

March 6, 1934.

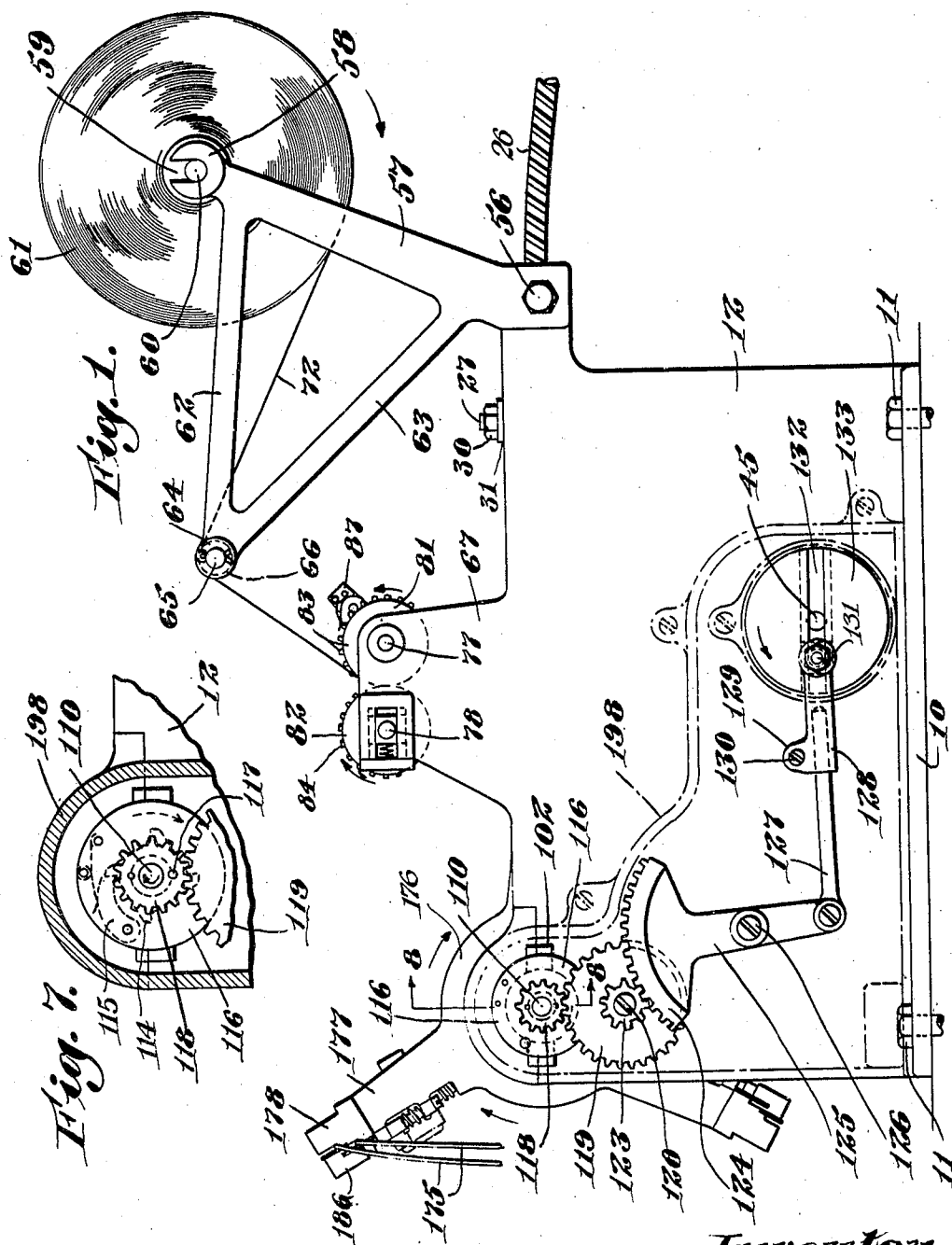
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1,949,544

BUNDLING AND WRAPPING MACHINE

Filed Jan. 30, 1924

7 Sheets-Sheet 1



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March 6, 1934.

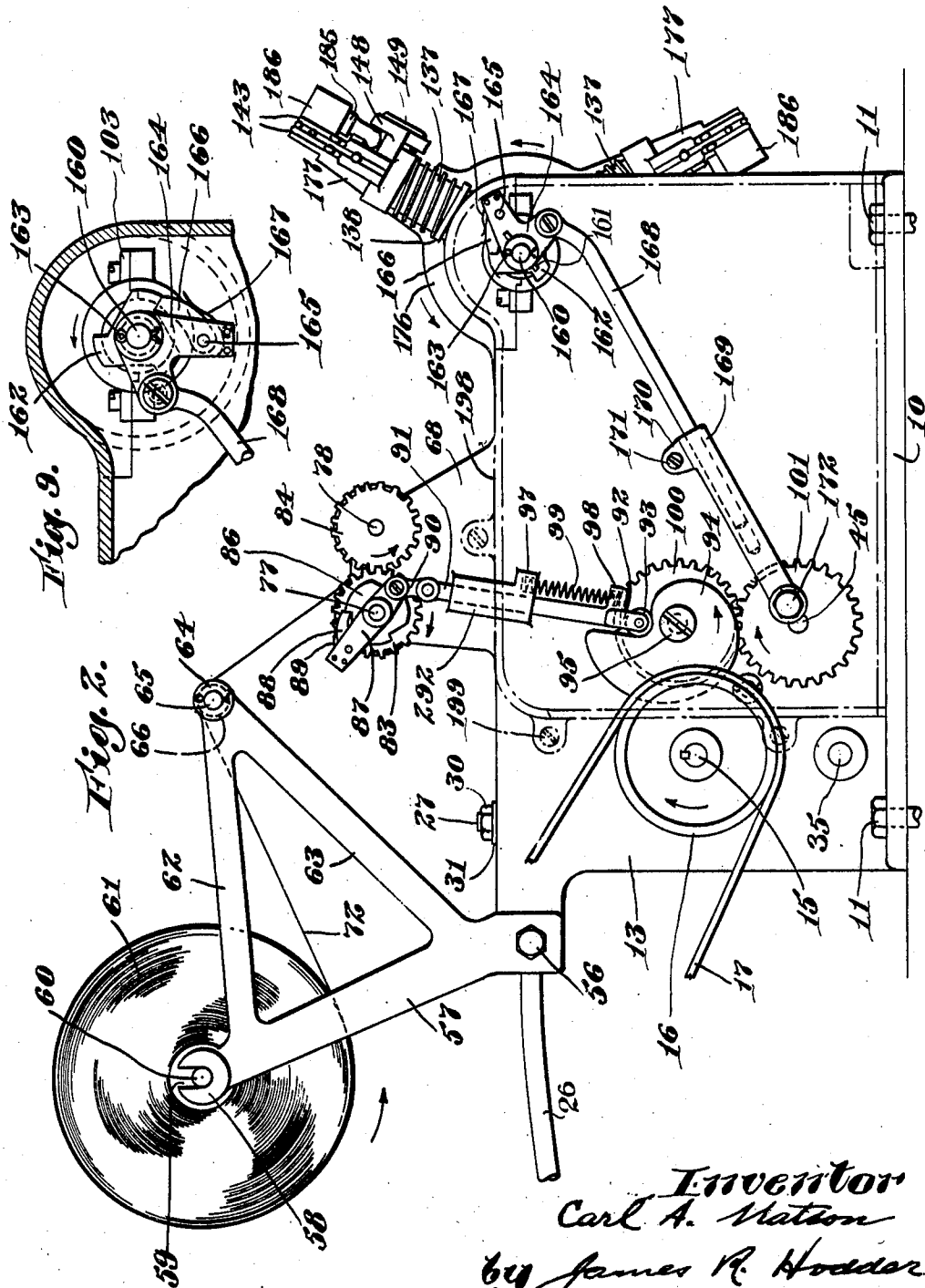
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Filed Jan. 30, 1924

