Aug. 7, 1934. F. J. MALLOY 1,969,517

APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

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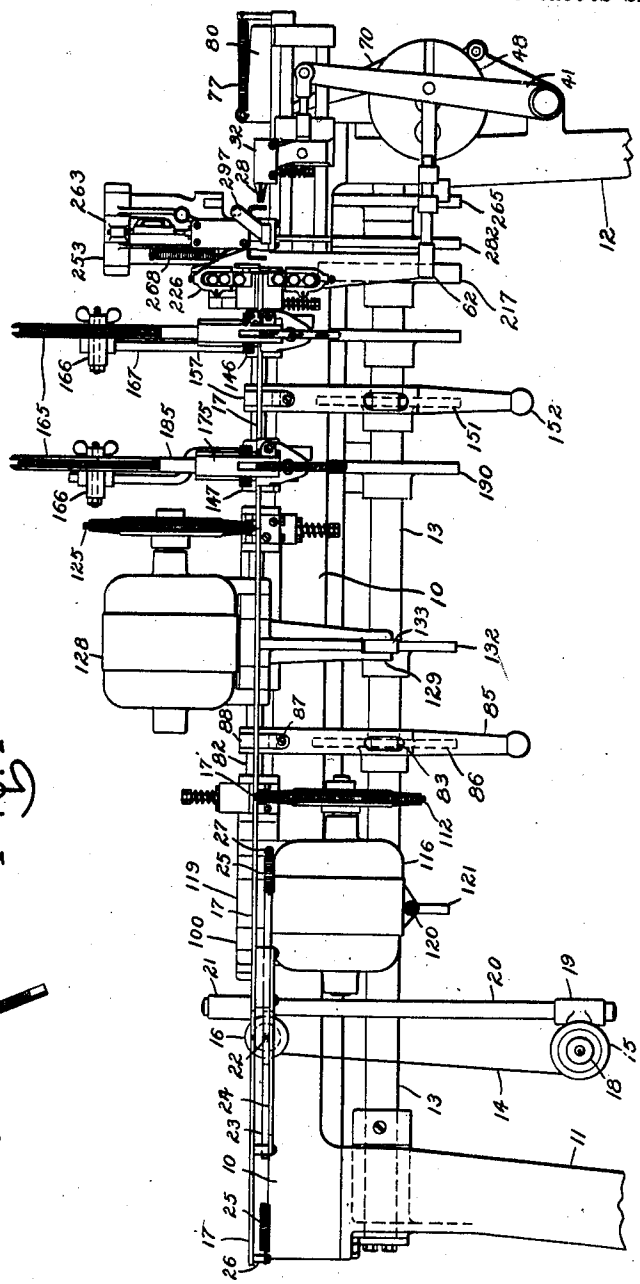


Fig. 1

Fig. 2

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APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

