to a position where it receives a reciprocating rod 180. The arm 161 also has vertical integral portions 179 disposed in sliding engagement with the front and rear surfaces of the support 136 to serve as guides during movement of the arm. The end of the arm 161 adjacent the rod 180 is in the form of a yoke, as illustrated in Fig. 2, to straddle the knurled nut 181, the latter being threaded upon the rod 180 for adjustment of the arm relative to the rod. The reciprocating rod 180 extends to the right (Fig. 2) through a bearing 183 to a point where it is connected to a yoke 184 of a link 185. The other end of the link 185 is operatively connected to an eccentric 186 mounted upon the adjacent end of the shaft 22, so that during rotation of the shaft the eccentric will cause the rod 180 to reciprocate in its bearings 183 and impart reciprocal movement to the scraping element 150 through the arm 161.

The scraping unit 38, as stated heretofore, is substantially identical in structure to the scraping unit 37 except that the former is mounted in reverse order to that of the latter. It is, therefore, believed that only the difference in structure as illustrated in Fig. 12 need be set forth, other details being identical to those shown, for example, in Fig. 5.

Attention is now directed to Fig. 12, wherein a support 190 substantially H-shaped in contour is mounted between the rails 81 and 82 and provided with an aperture 191 through which a cam lever 192 extends and in which the lever is pivoted at 193. One end of the lever 192 is provided with a roller 194 positioned in engagement with the cam 36, which has a high portion 195 and a low portion 189, the high portion serving to hold the cam lever out of scraping position whereas the low portion 196 allows the cam lever to move into scraping position. A backing block 196, carried by the other end of the cam lever, is conditioned to be urged toward the material 65 by a compression spring 197 disposed in a hollow projection 198 of the support 190. A member 199 supported by spaced plungers 200 identical in structure to the plungers 153 is conditioned by springs (not shown) similar to the springs 155 (Fig. 5) to move the member 199 with the plungers 200 upwardly to positions limited by nuts 201 on the threaded portions 202 of the plungers abutting against adjusting screws 203 which also serve to vary the tension of the springs associated with the plungers. A scraping element 205 (Fig. 1) is identical in construction to the scraping element 150 and has a sleeve 206 provided with a spring identical with the spring 163 (Fig. 5), the tension of which may be varied by an adjusting screw 207 to vary the force of the spring on the scraping element. The sleeve 206 is removably and adjustably carried by a reciprocating arm 209 by the same type of means illustrated in Fig. 16. The reciprocating arm 209 extends through the aperture 191 in which it is slidably disposed for reciprocatory movement and has its inner end apertured to receive the reciprocating

rod 180 and notched to receive a knurled adjusting nut 210.

The scraping unit 38 is positioned relative to the scraping unit 37 so that the portion of the material which has had the coating removed from its upper surface by the unit 37 will be positioned in the scraping unit 38 for the removal of the coating from the under surface of that portion. When the material is thus positioned it will in this instance rest upon the pads similar to the pads 147 of unit 37, and the cam lever together with the backing block 196 will be moved by the compression spring 197 when permitted by the cam 36, so as to force the plungers 200 together with the material, the pads and the member 199 downwardly against the force of the springs adjacent the adjusting screws 203, until the material has been positioned with respect to the scraping element 205 so that the reciprocatory movement of the scraping element through the movement of the arm 209 will cause removal of the coating on the material.

Shearing unit

Attention is now directed to Figs. 1, 2, 8 and 14, which illustrate the shearing unit 57. This unit is also provided with a substantially H-shaped support 215 mounted between and supported by rails 81 and 82 and adjustable thereon if desired. The support 215 has a forwardly extending integral projection 216 upon which a shearing block 217 is mounted. A clamping block 218 is positioned above the shearing block 217 and is supported by a pair of bolts 220 which are movable freely in vertical apertures in the shearing block and support compression springs 221 extending between the heads of the bolts and the under surface of the shearing block. These springs normally urge the clamping block 218 downwardly under predetermined variable pressure, to hold the material 65 against movement during the shearing operation. A shearing blade 223 pivotally supported at 224 in the support 215, carries a projection 225 extending laterally in a cutaway portion 226 of the clamping block 218, to move the clamping block upwardly when the shearing blade is moved upwardly or counterclockwise to position the clamping block 218 away from the shearing block for free movement of the material during the time of its advancement. A tension spring 228 having one end connected to the shearing blade 223 and the other end connected to a support 229 fixed to the rail 81, provides the means to move the shearing blade clockwise through its shearing operation. A cam arm 230 connected to the inner end of the shearing blade carries a roller 231 positioned to engage the cam 56 which is conditioned to move the shearing blade counterclockwise or out of shearing position, and to also force the clamping block 218 upwardly. A high portion 232 of the cam 56 causes upward or counterclockwise movement of the shearing blade, while a low portion 233 of the cam allows the spring 228 to move the shearing blade through its shearing operation. The shearing block 217 is positioned so that it will cooperate with the shearing blade in shearing the material.