7 Sheets-Sheet 2



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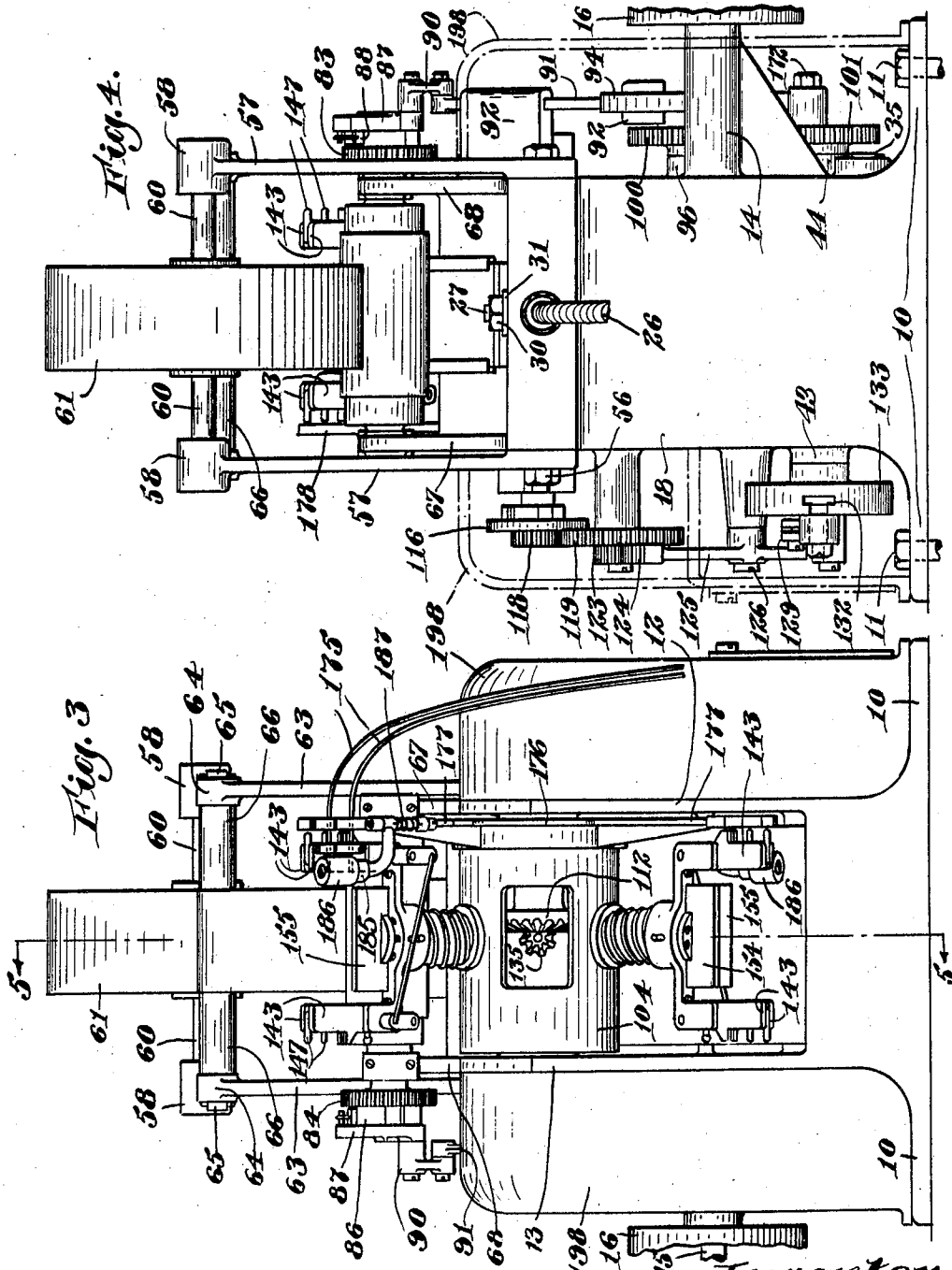
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1,949,544

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Filed Jan. 30, 1924

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March 6, 1934.

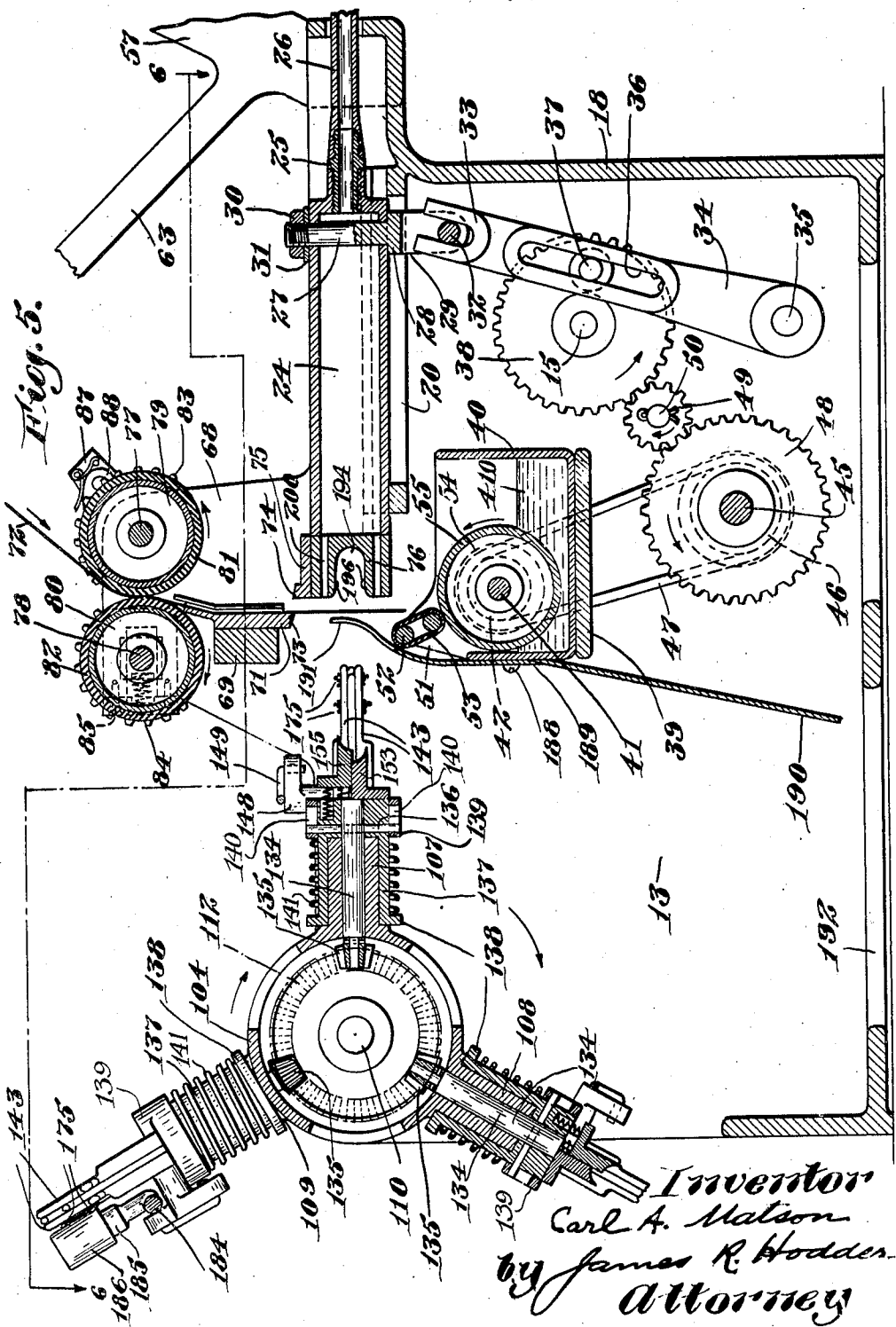
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1,949,544

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Filed Jan. 30, 1924

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March 6, 1934.