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Fig. 3

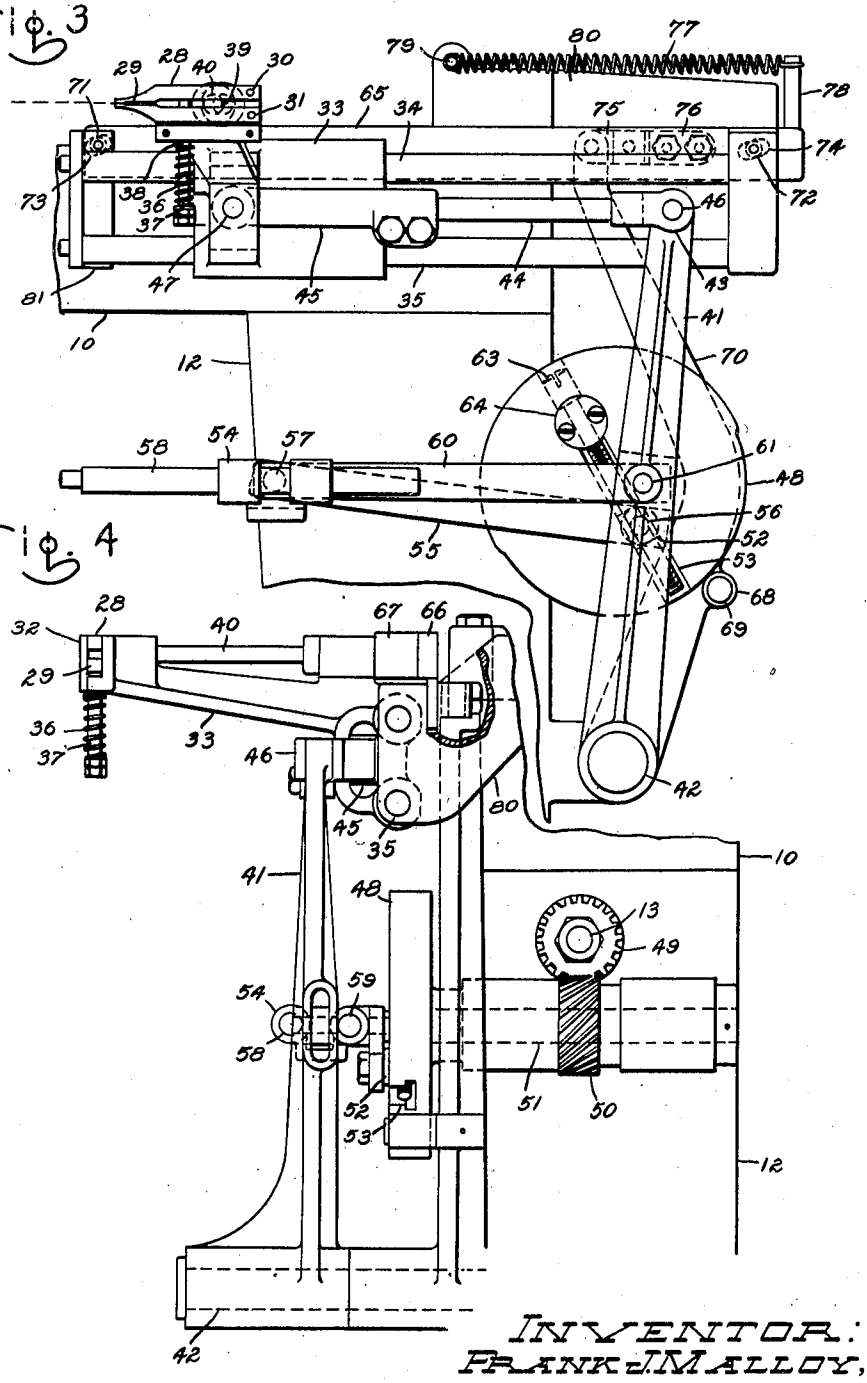


Fig. 4

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APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

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Fig. 7

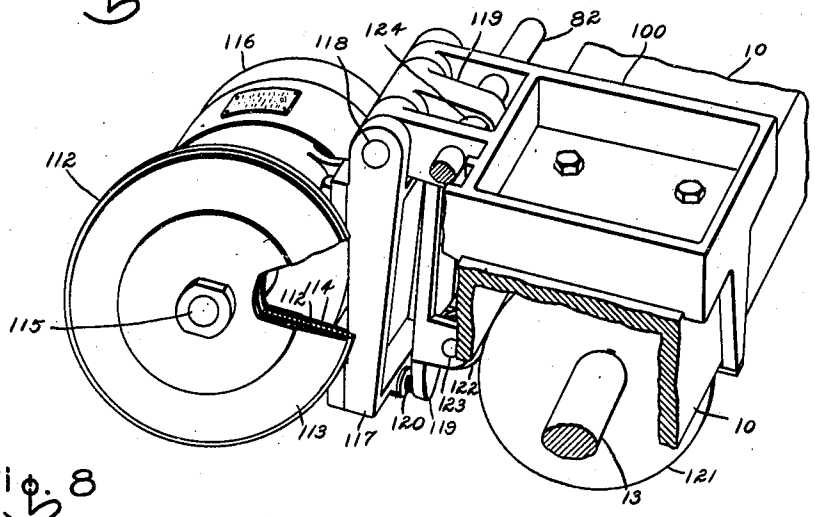


Fig. 8

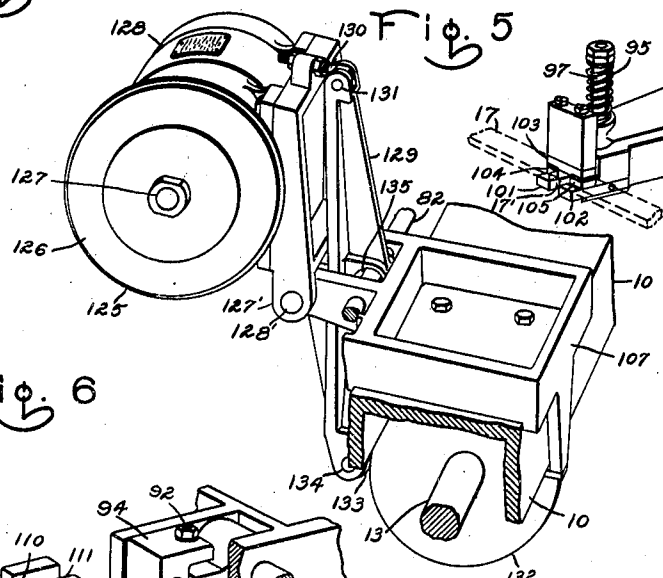


Fig. 5

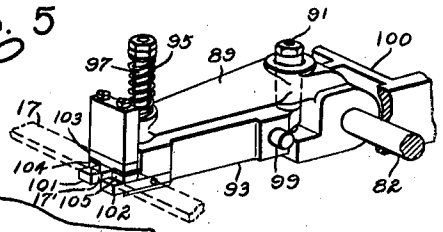
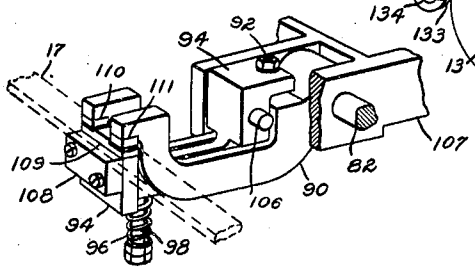


Fig. 6



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APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