The material in being advanced through the apparatus is pulled by the feeding unit 48, yet that portion in advance of the feeding unit is pushed through the shearing unit. To maintain the material in a definite path, a supporting means is provided for that portion of the material in advance of the feeding unit, that is, between the feeding unit and the shearing unit. This means consists of a supporting belt 235 (Figs. 1, 12 and 14) which has one end extending partially around and fixed to a projection 236 mounted upon the rail 82, while the other end is fixed at 237 to the shearing block 217. The intermediate portion of the belt 235 is conditioned to travel around rollers 238 and 239 carried by the feeding unit 48, the roller 239 being positioned with the forward securing means 237 to provide a support for the material in its normal plane of travel.

Valve control means

The valves 50 and 51 are mounted upon a common valve casing 240 which is supplied with air under pressure from a suitable source (not shown) through a hose connection 241. The detailed structures of the valves 50 and 51 are not shown, as these valves may be of any desired commercial type of plunger controlled valves normally closed but conditioned to be opened by pressure on the plungers.

An upright 242 is mounted upon the valve casing 240 and supports a shaft 243 at its upper end, this shaft also rotatably supporting cam levers 244 and 245. The cam levers 244 and 245 together with the associated parts to be described are identical in structure, and Fig. 3 is thought sufficient together with the showing in Fig. 2, to clearly illustrate both structures. The cam levers 244 and 245 have projections 246 and 247 disposed respectively to engage the plungers of their valves 50 and 51. Cam blocks 248 and 249 are mounted upon the cam levers 244 and 245, respectively, to ride upon their respective cams 52 and 53. The cams 52 and 53 have low portions 250 and 251, respectively, conditioned to receive the cam blocks 248 and 249, respectively, to allow the cam levers to move downwardly by gravity or other force to open the valves during predetermined intervals during the operating cycle of the apparatus.

The valve 50 when open directs a current of air through an air line 255 to a platform 256 (Figs. 2 and 17) upon which the completed filaments are positioned after the operation of the shearing unit 57, the upper surface of the platform 256 being disposed adjacent the plane of travel of the material so that during advancement of the material the finished portion fed beyond the shearing unit rests upon the platform during the shearing operation. The valve 50 is controlled by the cam 52 and other means hereinafter described so that it will be opened only after the shearing unit has operated. The purpose of the jet of air is to blow the completed filament from the platform into a receptacle or trough 258 which in the present instance is a part of the structure including the platform 256. The trough 258 is open at its ends so that the finished filaments may be readily removed therefrom and a forward wall 259 extends upwardly above the platform to cause the filaments to drop into the trough and prevent the filaments from being blown beyond the trough.

The valve 51 is operated to cause intermittent jets of air to pass to an air line 260 which is divided into two air lines at 261 to direct air to the scraping units 37 and 38. Although no detailed structure is shown illustrating the termination of the air lines at the scraping units, it is believed sufficient to say that these air lines are positioned to direct their currents of air toward their respective scraping elements 150 and 205 to blow

the particles of the covering as they are removed from the material.