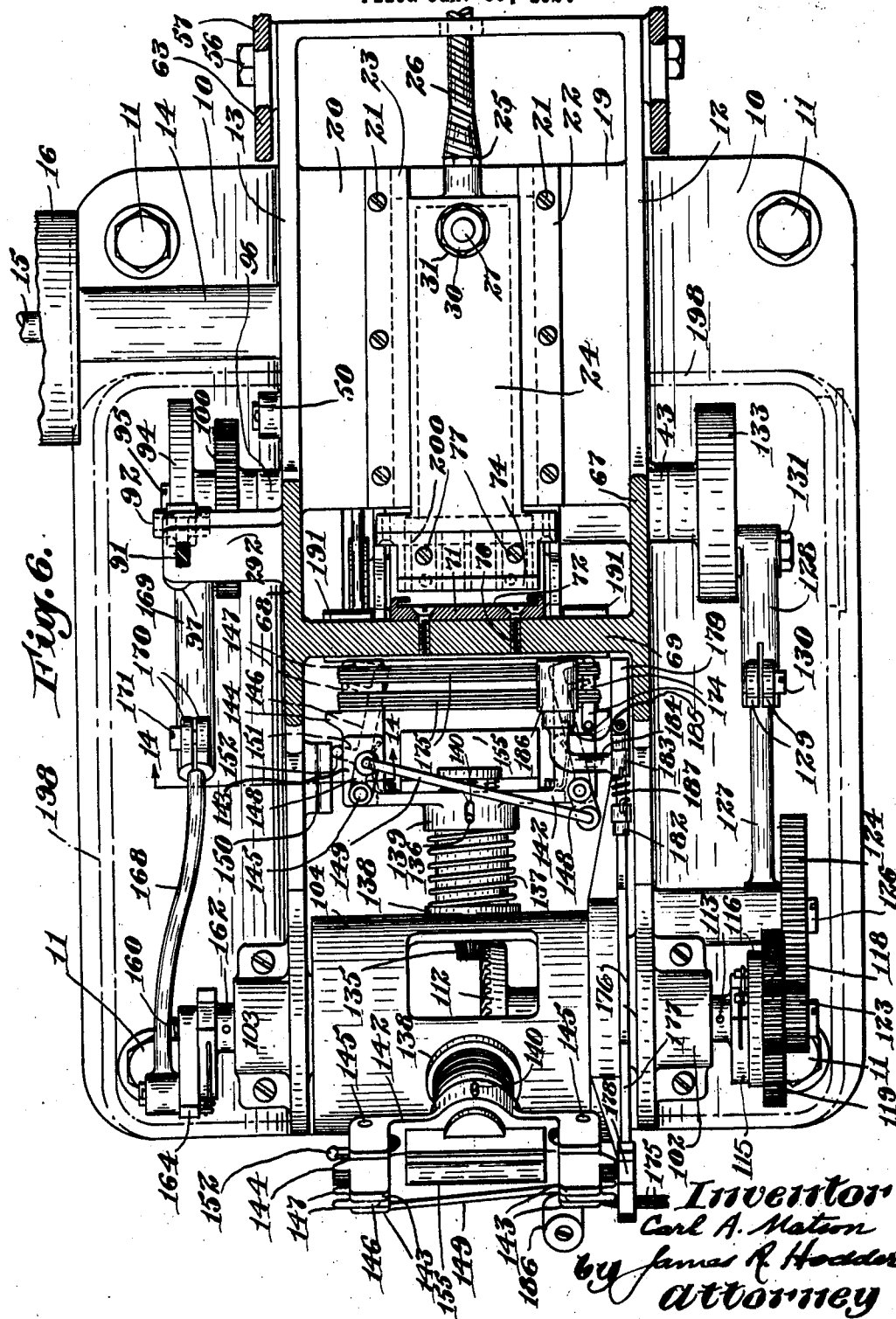
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1,949,544

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Filed Jan. 30, 1924

7 Sheets-Sheet 5



March 6, 1934.

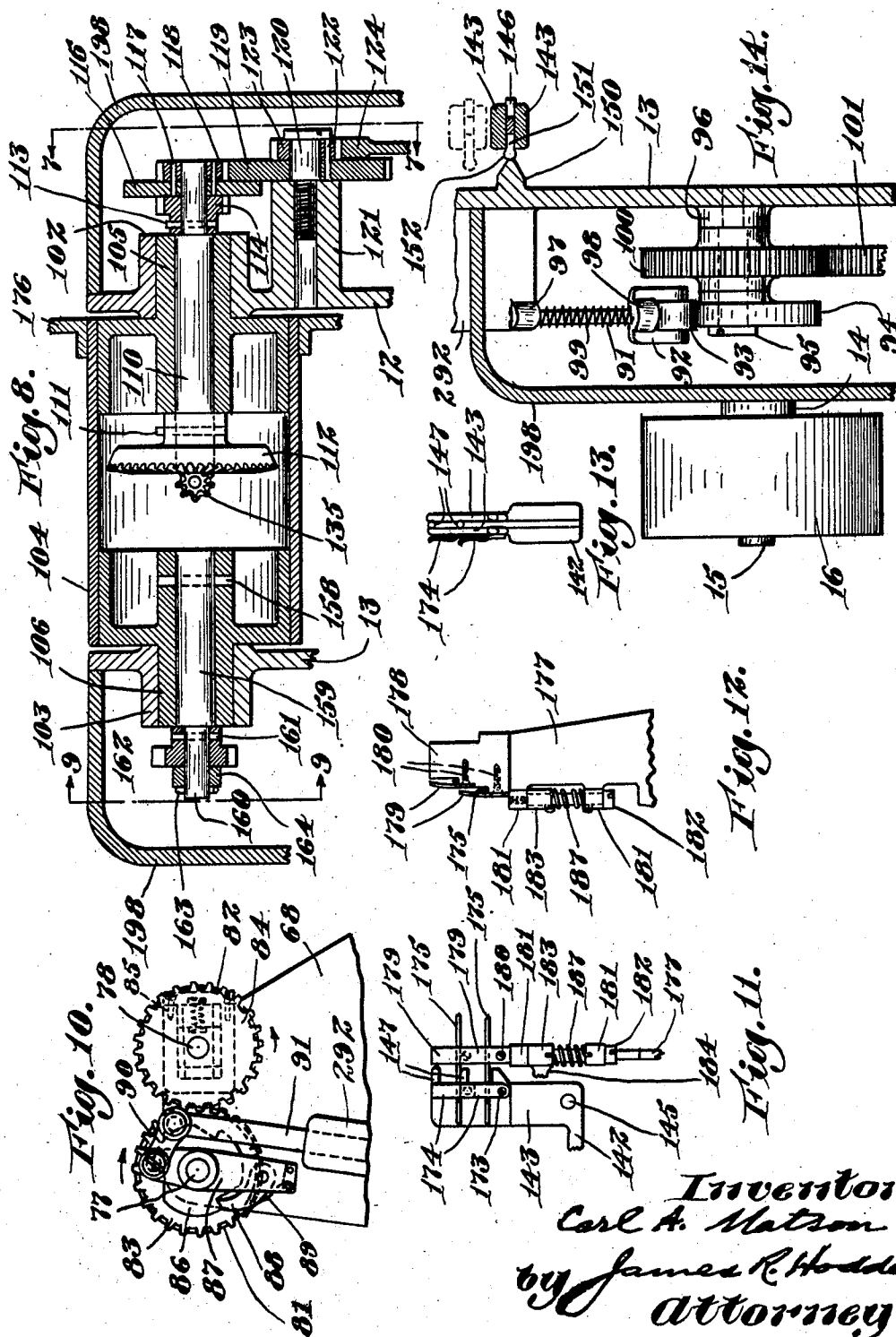
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1,949,544

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Filed Jan. 30, 1924

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March 6, 1934.