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Fig. 9

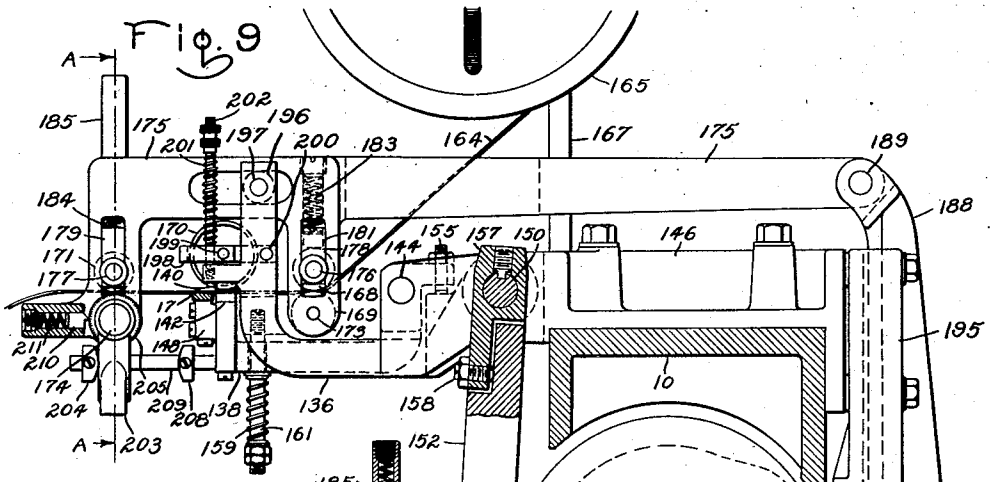


Fig. 11

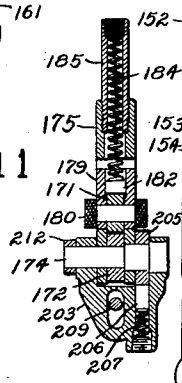


Fig. 10

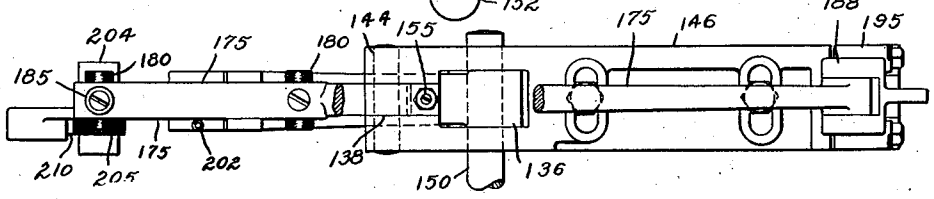
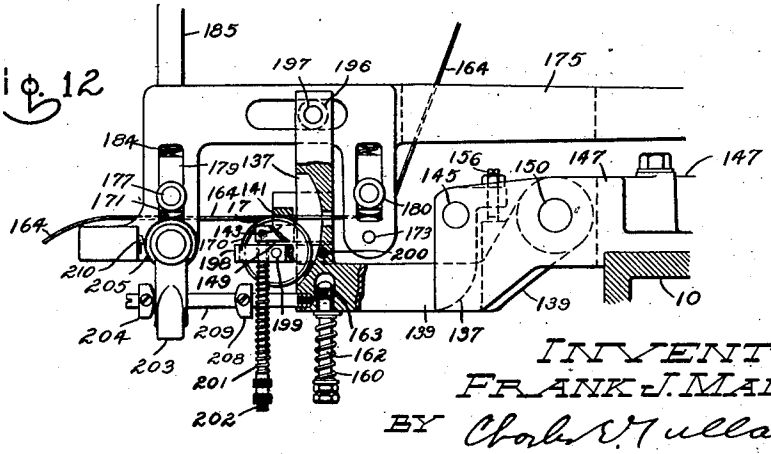