Control cam mechanism

The control cam **40** has various purposes and controls the operation of the scraping units **37** and **38**, the shearing unit **57** and the valve **50**. With this cam structure which is operated in synchronism with the cams **35**, **36**, **52** and **56**, as well as the cam **49** which controls the feeding unit **48**, the apparatus may be conditioned to cause the scraping units to operate during each cycle of operation of the apparatus, that is, during each cycle of the cam shaft and during every other cycle thereof or at definite time intervals depending upon the length of filament desired. For example, if the scraping units were operated during each cycle of operation of the cam shaft, a filament of a definite length would be completed. If, however, the scraping units were operated once during every two cycles of operation of the cam shaft the completed filaments would be twice that length. With the present cam structure the scraping units are conditioned to operate during every third cycle of operation of the cam shaft. This is brought about by the number and length of high portions **265** on the cam **40**. These portions determine the length of time the scraping units will be held out of operation, it being understood that the cam **40**, due to its connection with the cam shaft **28**, rotates at a much lower speed than the cam shaft or at a ratio of twelve to one.

A cam lever **266**, pivoted at **267**, has a cam roller **268** positioned to ride upon the high portions **265** of the cam **40** and also upon low portions **269** thereof. The lever **266** is operatively connected, at **270**, to a control rod **271** which is slidably supported in suitable bearings **272** and is normally urged to the right (Fig. 2) by a spring **273** to cause the cam roller to ride upon the cam **40**. A vertical latch or holding member **275** has an integral sleeve portion **277** hollowed to receive the control rod **271** and provided with suitable means, such as a set screw **278**, so that the holding member **275** may be disposed at any desired adjusted position depending upon the relative location of its scraping unit **38**. A pin or projection **280** is carried by the member **275** and conditioned to be moved to a position above the cam lever **192** (Fig. 13) to hold the cam lever in the position shown, to render the scraping unit ineffective for operation. Therefore, during the time the cam roller **268** rides upon one of the high portions **265** of the cam **40** the scraping unit **38** will be rendered ineffective for operation, allowing predetermined lengths of the material to be advanced thereto.

Due to the fact that certain lengths of the material may be advanced, the end of the material being fed onto the platform **256**, it is important that the valve **50** be held against operation until the complete length of the filament has been fed to the shearing unit and separated from the main body of material by the shearing unit. Therefore, a control or holding member **284** adjustably mounted upon the rod **271** in the same manner as the member **275** has a pin **285** positioned to be located beneath the cam lever **244** to hold the cam lever upwardly against operation of the valve **50** until the completed filament has been severed and located upon the platform **256**. As stated heretofore, the material **65** is of a delicate structure and if the valve **50** should be opened during the first two cycles of the cam shaft while the filament would not be completed until during the third cycle of the cam shaft, the forward end of the incompleted filament would not be blown from the platform and the completed filaments would, therefore, not be directed to lie uniformly in the trough **258**.

In order that the shearing unit will operate at desired intervals, for example, during every third cycle of the cam shaft **28**, another control rod **290** mounted in suitable bearings **291** for reciprocal movement is normally urged to the right by a spring **292** and is controlled by the cam **40** by the structure shown in Fig. 2. A cam lever **293**, pivotally supported near its center to a support **294**, carries a roller at one end positioned to engage the cam **40**, while the other end is connected through a link **296** to the control rod **290** at **297**. With the roller in engagement with the low portion of the cam **40**, the control rod **290** is moved to the right by the spring **292**. While in this position a holding member **298** (Figs. 2 and 8) is positioned away from the cam arm **230** and shearing blade **223**. However, when the cam **40** is moved to move the roller **295** upon a high portion thereof, as shown in Fig. 2, the holding member will be moved to position a pin or projection **299** above and for engagement with a lug **300** carried by the shearing blade **223**. This mechanism serves to hold the shearing blade against operation during certain cycles of operation of the cam shaft **28**. The control rod **290** also carries a holding member **274** adjustably positioned to hold the cam lever **138** (Fig. 9) in upper or inoperative position when the control rod is moved to the right (Fig. 2) and free the cam lever for operation when the control rod is moved to the left.