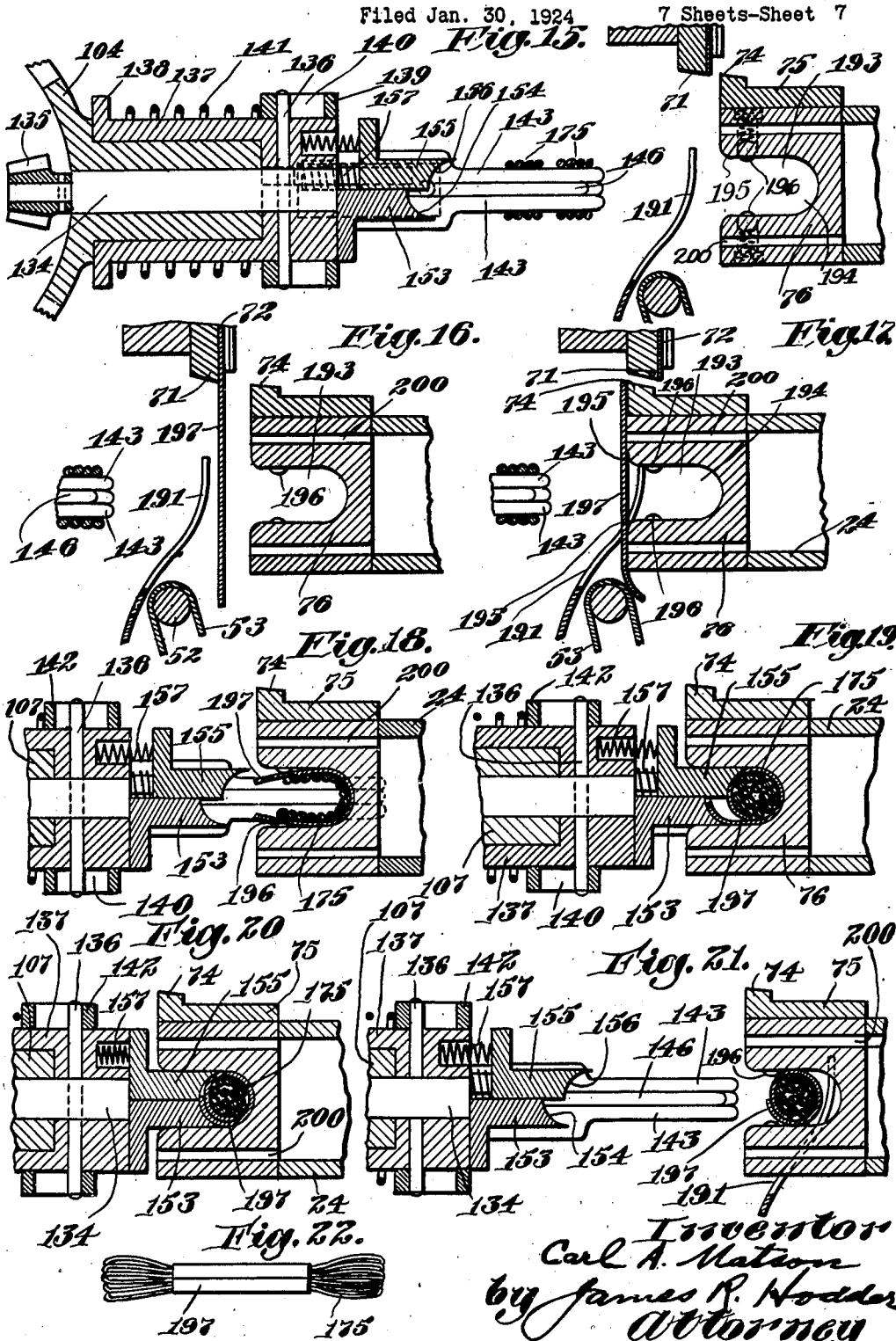
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1,949,544

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Filed Jan. 30, 1924

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UNITED STATES PATENT OFFICE

1,949,544

BUNDLING AND WRAPPING MACHINE

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mesne assignments, to Shoe Lace Company,
Ltd., Providence, R. I., a corporation of Rhode
Island

Application January 30, 1924, Serial No. 689,536

24 Claims. (Cl. 28—21)

This invention relates to packaging machines and is illustrated herein as embodied in a machine for forming bundles of laces.

The primary object of this invention is to provide an improved lace bundling machine which will wind a lace or a plurality of laces in coils of uniform and regular shape and will apply a band of wrapping material about the coils to form bundles which can be packed economically and attractively.

Various features of the invention which will be pointed out hereinafter and defined in the claims appended hereto have been illustratively embodied in a machine for bundling laces for shoes comprising a plurality of reels which are rotated to wind shoe laces thereon, a mechanism for applying a wrapping band about the laces on the reels, and also operating mechanism for causing the reels carrying coiled laces to be presented in succession to the wrapping mechanism.

For purposes of convenience in handling and of appearance of bundles of laces, it is desirable and customary to package them in pairs, each lace being separately wound in superimposed coils, and accordingly an important object of the invention is to provide improved mechanism which will effectively wind a pair of laces in independent coils. To this end, one feature of the invention consists in the provision of an improved winding reel the arms of which have spacing members, means for rotating the reel to cause the laces to be wound on the arms, and means operable at the end of the winding operation for moving the spacing members inwardly with respect to the arms to allow the laces to be removed from the arms. In the illustrated machine, the movement of the spacing members referred to above results from their engagement with a cam as the reels with which they are associated are presented successively to the wrapping or banding mechanism.

Provision is preferably made whereby the laces are tightly wound in superimposed coils. To this end, the laces are both tensioned and guided as they are wound by gripping means associated with each reel which frictionally resist movement of the laces. To insure that the tensioned ends of the laces will be securely but detachably anchored, the reel arms, as herein illustrated, are provided with clips adapted resiliently to grip the portions of the laces adjacent to the tips.

Invention is also to be recognized in the provision of improved means for winding laces having a wrapper applying or wrapping means, in combination with a die member, and means for

relatively moving said die member and wrapping means toward and away from each other, thereby to apply a piece of wrapping material disposed therebetween about the laces.

As herein illustrated, the above-mentioned die member is moved relatively to the wrapping means which comprises two members, one of which, as well as the winding reel itself, is mounted for limited yielding movement toward the other wrapping member. As a result of this yielding action of the winding reel and the yielding wrapping member, operation of the wrapping members in succession on the ends of the wrapping material is insured, causing them to be pressed in superimposed relation against the bundle.

Another object of the invention is to provide improved means for presenting pieces of wrapping material, as required, between the wrapping members or winding means and die member of a machine as above organized. To this end, another feature of the invention is constituted by means for projecting a strip of wrapping material into the path of movement of the die member as it moves away from the winding means and means operated by the die member during its movement toward the winding means for severing a piece of wrapping material from the strip. The severing of the strip of wrapping material, in the operation of the illustrated machine, is effected by the use of a shear member contiguous to the path of movement of the strip and a cooperating shear member carried by the movable die member.

The reciprocating die member is illustrated herein as being adapted to retain on its operating surface, by suction, the piece of wrapping material after it has been cut from the strip and to cause it to be applied to the coiled laces as above described. Moreover, as at this time the above-mentioned spacing members on the reel arms have been moved so as to allow the lace bundle to be removed from it, if the bundle can be held on the die member during its retrograde movement away from the winding reel, the bundle will be removed from the reel.

In view of the foregoing, and in accordance with another feature of the invention, the die member, as herein illustrated, is provided with means for releasably holding the bundle therein as it is moved away from the winding means or reel, whereby the bundle is stripped from the reel. Provision is also made whereby the bundle is removed from the die member at a convenient point in its movement. To this end, means uti-

lizing the movement of the die member and disposed in the path of movement of the bundle is employed to strip the bundle from the die member, from which it is allowed to drop into a receptacle for the bundled laces.