Fig. 12



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Fig. 14

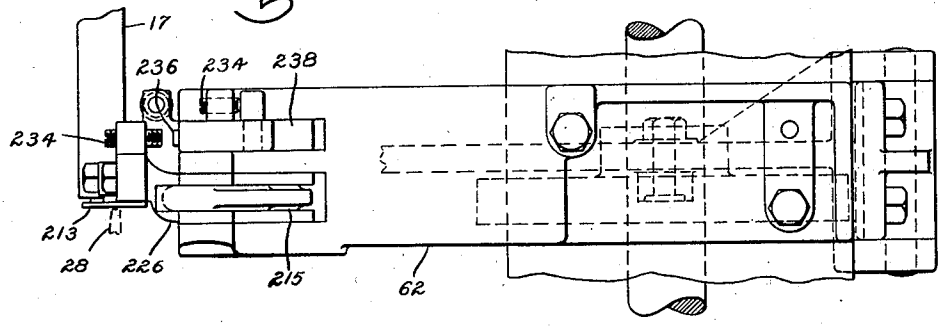


Fig. 13

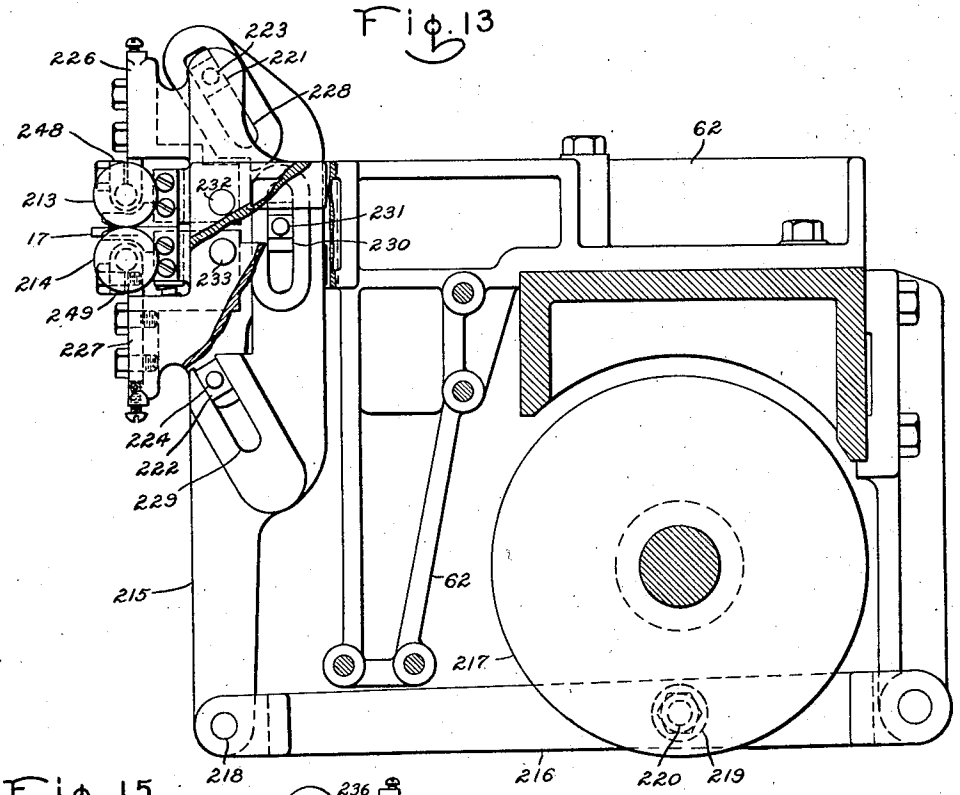
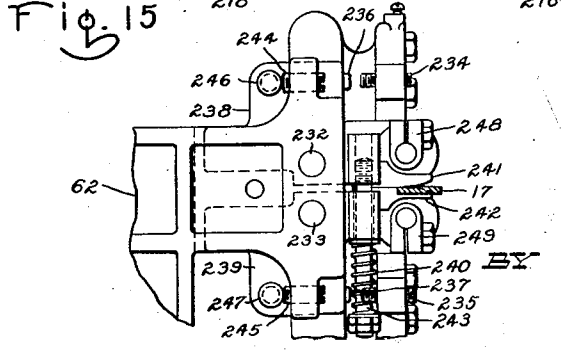


Fig. 15



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APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

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Fig. 16

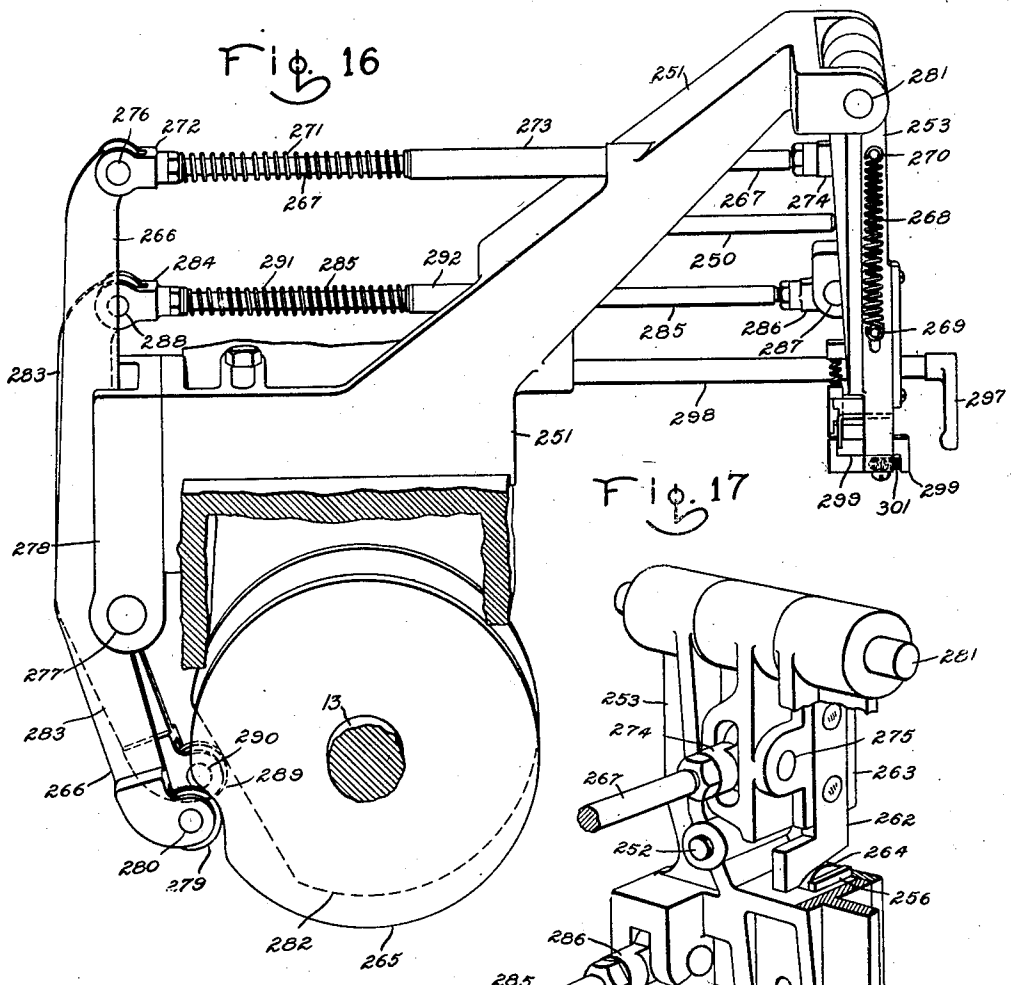


Fig. 17

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Patented Aug. 7, 1934 1,969,517