The cam **40** which is conditioned to cause the scraping uints **37** and **38**, the valve **50** and the shearing unit **57** to operate once during every three cycles of operation of the cam shaft **28** may be readily removed, for example, by removing the shaft **43**, and another cam disposed in position. Another type of cam is illustrated at **301** in Fig. 6, this cam being equal in diameter to the cam **40** and differing only in the dimensions and number of high portions **302** and low portions **303**. As this cam, the same as cam **40**, will rotate with the cam shaft **28** at a ratio of twelve to one, cam **301** will cause operation of the control means associated therewith, if substituted for the cam **40**, to effect operation of the scraping units **37** and **38**, the valve **50** and the shearing unit **57** once during every two cycles of operation of the cam shaft **28**. Another type of control cam is shown at **401** in Fig. 7. This cam has two high portions **402** equal in length to the high portions **302** of cam **301** but the remaining high portions **403** are longer. This control cam will cause the scraping units and the shearing unit to operate to form two short filaments and two long ones and also cause operation of the valve **50** at the correct intervals to eject the completed filaments. It should be apparent that other types of cams, that is, cams equal in diameter to the cams **40**, **301** and **401**, may be provided with other combinations of high portions and low portions to cause a high variation in the time intervals of operation of the different units of the apparatus associated therewith, to vary the length of the filaments formed by the apparatus. With cams of the type shown in Fig. 7, various types of filaments, that is, fila-

ments of various lengths may be formed during the continued operation of the apparatus.

Operation

With the apparatus as shown, particularly in Figs. 1 and 2, the material **65** is advanced a definite distance determined by the eccentric **60** and the latch tripping element **125**. As the eccentric is rotated the lever **107** is oscillated, imparting a reciprocatory movement to the feeding unit, moving it to the right (Figs. 1 and 12), with the gripping members **86** and **88** open, until the unit reaches the limit of this movement. The roller **102** (Fig. 11) will then be positioned in the path of the cam **49**, which will cause clockwise movement of the cam lever **98**, moving the latch into the position shown in Fig. 15, resulting in the movement of the gripping member **88** about its pivot to cause a gripping relation between the pads **87** and **90** and the material. The feeding unit will then be moved to the left, pulling the material through the scraping units which at this time will be in their open positions.

The feeding unit operates through a complete cycle during each cycle or complete rotation of the cam shaft **28**, while the control cam **40** rotates once during every twelve cycles of the cam shaft **28** and the feeding unit. In order that the operation of the apparatus may be understood more clearly, let the thought be in mind that the feeding unit **48** completes six half cycles, namely three feeding half cycles and three return half cycles during three cycles of the cam shaft and one-quarter cycle of the control cam **40**. During the first return half cycle of the feeding unit, that is, during the movement of the feeding unit from its extreme position at the left (Fig. 2) to its extreme position at the right, at which time the material is held against movement, the shearing unit **57** is operated to shear a completed filament or portion from the main supply of material and the scraping unit **37** is operated as well as the valve **51**. The valve **51** is operated during each cycle of operation of the cam shaft **28**, to cause air to be directed to the scraping elements of the units **37** and **38** to blow the particles removed by the scraping operations from the material. The scraping unit **37** as well as the shearing unit **57** are conditioned for operation by the roller of the lever **293** at one of the low portions **269** of the cam **40**, allowing the spring **292** to move the rod **290** to the right, freeing the holding member **272** from beneath the cam lever **138** (Fig. 9) and moving the projection **299** of the holding member **298** (Fig. 8), free of the lug **300** on the shearing blade **223**. The cams **56** and **35** are so arranged that their associated units, namely the shearing unit **57** and the scraping unit **37**, will be caused to operate during this return or first half cycle of the feeding unit. The high portions of these cams **56** and **35** are conditioned to move their respective units into inoperative positions; for example, the cam **56** will move the shearing blade **223** upwardly to move the clamping block **218** free of the material and the cam **35** will move the lever **138** to lower the backing block **143** downwardly and free the material from the scraping element **150** and condition the material for advancement. While the rollers **140** and **231** ride upon the high portions of their respective cams **35** and **56**, the rod **290** will be moved to the left (Fig. 2), positioning the holding members **274** and **298** to hold their respective cam levers **138** and **230** in their inoperative positions, so that during the next two and one-half cycles of operation of the cam shaft **28**, these units will be held against operation.