In the accompanying drawings illustrating a preferred embodiment of my invention,

Fig. 1 is a side elevation from the right side of the machine;

Fig. 2 is a side elevation from the left side of the machine;

Fig. 3 is a front elevation;

Fig. 4 is a rear elevation;

Fig. 5 is a vertical sectional side elevation on the line 5—5 of Fig. 3, a portion of the machine being removed;

Fig. 6 is a plan view, partly in section, taken on the line 6—6 of Fig. 5;

Fig. 7 is a detail section on the line 7—7 of Fig. 8;

Fig. 8 is a sectional view on the line 8—8 of Fig. 1;

Fig. 9 is a vertical sectional elevation on the line 9—9 of Fig. 8;

Figs. 10, 11, 12, 13, and 14 are detail views showing elements of the construction;

Fig. 15 is a sectional detail view through the bundling fork and wrapping die showing the position of same before engagement;

Fig. 16 is a detail sectional view of the structure shown in Fig. 15 illustrating a strip of wrapping material in front of the die;

Fig. 17 is a view similar to Fig. 16, but showing a piece of wrapping material severed from the strip;

Fig. 18 is a view showing the bundle of loops of the lacings in position to be wrapped;

Fig. 19 is a view similar to Fig. 18, but with the wrapping and bundling dies shown in operative position;

Fig. 20 is a view similar to Fig. 19, but with the bundling and wrapping operation completed;

Fig. 21 is a view similar to Fig. 20, but with the bundling and wrapping dies and bundling fork withdrawn from the die; and

Fig. 22 is a view of the completed bundle and wrapped lacings.

Referring to the drawings, 10 designates a base adapted to be secured to the top of a bench or other support by bolts 11. Formed integral with said base and spaced apart from each other and extending upwardly on either side of said base are side plates 12 and 13 (Fig. 6). Formed integral with the side plate 13 and extending laterally outward therefrom is a cylindrical member 14 that forms a bearing in which is rotatably mounted on main drive shaft 15. Secured to the outer end of the shaft 15 is a drive pulley 16 over which runs a belt 17 (Fig. 2) and by means of which power is transmitted to the shaft 15 from any suitable source of power. The side plates 12 and 13 are tied together at their rear ends by a cross plate 18, as clearly shown in Fig. 5. Extending between the side plates 12 and 13 and near the top thereof are slideway members 19 and 20 respectively (Fig. 6) and secured to the top surfaces of the members 19 and 20 by screws 21 are guide plates 22 and 23 respectively, these guide plates extending longitudinally of the machine. Mounted to slide between the members 19 and 20 and the guide plates 22 and 23 is a reciprocating crosshead or plunger 24, which is hollow, as shown in Fig. 5. Threaded into the extreme rear end of the crosshead is a nipple 25 on the end of which may be forced

a tube 26 and through which air may be drawn to create a suction through a device hereinafter described. Passing through the crosshead 24 near its rear end and upwardly thereof is a bolt 27 having formed integral therewith and at its lower end a plate 28 on which are formed downwardly extending lugs 29. The upper end of the bolt 27 is threaded to receive a nut 30 and the washer 31 is placed under the nut 30. Secured in the lugs 29 is a hardened steel pin 32 which engages the forked end 33 of a lever 34, which lever is pivotally mounted on a shaft 35 extending between the side plates 12 and 13 and near the lower end thereof. The lever 34 is provided with an elongated slot 36 intermediate between its ends and through this slot extends a crank pin 37 secured to one face of a gear 38 which is mounted to rotate with the main shaft 15. From the above description, it will be obvious that rotation of the shaft 15 in the direction of the arrow shown in Fig. 5 will cause a reciprocating movement of the crosshead 24 on the members 19 and 20. Secured to the forward end of the crosshead 24 are instrumentalities, the construction and function of which will be later described.

Extending between the side plates 12 and 13 below, and slightly in front of, the members 19 and 20, and formed integral with said side plates 12 and 13 is a shelf 39 (Fig. 5). Mounted on said shelf 39 and secured thereto in any suitable manner is a tank 40 adapted to hold liquid adhesive material 410 such as paste, glue, or the like. Mounted for rotation in the sides of the tank 40 is a shaft 41 provided on one end with a pulley 42. Formed integral with the side plate 12 (Fig. 6) and extending laterally outward therefrom is a bearing 43 that is in alinement with a corresponding bearing 44 (Fig. 4) that is formed integral with, and extends outwardly from, the side plate 13. These bearings 43 and 44 are drilled to receive a shaft 45. Secured to the shaft 45 intermediate between its ends is a pulley 46 (Fig. 5) that is in alinement with the pulley 42 on the shaft 41, and over these pulleys runs a belt 47 by means of which power is transmitted from the shaft 45 to the shaft 41. Also secured to the shaft 45 and intermediate between its ends is a gear 48 which meshes with, and is driven by, an idler pinion 49 that is rotatably mounted on a shaft 50 secured to the inner faces of the side plates 12 and 13. The idler pinion 49 meshes with, and is driven by, the gear 38 on the main drive shaft 15. The upper front ends of the side plates of the tank 40 are provided with extensions 51 and in these extensions and located one above the other in such manner that a plane passing through the axes lies at an angle to the perpendicular are rollers 52 over which runs an endless flexible belt 53. Secured to the shaft 41 and within the tank 40 is a roller 54 provided with a resilient, absorbent covering 55 the surface of which is in engagement with the endless flexible belt 53. Rotation of the main drive shaft 15 will cause, through the idler pinion 49, gear 48 and belt 47, a rotative movement of the shaft 41 so as to cause a rotative movement of the roller 54. The roller 54, dipping within the adhesive material 41, will have its covering 55 covered with adhesive material which will then be brought up and applied progressively to the endless flexible belt 53. The object of this construction will be apparent as the description of the illustrated structure progresses.

Secured to the upper rear ends of the side plates 12 and 13 by bolts 56 (Fig. 1) are up-

wardly and rearwardly extending members 57 each of which has formed at its upper end a boss 58 provided with a U-shaped groove 59 and in these grooves, which it is to be understood
 5 are in alinement with each other, is rotatably mounted a shaft 60 on which is mounted a roll of paper 61. Formed integral with the members 57 at each side of the machine and extending forwardly therefrom are members 62 and 63,
 10 which members meet and form bosses 64, 64. The bosses 64, 64 are drilled to form alined bearings for the reduced ends 65 of a roller 66, the axis of which is parallel to that of the shaft 60. Formed integral with the side plates 12 and 13
 15 on the top edge thereof and between the forward and rear portions are standards 67 and 68 respectively. Extending between the standards 67 and 68 is a web 69 (Figs. 5 and 6) and secured to the rear face of the web 69 by screws 70 is a
 20 guide 71 arranged to receive the paper strip 72 as it is unwound from the roll 61. The guide 71 is arranged and adapted to guide the paper strip 72 substantially vertically downward and into the line of travel of the crosshead 24 and attached
 25 parts. The lower rear edge of the guide 71 is bevelled to form a cutting edge at 73 which co-operates with a bevelled cutting edge 74 on the upper forward end of a shear member 75 secured to the upper face of a die member 76 by screws
 30 77. This die member 76 is secured to the forward end of the crosshead 24 in any desired or approved manner and is provided with a plurality of perforations 200. It is obvious from the above, therefore, that reciprocating movement of the crosshead 24 will bring the associated cutting
 35 edges 73 and 74 into position to shear off that portion of the paper strip 72 that extends below the cutting edge 73, as clearly shown in Fig. 5. Rotatably mounted in the standards 67 and 68, and spaced apart from, but parallel with, each
 40 other are shafts 77 and 78. The shaft 78 is mounted in bearings separable from, but slidable in, the standards 67 and 68 and springs 85 are employed to urge the bearings for said shaft 78 toward the shaft 77. Secured to such shafts 77
 45 and 78 and between the standards 67 and 68 are rolls 79 and 80 respectively. The rolls 79 and 80 are provided with resilient coverings 81 and 82 respectively. The distance between the shafts 77 and 78 and the diameters of the rolls 79 and 80 with their respective resilient coverings 81 and 82
 50 are so proportioned as to have the resilient coverings 81 and 82 engage with each other and to feed downwardly therebetween the paper strip 72 from the roll 61. Secured to the shafts 77 and 78 adjacent to the standard 68 and on the outside
 55 of such standard are gears 83 and 84 respectively (Figs. 2 and 10), which gears are in mesh with each other. Therefore, rotation of one shaft, as
 60 77, will cause a corresponding and opposite rotation of the shaft 78, it being assumed that the gears 83 and 84 have the same number of teeth. Secured to the shaft 77 adjacent to the gear 83, but exteriorly thereof, is a ratchet wheel 86 (Figs. 2 and 10). Pivoted on one end of an
 65 arm 87 rotatably mounted on the shaft 77 is a pawl 88 which is held in engagement with the ratchet wheel 86 by means of a spring 89. Pivotal-ly mounted to the other end of the arm 87 is
 70 one end of a connecting link 90, the lower end of this link being pivotally connected to the upper end of a member 91 that is slidably mounted in a guideway formed in a lug 292 secured to, or formed integral with, the standard 68 and on the outside thereof. The lower end of the mem-