UNITED STATES PATENT OFFICE

1,969,517

APPARATUS FOR REMOVING COATINGS FROM WIRES OR STRIPS

Frank J. Malloy, Cleveland, Ohio, assignor to General Electric Company, a corporation of New York

Application May 27, 1931, Serial No. 540,405

7 Claims. (Cl. 250—27.5)

My invention relates to apparatus for removing coatings from wires or strips, more particularly of filamentary proportions. Still more particularly my invention relates to apparatus for removing certain portions of the coating of filamentary wire or strip in the manufacture of cathodes for vacuum tubes and similar devices in order to make such portions suitable for electric contact. In addition to the coating which is intentionally applied to such wires, there is also a crust or scale which it acquires during the process of drawing down the wire. Such coating is usually carbonaceous because of the graphite used as a die lubricant. My invention provides an apparatus for removing such portions of such crust or scale as may be located beneath the oxide or other intentionally applied coating.

According to my invention, I provide a series of units which operate in order on the wire as it is drawn thereby. The arrangement of units is such that the wire is first engaged from above and below by brushing units and then by an abrasive unit or units. The brushing units are particularly adapted for removing portions of the coating intentionally applied to the wire and the abrasive unit is particularly adapted to remove the crust or scale hereinbefore referred to. Another feature which I prefer to incorporate in apparatus embodying my invention is that of combining the aforesaid elements with means for cutting the wire into lengths, the end portions of which are the cleaned portions of the wire and also I prefer to include means for bending each of the filaments thus formed into a desired shape. Other features and advantages of my invention will appear from the following description of a species thereof and from the accompanying drawings.

In the drawings, Fig. 1 is a side elevation of the machine of my invention; Fig. 2 is a perspective view of a completed filament; Fig. 3 is a side elevation of the filament wire feeding unit; Fig. 4 is an end elevation thereof; Fig. 5 is a perspective view of the filament wire gripping mechanism of the wire cleaning unit which operates on the bottom side of the wire; Fig. 6 is a perspective view of a similar mechanism of the unit which operates on the top side of the wire; Fig. 7 is a perspective view of the filament wire cleaning unit which engages the bottom of the wire; Fig. 8 is a perspective view of a similar unit which engages the top side of the wire; Fig. 9 is a side elevation of an abrasive unit which operates on the top of the filament wire; Fig. 10 is a plan view thereof; Fig. 11 is a vertical section along line A—A of Fig. 9; Fig. 12 is a side elevation of a portion of the abrasive unit which operates on the bottom of the filament wire; Fig. 13 is a side elevation of the filament wire cutting unit; Fig. 14 is a plan view thereof; Fig. 15 is a partial elevation of the opposite side of the said unit; Fig. 16 is a perspective view of the filament bending unit; and Fig. 17 is a perspective view of a portion thereof on an enlarged scale.

My machine, as shown in Fig. 1, consists of a series of units or mechanisms which operate upon the filament wire as it is drawn intermittently from the left end of my machine to the right end. The units are located along the upper surface of the table 10 which is supported by legs 11 and 12 through which passes cam shaft 13. All units of the machine are driven from cams on this shaft which is driven by an electric motor driven worm gear reducer not shown. The filament wire 14 is supplied to the machine on spool 15 from which it passes up over sheave 16 and along rail 17 to the feeding unit at the right end of the machine. The spool 15 is located on spindle 18 in bracket 19 which is supported by rod 20 extending from bracket 21 on said table. Sheave 16 turns on pin 22 in bar 23 which rests on plate 24 and is moved longitudinally against the pull of the wire by spring 25 so as to keep said wire taut. Spring 25 is stretched between post 26 in the end of the rail and post 27 in the opposite end of said bar. The rail 17 is preferably made in sections. Openings 17' (only one being shown) are provided at intervals as by spacing apart contiguous ends of sections so as to allow access to the wire by brushing and abrasive units disposed below said wire. Rail sections of different lengths may be used depending on the distance desired between the cleaned portions and, therefore, the length of filament desired.