During the next half cycle of the cam shaft, the feeding unit **48** is moved to the left, advancing the material a definite distance, at which time none of the other units are operated. During the next return or half cycle of the feeding unit to the left (Fig. 2), the scraping unit **38** and valves **50** and **51** are operated. It will be noted by viewing Fig. 2, that the lever **293** has moved the rod **290** to the left to render the holding members **274** and **298** effective to hold the scraping unit **37** and shearing unit **57** against operation, and at this time the roller **268** of the lever **266** has moved inwardly to a low portion of the cam **40**, allowing the spring **273** to move the rod **271** to the right, freeing the unit **38** and the valve **50** for operation, by moving the holding members **275** and **284** so that their pins or projections **280** and **285**, respectively, will be moved free of their respective cam levers **192** and **245**. During this half cycle of the feeding unit the portion of the material which has had the coating removed from the upper surface thereof during the previous return movement of the feeding unit by the scraping unit **37**, will be located relative to the scraping unit **38** so that the scraping element **205** thereof will remove the covering directly beneath the said portion of the material. The scraping elements **150** and **205** are continuously reciprocated through the movement of the reciprocating rod **180**, so that when the material is moved into and held in engagement with these scraping elements the coating or covering **66** on the material **65** is removed. The operation of the valve **51** during the scraping operations causes air to blow the particles of the covering material free of the scraping units.

During this half cycle of operation the valve **50** is allowed to be opened by the cam block **248** being allowed to ride upon its cam **52**, forcing air through the air line **255** to blow the completed filament, which has been resting upon the platform **256**, into the trough **258**. Before the feeding unit **48** starts its next half cycle to feed the material to the left, the cams **36** and **52** will move their cam levers to render their respective unit **38** and valve **50** ineffective and hold the cam levers thus until the roller **268** (Fig. 2) rides upon a high portion **265** of the cam **40**, to move the rod **271** to the left to cause the holding members **275** and **284** effective to hold their respective cam levers in inoperative positions for the next two and one-half cycles of operation of the cam shaft **28**.

Following the half cycle in which the scraping unit **38** and the valve **50** are operated together with the valve **51**, the feeding unit completes its next feeding half cycle or movement to the left, advancing the material its second definite distance, returns, during which time only the valve **51** is operated, and then completes its third feeding half cycle feeding the material to the left the third definite distance. This completes what may be termed one complete operation of the apparatus. During this complete operation the covering has been removed from a portion at the scraping unit **37**, this same portion has been advanced to the scraping unit **38** where the covering has been removed from beneath that portion and two additional advancements have been made on the material, and now the apparatus is in readiness to repeat this operation. As a result, due to the selection of the particular con-

trol cam 40 and the adjustment of the eccentric 60 and the element 125 for the feeding unit, the completed filament is of a length determined by three times the distance the feeding unit moves to advance the material, the scraping units having removed the covering from portions at both ends of this definite length and the shearing unit severing the material at the mid-point of scraped portions, which treatment produces a filament of a definite length with the covering material removed for definite distances at both ends thereof.

It should be understood that the length of these filaments may be varied either by employing different control cams or varying the stroke of the feeding unit through the eccentric 60 and the element 125 or varying the relative positions of the scraping units 37 and 38 or a combination of all of these features.

The embodiment of this invention disclosed is illustrative only and may be widely modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. In an apparatus for treating material, a scraping element continuously reciprocable in a given path, a backing member, means to advance material intermittently between the element and the backing member, means to cause the backing member to move a portion of the material into engagement with the element and support the said portion in a plane parallel with the said path, and means to hold the backing member away from the element during a predetermined number of intermittent movements of the material.

2. In an apparatus for treating material, a feeding unit operable in continuously repeated cycles to advance a material intermittently, means to vary the distance the feeding unit advances the material, scraping units operable to scrape opposing surfaces of the material, means to adjustably support the scraping units spaced distances variable with variations in the feeding units, and means to cause alternate operations of the scraping units to cause alternate scraping of like portions of the material.

3. In an apparatus for treating material, means operable in continuously repeated cycles to advance a material intermittently, scraping units to scrape opposing portions of the material, a shearing unit to shear portions of predetermined length from the material, a platform to receive the sheared portions, a valve operable to cause air under pressure to force the sheared portions from the platform, a control member, and separate means actuated by the control member to cause operation of the units and valve in predetermined sequence to produce and eject sheared portions of predetermined lengths with the ends thereof scraped.

4. In an apparatus for treating material, a unit to move material intermittently in a predetermined path, a scraping element, means to cause reciprocatory movement of the element in a path parallel with the path of the material, and means to cause movement of a portion of the material at right angles to the paths and in engagement with the element during reciprocatory movement of the latter to effect scraping of the portion by the element.