ber 91 is forked at 92 and in the forked end is rotatably mounted a cam roller 93 which engages with a cam 94, this cam being secured to a stub shaft 95 screwed into a boss 96 formed on the exterior of the side plate 13. The member 292
 80 has formed thereon at its lower end a lateral extension 97 in alinement with a lateral extension 98 on the forked end 92 of the member 91 and lying in depressions in the extensions 97 and 98 is a compression spring 99 which tends
 85 to force the member 91 downwardly and hold the roller 93 in engagement with the cam 94. Secured to the cam 94 and rotatable therewith on the shaft 95 is a gear 100 which meshes with, and is driven by a gear 101 secured to the shaft
 90 45. Rotation of the cam 94, therefore, will cause an oscillating movement of the arm 87, once for each revolution of such cam, and, the cam rotating in the direction of the arrow shown in Fig. 2, it will be obvious that there will be a relatively
 95 slow upward movement of the member 91 and, therefore, a relatively slow movement of the pawl 88 with respect to the ratchet wheel 86. Also, it will be obvious, from an inspection of the cam 94, that, when the cam has been rotated to a
 100 certain point, the spring 99 will force the member 91 rapidly downward, causing a relatively rapid rotative movement of the shaft 77 and, therefore, the shaft 78 through a portion of a revolution to feed a predetermined length of the
 105 paper strip 72 downward between the rolls 81 and 82, the diameter of the rolls 81 and 82 being so proportioned as to cause the feeding of the proper length of paper for each third of a revolution of such rolls.

At the forward upper ends of the side plates 12 and 13 and on the outside of such side plates are formed bearings 102 and 103 respectively (Figs. 6 and 8). Numeral 104 designates a member having hollow projections 105 and 106 which
 110 rotate respectively in the bearings 102 and 103, as clearly shown in Fig. 8. The member 104, as illustrated, is provided with three radially extending projections 107, 108 and 109, preferably cylindrical in shape, and provided with radially
 115 extending passages. Rotatably mounted in the projection 105 (Fig. 8) is a shaft 110 and to the inner end of this shaft is secured by pin 111 a bevelled gear 112 while secured to the other end of the shaft 110 by a pin 113 is a ratchet wheel
 120 114. Rotatably mounted on the shaft 110 is a plate 116 which may be circular or not, as desired, and pivotally mounted on the plate 116 is a pawl 115 (Fig. 7) which engages with, and drives, the ratchet wheel 114 and, therefore, the
 125 shaft 110 and attached parts. Secured to the plate 116 by pins 117 is a gear 118 which meshes with, and is driven by, a gear 119 rotatably mounted on a stub shaft 120 screwed into the threaded
 130 boss 121 formed integral with, and extending laterally outward from, the side plate 12, as clearly shown in Fig. 8. Also rotatably mounted on the stub shaft 120 and secured to the gear 119 by pin 122 is a pinion 123 which meshes with, and is driven by, a circular rack 124 (Figs. 1
 135 and 8) formed on one end of an arm 125 that is rotatably mounted, intermediate between its ends, on a stub shaft 126 screwed into the side plate 12. To the lower end of the arm 125 remote from the circular rack 124 is pivotally attached
 140 one end of a connecting link 127 and the other end of this link is adjustably mounted in one end of a member 128, such member being provided with lugs 129 and a screw 130 by means of which
 145 the effective length of the link 127 may be ad-

justed, the end of the member 128 having the lugs 129 being split for this purpose. The end of the member 128 remote from the point of its connection with the link 127 is rotatably mounted on a bolt 131 that is adjustably secured in a T slot 132 that extends radially in the face of a circular plate 133. The circular plate 133 is secured to one end of the shaft 45 and therefore rotates with it. Assuming that the shaft 45 rotates continuously in the direction of the arrow shown in Fig. 2, it will be evident that an oscillatory movement will be imparted to the circular rack 124 and that, therefore, an oscillatory movement will be imparted to the shaft 110. The various gears, and pinions 124, 119, 123, and 118 are so proportioned that, for each oscillatory movement of the arm 125, the shaft 110 is rotated in excess of one complete revolution. The pawl 115 insures that there will be a positive driving connection to provide the aforesaid movement of the shaft 110 and that there will be no retrograde movement of the shaft 110. The rotative movement of the shaft 110 is, therefore, always in the same direction, but is intermittent. Rotatably mounted in each of the radial projections 107, 108, and 109 is a shaft 134 and to the inner end of each shaft is secured a bevel pinion 135, each of which meshes with, and is driven by, the ring gear 112. Secured to the outer ends of the shafts 134 by pins 136 are members 137 which surround, and are rotatably mounted on, the radial projections 107, 108, and 109 respectively. On the end of each member 137 adjacent to the member 104 is provided a flange 138. Slidably mounted on the end of the member 137 remote from the flange 138 is a reel hub 139 provided with diametrically arranged slots 140 into and through which protrude the ends of a pin 136, fixed in the shaft 134 and member 137, to thereby limit movement of the reel 139 radially of the member 104. Located between the flange 138 and the adjacent end of the reel hub 139 is a coil spring 141 which tends to move the reel hub 139 into the position shown in Figs. 6 and 15, for example. Formed integral with, and extending radially and horizontally outward from, the reel hub 139 are reel arms 142 from the outer ends of which extend two bifurcated reel pins or arms 143 on the outer edges of which are arranged projecting stops 144, as clearly shown in Fig. 6. Rotatably mounted in a bearing formed at the junction of each of the arms 142 and pins or arms 143 is a vertical shaft 145, and to each of said shafts is secured a guide 146 which is arranged to swing in the slot formed by the bifurcations in the pins on arms 143. Each of the guides 146 is provided with a plurality of laterally extending fingers 147 spaced apart from each other and, when in their normal position, extend laterally beyond the limits of the arms 143. Also secured to the vertical shafts 145 are arms 148 and to the outer ends of each of the arms 148 are pivotally attached the ends of a connecting link 149, the arms 148 being so arranged with respect to the shafts 145 and the guides 146 that the free ends of the guides 146 will be moved in unison either toward or away from the axis of rotation of the reel hub 139. Formed on the inner face of the side plate 13 and extending laterally inwardly therefrom is a cam surface 150. Formed on the guides 146 and extending laterally outward beyond the reel pins or arms 143 are arms 151, the outer ends of which are rounded, as shown at 152, and are adapted to engage with the cam surface 150 to

rotate the guides 146 about the shafts 145 as centers, as clearly shown in Figs. 6 and 14. While the cam surface 150 engages only one of the guides 146, it is obvious that the free ends of both guides 146 of any reel, will be moved inwardly with respect to the reel arms 143 simultaneously owing to operation of the link 149. The cam surface 150 is elongated radially of the member 104 in order that the rounded end 152 may be held in engagement with such cam surface if the reel hub 139 and attached parts is subjected to a sliding movement, within the limits of the slot 136, on the member 137. Secured to the outermost end of the member 137 in any suitable manner and having its upper face lying in a plane in which lies the axis of the shaft 134, it being assumed that the shaft 134 is that shaft associated with the cylindrical member 107 and that such shaft and cylindrical member are in the position shown in Fig. 5, is a wrapping or die member 153 the folding surface of which is concave as shown at 154 (Fig. 15) and has a radius of curvature which is the same as that of the cooperating surface of the associated die member 76. Slidably mounted on the outermost end of the member 137 above, and associated with the member 153 is another wrapping or die member 155 provided with a concave surface 156 having a radius of curvature equal to that of the concave surface 154 on the wrapping or die member 153. Springs 157 tend to move the member 155 axially of the member 137 and the die member 153 so that the concave portions 156 and 154 of the wrapping or die members 155 and 153 respectively occupy the relative positions when these members are in their normal positions in which they are shown in Fig. 15.