The filament wire 14 is fed by the unit shown in Figs. 3 and 4, the jaws 28 and 29 of which grip the end of the wire and then move to the right a distance equal to the desired filament length. This wire is then cut from the remaining wire and carried away by another unit of my machine so that said jaws may return for the next feeding cycle. The jaws are located on pins 30 and 31 behind plate 32 on the arm of carriage 33 which is slidably mounted on rods 34 and 35. The jaws are closed by spring 36 which operates between the nuts on rod 37 in jaw 28 and sleeve 38 when this is allowed by the flat portion 39 of

rod 40 which separates them. Sleeve 38 passes through an opening in said carriage and abuts against jaw 29. The carriage is moved to the right by motion of lever 41 on stud 42 which is connected to said carriage by yoke 43, rod 44 and arm 45. Yoke 43 is fastened to said lever by pin 46 and arm 45 to said carriage by pin 47. Cam wheel 48 which is turned by cam shaft 13 through gears 49—50 and shaft 51 operates this lever. The motion is produced as the wheel rotates by the eccentrically placed block 52 in slot 53 in said wheel which causes cross head 54 to which it is connected by bar 55 and pins 56 and 57 to reciprocate horizontally on rods 58 and 59. Cross head 54 is connected to lever 41 by bar 60 which is attached to its respective parts by pins 57 and 61 and one end of rods 58—59 and 34—35 are supported by bracket 62 of the wire cutting unit shown in Figs. 1 and 13. The length of the feeding motion is adjusted by turning screw 63 in plug 64 in cam wheel 48 which moves block 52 with respect to the center of the wheel. On reaching their limit of motion the jaws are opened by rod 40 which is turned as rail 65 rises consequently opening the jaws as the flat end 39 of rod 40 located between said jaws is also turned. This rail 65 acts through roller 66 which is centrally located on the end of cylinder 67, which in turn is eccentrically located upon the end of rod 40. During the period in which the jaws are closed and the rail is down, roller 68 on pin 69 in lever 70 is on the low part of cam wheel 48 and pins 71 and 72 which support said rail are in the high part of slots 73 and 74. But, as the high part of the cam wheel is brought below said roller, lever 70 swings to the right about pin 42, thereby moving said rail to which it is connected by link 75 and bracket 76 so that pins 71 and 72 slide into the low part of said slots raising the rail. Roller 68 on lever 70 is kept against said cam wheel by spring 77 which is located between spring post 78 in the end of said rail and spring post 79 in bracket 80. This bracket also supports the right end of rods 34—35 and pin 72. Pin 71 is located in angle plate 81 on the opposite ends of said rods.

The filament wire on leaving the spool, as shown in Fig. 1, is first drawn before the unit of my machine which cleans a strip across the bottom side of said wire and then is drawn before a similar unit several indexing positions further along which cleans another strip across the top side of said wire directly over the first. These units operate when the wire is not in motion and only after said wire is gripped by the mechanisms shown in Figs. 5 and 6. Both of these mechanisms depend for operation on shaft 82 which is at its limit of movement in a clockwise direction when said wire is free. In this position roller 83 (Fig. 1) in lever 85 is against the high part of cam 86 and screw 87 in arm 88 on said shaft is against said lever. Upper jaws 89 and 90 (Figs. 5 and 6) of these mechanisms which are attached to said shaft are then raised to the limit set by screws 91 and 92 in the lower jaws 93 and 94 which strike the projecting portions of the bosses of said jaws. When the jaws engage the wire, lever 85 swings away from screw 87 as said shaft turns only that distance necessary to bring said jaws in engagement with the wire. This movement is produced by springs 95 and 96 which operate in the mechanism shown in Fig. 5 between upper jaw 89 and the nuts on the end of spindle 97 in lower jaw 93 and in the mechanism shown in Fig. 6 between lower jaw 94 and the nuts on the end of spindle 98 in a portion (not shown) of upper jaw 90 which extends between both halves of said jaw. In the former mechanism the lower jaw 93 is supported on pin 99 in bracket 100 and supports rail 17 through arms 101 and 102. The actual contact is made with the filament wire through block 103 in the upper jaw and blocks 104 and 105 in the lower jaw. In the latter mechanism the lower jaw 94 is supported on pin 106 in bracket 107 and supports rail 17 through block 108. The filament wire is actually gripped between block 109 in lower jaw 94 and blocks 110 and 111 in the upper jaw 90.

That unit of my machine which operates in connection with the filament gripping unit, shown in Fig. 5, is shown in Fig. 7. This unit consists of the motor driven wire brush 112 which strikes the filament wire between sections of the lower wire gripping jaw, cleaning therefrom the oxide coating in a strip preferably about one-fourth inch in width. The brush consists of the commercial circular wire brush 112 clamped between plates 113 and 114 on drive shaft 115 of the electric motor 116. The motor is supported by bed plate 117 which hangs from spindle 118 in bracket 100 resting on the table 10 and is swung about said spindle so as to bring said wire brush into contact with the filament wire by lever 119 which bears against screw 120 in said bed plate. Lever 119 swings from spindle 118 and carries the brush against the filament when the high portion of cam 121 is engaged with roller 122 on stud 123 in said lever. Shaft 82 which operates the filament gripping units passes through opening 124 in lever 119 and has no connection therewith.

That unit of my machine which operates next upon the filament and in connection with the filament wire gripping unit shown in Fig. 6, is shown in Fig. 8. This unit consists of the motor driven wire brush 125 which strikes the filament wire between sections of the upper gripping jaw, cleaning thereacross a strip preferably about one-fourth inch in width which is directly above the other strip previously cleaned across the bottom. The brush consists of the commercial circular wire brush 125 clamped between plate 126 and a similar plate (not shown) on drive shaft 127 of the electric motor 128. The motor is supported by bed plate 127', which in turn is supported by spindle 128' in bracket 107 resting on the table 10 and is swung about said spindle so as to bring said brush into contact with the filament wire by lever 129 to which it is connected by link 130 and pin 131. This lever operates about spindle 128' and carries the brush against said wire when the lower part of cam 132 comes below roller 133 on stud 134 in the lower end of said lever. As before, shaft 82 passes through hole 135 in lever 129 and does not contact therewith.