5. In an apparatus for treating material, a unit to move material intermittently in a predetermined path, a scraping element, means to cause reciprocatory movement of the element in a path parallel with the path of the material, means to cause movement of a portion of the material at an angle with respect to the path and in engagement with the element during reciprocatory movement of the latter to effect scraping of the portion by the element, and means to grip the said portion at each side of the element to hold the portion against longitudinal movement while being scraped.

6. In an apparatus for treating material, a scraping element reciprocable in a given path, means to advance a material intermittently relative to the element, and a support adapted for movement between the advancements of the material to move a portion of the material transversely of the said path to position and support the said portion in engagement with the element in a plane parallel with the said path.

7. In an apparatus for treating material, a scraping element reciprocable in a given path, means to advance a material intermittently relative to the element, a support adapted for movement between the advancements of the material to move a portion of the material transversely of the said path to position and support the said portion in engagement with the element in a plane parallel with the said path, and means to hold the said portion against movement during the engagement of the material with the element.

8. In an apparatus for treating material, a scraping element, a member adapted to support the element for movement in a given direction relative thereto from a normal stop position, means to reciprocate the member with the element in a path at an angle with respect to the said direction of movement of the element, means to advance a material intermittently relative to the element, means to move a portion of the material in the said given direction against the element for the scraping of the portion by the element, and a spring carried by the supporting member to apply a force to the element to normally hold the element in the said stop position and cushion the element when moved away from stop position by the said portion during the scraping thereof.

9. In an apparatus for treating material, a scraping element, a member adapted to support the element for movement in a given direction relative thereto from a normal stop position, means to reciprocate the member with the element in a path at an angle with respect to the said direction of movement of the element, means to advance a material intermittently relative to the element, means to move a portion of the material in the said given direction against the element for the scraping of the portion by the element, a spring carried by the supporting member to apply a force to the element to normally hold the element in the said stop position and cushion the element when moved away from stop position by the said portion during the scraping thereof, and means to vary the force of the spring to vary the scraping effect of the element on the said portion of the material.

10. In an apparatus for treating material, a feeding unit operated at repeated cycles to intermittently advance a material longitudinally, scraping units disposed at opposite sides of the material and at spaced positions longitudinally thereof, means to cause one scraping unit to scrape one side of a portion of the material during one cycle of the feeding unit and another

scraping unit to scrape the other side of the said portion during another cycle of the feeding unit, and means for each scraping unit to support the respective portions of the material at the opposite sides of their respective scraping units while the said portions are being scraped.

11. In an apparatus for treating material, a feeding unit operated at repeated cycles to intermittently advance a material longitudinally, scraping units disposed at opposite sides of the material and at spaced positions longitudinally thereof, means to cause substantially simultaneous operation of the scraping units during predetermined cycles of the feeding unit to cause scraping of different sides of different portions of the material to produce the portions of the material with both sides scraped, and means for each scraping unit to support the respective portions of the material at the opposite sides of their respective scraping units while the said portions are being scraped.

12. In an apparatus for treating material, a feeding unit operated at repeated cycles to intermittently advance a material longitudinally, scraping units disposed at opposite sides of the material and at spaced positions longitudinally thereof, material supporting members for the scraping units movable to position different portions of the material in positions to be scraped by their scraping units and support the portions during the scraping thereof, and means to cause movement of the supporting members during predetermined cycles of the feeding unit to cause scraping of different sides of different portions of the material to produce the portions of the material with both sides scraped.

13. In an apparatus for treating material, a reciprocable feeding unit to longitudinally advance a material intermittently, means to scrape portions of the material, a shearing unit adapted for operation during predetermined cycles of the feeding unit toward and away therefrom to shear lengths from the leading end of the material, a belt disposed adjacent the shearing unit, and means to cause the belt to support the successive leading ends of the material between the said units.

14. In an apparatus for treating material, a reciprocable feeding unit to longitudinally advance a material intermittently, means to scrape portions of the material, a shearing unit adapted for operation during predetermined cycles of the feeding unit toward and away therefrom to shear lengths from the leading end of the material, a belt disposed adjacent the shearing unit, and means carried by the feeding unit to move the belt into and out of engagement with the leading end of the material during the respective movements of the feeding unit away from and toward the shearing unit to cause the belt to support the successive leading ends of the material between the said units.

JOHN EHRET, JR.
CARL W. MAURER.