Secured to the hollow shaft 106 (Fig. 8) by a pin 158 is a shaft 159, the outer end of which is reduced at 160. Secured to the reduced end 160 by a pin 161 is a ratchet wheel 162 (Figs. 8 and 9). Rotatably mounted on the reduced end 160 of the shaft 159 and prevented from longitudinal movement on such reduced end by cotter pin 163 is a bell crank 164. Pivotally mounted on one arm of the bell crank 164 on a pin 165 is a pawl 166, and a spring 167 secured to the bell crank 164 yieldingly holds the pawl 166 in engagement with the ratchet wheel 162. Pivotally mounted on the other end of the bell crank 164 eccentrically with respect to the reduced end 160 of the shaft 159 is one end of a connecting rod 168 (Fig. 2) which is adjustably mounted in the hollow end of a connecting member 169, such member being provided with ears 170 through which a bolt 171 is inserted and tightened to clamp the hollow end of the connecting member 169 about the end of the connecting member 168. The end of the connecting member 169 remote from the ears 170 is pivotally attached to a crank pin 172 arranged parallel to, but eccentric with respect to, the shaft 45, as clearly shown in Fig. 2. The rotation of the gear 101 causes an oscillating movement of the bell crank 164, through the connecting members 168 and 169, and the ratchet mechanism connecting the bell crank 164 and the shaft 159 is so constructed that one-third of a revolution is imparted to the shaft 159 for each full revolution of the shaft 45, the shafts 134 being brought to rest successively in alinement with the longitudinal axis of the crosshead 24.

Secured to the arms 143 (Fig. 11) by screws 173 are spring plates or clips 174 between which and the arms 143 are anchored the ends of lacings 175. Secured to the member 104, (Fig. 8) as by

a shrinking fit, so as to be rotatable therewith is a plate 176, which plate has formed integral therewith and extending outwardly radially therefrom a plurality of arms 177, one for each of the members 107, 108 and 109. The outer end of each of the arms 177 is enlarged in thickness, as indicated at 178 (Fig. 12), and secured to one edge of such thick end portion so as to lie parallel to and alined with the spring plates 174 are spring plates 179, such spring plates being secured to the thickened portion 178 by screws 180. The edge of the thickened portion 178, to which are secured the plates 179, is formed in a series of steps, as clearly shown in Fig. 12. Formed on one edge of the arms 177 adjacent to the enlarged portion 178 are bearing lugs or ears 181. These lugs are drilled to receive a bearing screw 182 and on this bearing screw between the lugs 181 is rotatably mounted a member 183 which has formed integral therewith, and extending outwardly therefrom, an arm 184. Formed at the outer end of the arm 184 and extending outwardly is a bearing stud 185 (Figs. 5 and 6). Rotatably mounted on the bearing stud 185 is a roller 186. Encircling the bearing screw 182 and having one end fastened in one of the lugs 181 and its other end fastened to the member 183 is a coil spring 187 which tends to move the bearing stud 185, and therefore the roller 186, into engagement with that arm 143 which is adjacent to it. It will be obvious, therefore, that, if the ends of lacings 175 are anchored between the spring clips 174 and the reel arm 143 adjacent to the roller 186 (Fig. 3), and that, if the reel arm 143 is rotated about the axis of the shaft 134 as a center, the anchored ends of the lacings 175 will be moved toward and against the roller 186 and hence rotate it about the bearing screw 182 and against the tension exerted by the spring 187. The point of contact of the roller 186 with the lacings 175 thus moves outwardly across the reel arm 143 and around the outermost ends of the lacing coils as they leave the field of action of the roller 186. From this point until the opposite arm 143 moves into a relation of proximity to roller 186 the latter yieldingly bears against the lacings at a point intermediate between the supported portions of the lacings, one of which is at the bite of the clips 174 and the portion 178 of the arm 177 and the other of which is at the said outermost portion of that arm 143 which is moving away from the arm 177. The roller 186 thus supplements the tensioning function of the spring plates or clips 174 by insuring that the laces will be tensioned as they are wound on the arms 143, and also performs the function of holding the ends of the lacing against the coils at the completion of the rotation of the reel arm 143, thus preventing the outermost ends of the coil from moving away from the bundle which has been formed, as indicated in Fig. 6.

Secured to the front of the container or tank 40 (Fig. 5) by screws 188 is a combined deflecting plate and spring throw out 189, the deflecting plate portion being designated by the numeral 190 while the spring throw out means comprise fingers which are designated by the numeral 191. The deflecting portion 190 extends downwardly to a point adjacent to an opening 192 formed in the body of the machine and the spring fingers 191 are arranged on either side of the movable die member 76 attached to the forward end of the crosshead 24.

The die member 76 is provided with a trans-

verse passage 193 at its forward end, the rear end of this passage being rounded, as indicated at 194, while the forward end is flared, as indicated at 195. Secured in the die member 76 and extending inward through the top and bottom surfaces of the transverse passage 193 are spring pressed balls 196 which act as means for retaining, temporarily, the folded or bundled pair of lacings 175. After the pair of lacings 175 has been bundled and wrapped, its appearance is as shown in Fig. 22 with the wrapper taking the form of a short length of paper 197.

By referring to the figures, it will be noted that various shafts, rods, and gears extend outward from, or are located exteriorly of the side plates 12 and 13. To insure safety to the operators of the apparatus, I have enclosed such rods, gears, and the like in protecting shields 198, securing such shields in position on the side plates 12 and 13 by screws 199, for example.

The operation of my improved machine is as follows, it being assumed that it is desired to bundle lacings 175 of predetermined length in pairs and to wrap such bundles in an enclosing band of paper or other material. The wrapping paper is in the form of a strip wound in a roll 61 (Figs. 1 and 2) and such roll is placed on the shaft 60 which, in turn, is rotatably mounted in the slot 59 of the lugs 58, as above described. The end of the paper strip 72, of which the roll 61 is composed, is led from beneath the roll, over the roll 64 and then downwardly between the resilient coverings 81 and 82 on the rolls 79 and 80 respectively. After passing between the rolls, such paper 72 is fed downward through the guide 71 to a point where its lower edge is just beneath the lower surface of the die member 76, as clearly shown in Fig. 5. The operator now takes a pair of lacings 175 and places the ends thereof under the spring clips 174, as shown in Figs. 11, 12 and 13 and under the spring plates 179 on the enlargement 178 of the uppermost arm 177 as indicated in Fig. 1. Liquid adhesive material is placed in the tank 40. Power is now supplied to the machine by means of a belt passing over the pulley 16. Rotation of the main shaft 15 causes a rotation of the shaft 45 by means of the gears 38, 49, and 48 respectively and rotation of the shaft 45 rotates the plate 133 and gear 101 secured to the opposite ends thereof. Rotation of the plate 133 causes an oscillatory movement of the circular rack 124 and a rotation of the shaft 110 through the gears 123, 119 and 118, respectively. The rotation of the shaft 110 rotates the ring gear 112 which, meshing with the bevel pinions 135, causes a rotative movement of the shafts 134 and therefore a rotative movement of the reel hub 139 that has formed integral therewith the arms 143. The number of revolutions of the shaft 134, and therefore of the arms 143, is dependent on the positions of the crank 131 in the radial slot 132 in the plate 133 and this setting is adjusted in accordance with the length of the lacings 175 being worked on. As the arms 143 are rotated the lacings are pulled through the constricted space between the spring plates 179 and the member 178 which cooperate frictionally to tension the laces. Further to insure that the lacings will be wound in tight coils, the roller 186 yieldingly bears against an intermediate portion of the lacing strands extending between that arm 143 which is moving away from the spring plates 179 and the plates themselves. The pivotally mounted guides 146 are so arranged on the arms 143 that the lacings will be wound in the posi-

tion shown in Fig. 6, each lacing being separate from the other and kept separate by the fingers 147 on such pivoted guides 146.