The next unit of my machine to operate upon the filament wire cleans by means of emery cloth the strip on the under side of the wire previously cleaned by the wire brush unit. The unit partially shown in Fig. 12 consists principally of a variation of the similar unit next in line which cleans the top side of the wire and will be described in connection with this unit which is shown in full in Figs. 9, 10 and 11. The wire is gripped during the active periods of these units between upper jaws 136—137 and lower jaws 138—139 which actually make contact

with the wire through blocks 140—141 and 142—143. The lower jaws in each case are the stationary jaws as they are supported by pins 144 and 145 in brackets 146 and 147 respectively and are connected to rail 17 through block 148 and arm 149 respectively. The upper jaws of each unit are attached to shaft 150 which is held in brackets 146 and 147 and is operated from cam 151 by lever 152. When the high part of the cam is brought beneath roller 153 on stud 154 in said lever, the upper jaws will be raised until engaged by screws 155 and 156 as arm 157 on shaft 150 will then have been turned clockwise by lever 152 striking screw 158 in said arm. When the lower part of said cam is beneath the roller, lever 152 will be away from screw 158 and the jaws will have been closed by springs 159 and 160. The former of these operates between lower jaw 138 and the nuts on stud 161 in upper jaw 136, while the latter operates between upper jaw 137 and the nuts on stud 162 in rod 163 which connects both halves of the lower jaw.

The emery cloth 164 used with these units is unwound from spools 165 which, like practically all other parts of these units, are given but one reference numeral as they are identical. The spools 165 (Fig. 1) are supported by brackets 166 on rods 167 extending from brackets 146 and 147 on table 10. In the particular unit operating on the top side of the wire, the emery cloth enters between rollers 168 and 169 emery side down, while in the other unit the cloth enters cloth side down. These rollers retard the movement of the cloth which then passes over or under the wire directly under or over wheel 170 as the case may be and between rollers 171 and 172. The cloth is forced against the wire by wheel 170 and is fed by rollers 171 and 172. Rollers 169 and 172 operate about pins 173 and 174 in the body 175 of the unit, while rollers 168 and 171 operate about pins 176 and 177 in blocks 178 and 179 in vertical slots in said body on either side of said rollers. These blocks are kept from slipping off said pins by collars 180. Friction is applied to rollers 168 and 171 to keep the cloth tight between the rollers by blocks 181 and 182 (Figs. 9 and 11) which ride against the outer edge of said rollers with the pressure exerted against them by springs 183 and 184. Spring 184 being longer is enclosed by sleeve 185. The horizontal oscillating motion of the body which pulls the cloth back and forth between the wire and wheel 170 is produced by lever 188 which is connected thereto by pin 189 and is in turn operated by cam 190. This cam engages roller 191 on pin 192 in arm 193 of the particular lever 188 operating the unit shown in Fig. 9, while the same lever of the other unit is operated from shaft 194 in brackets 195 to which both levers are attached. The units also differ in that the body of the former is supported by roller 196 on pin 197 in the upper jaw 136, and yoke 198 which supports wheel 170 through pin 199 is supported on pin 200 in the upper jaw 136, while the body of the latter is supported by roller 196 on pin 197 in the lower jaw 137, and yoke 198 which supports wheel 170 through pin 199 is supported on pin 200 in the lower jaw 137. In both instances said wheel is forced against the cloth by springs 201 which are confined between yoke 198 and the nuts on the end of studs 202 in upper jaw 136 and in arm 149 respectively. The wire is untouched by the cloth during the indexing as the cloth carrying body is raised by jaw 136 in the unit operating on the top side of the wire and as the cloth rises when permitted by jaw 139 of the other unit.

The oscillating motion which rubs the cloth across the filament wire is also used to feed the emery cloth through the units. Of the various oscillating movements in each cyle of operation, one movement carries the body farther to the left than any other which causes yoke 203 on pin 174 to strike stop collar 204 swinging said yoke to the left. This motion feeds the cloth a short distance as pin 174 (Fig. 11) is attached to roller 172 in contact with said cloth and is also attached to ratchet wheel 205 which is engaged by pawl 206 on spring 207 in a well in said yoke. The mechanism is returned to its former position in preparation for another cycle of operation by the return oscillation which causes the yoke to strike the other stop collar 208 on rod 209 in the lower jaw 136 and the upper jaw 137 respectively. The ratchet wheel 205 is prevented from returning to its former position by pawl 210 on spring 211 in a well in said body which engages said wheel. Collar 212 keeps pin 174 in place. The operation of this unit is then complete and the filament wire passes to the feeding unit hereinbefore described.

The first feeding motion places the wire so that the first strip cleaned across said wire extends beyond the end of rail 17 and before the cutting unit of my machine. In this position the wire is so located that the cutting edges of knives 213 and 214 are, respectively, below and above the approximate center of the cleaned strip. When cut, both ends of each filament will be thoroughly cleaned for about one-eighth of an inch from each end. All portions of the cutting unit are operated through motion of slide 215 which is operated by lever 216 from cam 217. Pin 218 in said lever engages said slide and roller 219 on pin 220 in said lever engages said cam. The slide is first moved upwardly causing blocks 221 and 222 on pins 223 and 224 in levers 226 and 227 to move downwardly in slots 228 and 229 in said lever as block 230 on pin 231 keeps said slide from moving horizontally. The early part of this movement carries the knives nearer the filament as said levers turn about pins 232 and 233 and by so doing pull screws 234 and 235 in said levers away from studs 236 and 237 in levers 238 and 239. These levers are then turned about pins 232 and 233 by spring 240 bringing fingers 241 and 242 carried thereby together against the filament wire between the end of rail 17 and the cutting knives. Spring 240 operates between lever 239 and the nuts on the end of stud 243 in lever 238. The limits of movement of levers 238 and 239 is controlled by screws 244 and 245 in bracket 62 which strike studs 246 and 247 in said levers. Further movement of levers 226 and 227 carries the knives in arms 248 and 249 in said levers against the filament wire cutting a filament from said wire. The return cycle of movement of the unit then takes place pulling the knives back in place and releasing the wire from the grip of fingers 241 and 242.

Directly after the wire has been gripped by the unit just described, the filament bending unit shown in Figs. 1, 16 and 17 swings into position about that portion of the wire extending between the gripping and the indexing jaws. This position is indicated when the end of rod 250 in bracket 251 strikes screw 252 in head 253

of the unit and when the edge of slide 254 is above said wire, and the edge of block 255 is below said wire. The wire is then gripped between these parts by the downward movement of slide 254 which is moved by a corresponding movement in slide 256 to which it is connected by arm 257, spring 258 and block 259. The thin portion of slide 254 operates in a slot in arm 260 of slide 256 behind shim 261 and is the same piece of metal as block 259. Slide 256 is forced downward by cam 262 in lever 263, the thicker portion of which is pushed behind roller 264 of a pin (not shown) in said slide by movement of said lever which is operated from cam 265 through lever 266 and rod 267. Slide 256 operates against spring 268 which extends between spring post 269 in said slide and post 270 in said head, and rod 267 operates against spring 271 which is located between yoke 272 on said rod and sleeve 273 against bracket 251. Said rod connects to the head through link 274 and pin 275 and to lever 266 through yoke 272 and pin 276. Said lever is operated about shaft 277 in bracket 278 by the engagement of roller 279 on pin 280 with said cam.

The filament is next separated from the filament wire by the cutting unit previously described, whereupon the head swings to the right about pin 281 in bracket 251. This motion is produced by mechanism operating off cam 282 which consists in lever 283 on shaft 277, yoke 284, rod 285 and link 286. Lnk 286 is attached to said head through pin 287, yoke 284 is connected to said lever by pin 288 and lever 283 engages said cam through roller 289 on pin 290. This motion occurs against the action of spring 291 which acts between yoke 284 and sleeve 292 abutting against bracket 251. During the swing, slide 256 is continually moving downward while any tendency the filament may have to swing sideways is prevented by arms 293 and 294 in said head. This movement finally brings blocks 295 and 296 against the filament causing it to be bent into an inverted V over block 255. The filament is then in its final form, as shown in Fig. 2, and the slide is returned to its raised position before the head reaches the limit of its swing. As the head is brought up at the end of its swing, arm 297 on rod 298 in bracket 251 strikes the ends of blocks 299 and 300 causing them to strip the filament from block 255. This action of the blocks takes place against the action of springs 301 and is the final operation of the machine as well as the unit. The filaments are received either on a tray or rod (not shown) from which they are taken away from the machine.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In an apparatus for removing coating from wire, the combination of a rail having an opening therein, means for feeding a wire intermittently along said rail, a rotary brushing device disposed below and transversely to the path of travel of said wire, a device for gripping said wire on each side of said brushing device and means for periodically moving said brushing device through said opening to engage said wire.

2. In an apparatus for removing coating from wire, the combination of a rail having an opening therein, means for feeding a wire intermittently along said rail, brushing devices, one located above and one below said rail and means for alternately moving said device below said rail through said opening to engage a portion of said wire and said device above said rail down into engagement with the same portion of said wire.

3. In an apparatus of the class described, the combination of a rail, means for feeding a wire intermittently therealong, a brushing device disposed adjacent the path of travel of said wire, an abrasive device also so disposed and means for alternately moving said brushing and said abrasive devices into engagement with the same portion of said wire.

4. The method of treating coated filament wire which consists in intermittently moving said wire to bring selected spaced portions thereof successively into operative relation with brushing and then with abrasive units, operating said units to clean said portions and cutting said wire into lengths, each of which includes a cleaned portion as said wire advances beyond said cleaning apparatus.

5. In a device for cleaning wire, the combination of means for feeding a wire intermittently, means for bringing a strip of abrasive material in contact with said wire during periods of rest and means for oscillating said strip back and forth over said wire while in contact therewith to clean it.

6. In a device for cleaning wire, the combination of means for feeding a wire intermittently, means for bringing a strip of abrasive material in contact with said wire during periods of rest, means for oscillating said strip back and forth over said wire while in contact therewith to clean it, and means for feeding an unused portion of said strip into operative relation with said wire in place of a used portion.

7. In a device for cleaning wire, the combination of means for feeding a wire intermittently, means for bringing a strip of abrasive material in contact with said wire during periods of rest, means for gripping said wire on each side of said strip, and means for oscillating said strip back and forth over said wire while in contact therewith to clean it.

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