As the arms 143, on which the lacings 175 are described as being wound, approach the position shown in Fig. 6, the ball end 152 on the arm 146 adjacent to the cam 150 engages it and causes a rotative movement of the pivoted guide 146 inward toward the center of rotation of the shaft 134. Because of the connecting means 148 and 149 between the pivoted guides 146, such an inward movement of one guide 146 causes a corresponding movement of the other and also of the fingers 147 thereof, thus making it possible to slip the loops of lacings 175 off the arms 143. Simultaneously with the winding of the lacings 175 in bundles, the gear 101 (Fig. 2) causes, through the connecting members 168 and 169, rotative movement of the shaft 159 which, in turn, causes a rotative movement of the entire mechanism, including the shafts 134, and therefore a rotative movement of such mechanism through one third of a revolution, the amount of rotative movement being determined by the ratchet wheel and pawl 162 and 166 interposed between the connecting members 168, 169 and the shaft 159. Also, by reason of the ratchet wheel and pawl 114 and 115 interposed between the shaft 110 and the driving mechanism therefor, the rotative movement of the shaft 110 takes place during only a half cycle of the movement of the circular rack 124, the retrograde movement of such rack 124 being an idle movement. During the above operation, as the shaft 45 is continually rotating, power is transmitted through the belt 47 (Fig. 5) to the shaft 41 and the roller 55 dipping into the adhesive 41 in the tank 40 gradually feeds such adhesive upward to keep the belt 53 on the idler roller 52 wet with such adhesive. The main drive shaft 15 being assumed to be constantly driven and the gear 38 thereon therefore being constantly driven, the crank pin 37 on such gear 38 engaging with the slot 36 on the pivoted arm 34, oscillates such arm 34 through an angle the sides of which are tangent to the circle described by the axis of the crank 37 and intersect at the axis of the shaft 35, as will be clearly apparent from an inspection of Fig. 5. The upper slotted end 33 of such pivoted arm 34 engaging with the pin 32 on the lower end of the bolt 27, will impart a reciprocating movement to the crosshead 24. Such crosshead as has been described above is hollow and air is drawn there-through and through the passages 200 in the die member 76 by suction means of any desired description attached to the tube 26. The mechanism is so proportioned that the pair of lacings 175 will be wound in position on the arms 143 and the pair of such arms will be positioned in alignment with the travel of the crosshead 24 prior to the starting of such crosshead 24 on its forward travel; that is, the parts of the mechanism are now assumed to be in the position shown in Fig. 5 with the arms 143, on which the lacings 175 are positioned, stationary and with the crosshead 24 just about to start to move toward them. The die member 76 and the lacings 175 to be wrapped are in the position shown in Fig. 5 or in the position shown in Fig. 15. The crosshead 24 now moves and brings the cutting edge 74 into engagement with the cutting edge 73, severing a length of paper strip 197 from the paper 72 and after this has been done, the parts are assumed to be in the position shown in Fig. 17. As the forward end of the die member 76 engages with the strip

of paper 72 simultaneously with the cutting off operation by the cutting edges 73 and 74, the length of paper 197 cut off from such strip 72 is held against the forward end of the die member 76 by the suction created through the tubes or passages 200. The length of paper 197, therefore, will be held firmly in position on the face of the die member 76 and will cover the front end of the transverse passage 193. The amount of feeding motion imparted to the strip of paper 72 by the rolls 79 and 80 is determined by the ratchet and pawl mechanism 86, 87, 88, and 89 on the shaft 77 and the length of the paper fed is such that the lower end of the portion 197 extends a sufficient distance below the bottom face of the die member 76 to engage with the adhesive covered belt 53 on the idler rolls 52. The feeding movement of the paper 72 takes place practically instantaneously because of the peculiar form of the cam 94, the feeding movement being brought about by the expansion of the spring 99 moving the sliding member 91 suddenly, as will be clearly apparent from an inspection of Fig. 2. As the die member 76 moves forwardly, carrying the length of paper 197 on its front face, the lower end of the paper 197 engages with the adhesive covered belt 53, coating such lower end with adhesive, as clearly shown in Fig. 17. Further forward movement of the die member 76, from the position shown in Fig. 17 to that shown in Fig. 18, causes the loops of the lacings 175 to engage with the strip of paper 197 and forces such paper inward in the transverse slot 193, the paper taking the shape of such transverse slot and the whole being in the position shown in Fig. 18. Continued forward movement of the die member 76 causes the curved rear end 156 of the spring pressed die member 155 to engage with the upper edge of the strip of paper 197, rolling such edge around and causing it to assume the position shown in Fig. 19, this movement also tending to force the lacing loops 175 into a round bundle. Continued forward movement of the die member 76 brings the rearward curved portions 154 of the fixed die member 153 into engagement with the lower edge of the paper 197, the parts moving, therefore, from the position shown in Fig. 19 to the position shown in Fig. 20, and at the end of the stroke, the adhesive coated portion of the strip of paper 197 is brought into engagement with the intermediate portions of such paper, which portions of paper stick together, thereupon leaving the bundle of lacings 175 enclosed and held by the wrapper 197. Having reached the forward end of its stroke, the continued rotation of the shaft 15 moves the die member 76 rearwardly again, the die member 76 thus moving from the position shown in Fig. 20 to that shown in Fig. 21. It will be noted that, as a result of the forward movement of the die member 76, the relation between it and the spring throw out means 191 changes from that shown in Fig. 17 to that shown in Fig. 21. That is, while the spring throw out means 191 remain stationary, the bundled lacings 175 are gradually brought into engagement therewith and on a continued rearward movement of the die member 76 the bundled lacings 175 are withdrawn from the transverse slot 193 against the tension exerted on said bundles by the spring pressed balls 196. Being withdrawn from the transverse slot 193, the bundled lacings 175 coast down the shield 189 and are deflected by the portion 190 thereof through the opening 192 into any suitable container.

The above sequence of operations takes place

indefinitely, it only being necessary for the operator to feed into the machine pairs of lacings 175 which are thus automatically wound and bundled.

5 The strip of paper 72 may have printed thereon a plurality of labels, each label being centered on the individual strips 197 so that, when the strip 197 is placed on the bundled lacings 175, the usual or ordinary nomenclature of such labels, such as the style of lacing, length of lacing, etc., may clearly appear.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

15 1. In a device of the kind described, the combination of a pair of spaced arms, pivotally mounted outwardly extending members on said arms and defining substantially U-shaped grooves on the outer surface of the arms, said
20 grooves being spacing means for independent lacings, means for rotating said arms in the surface of a cylinder about a common center to wind a pair of lacings into loops of predetermined number and length, and means operable at the
25 end of the winding operation for moving said outwardly extending members inward with respect to the pair of spaced arms.

2. In a device of the kind described, the combination of a pair of spaced arms, pivotally
30 mounted outwardly extending members on said arms and defining substantially U-shaped grooves on the outer surface of the arms, said grooves being spacing means for independent lacings, means for rotating said arms in the surface of
35 a cylinder about a common center to wind a pair of lacings into loops of predetermined number and length, and means for moving the outwardly extending members on both arms inward simultaneously.

40 3. In a device of the kind described, the combination of a shaft, a plurality of radially extending arms mounted thereon and rotatable about said shaft, rotatably mounted shafts extending longitudinally of each of the radially
45 extending arms, a pair of spaced arms secured to each of the shafts in the radially extending members and mounted for rotation on the axis of said shaft and in the surface of a cylinder, and means
50 for simultaneously rotating the spaced arms about the first said shaft and about the shaft in the radially extending arms.

4. In a device of the kind described, the combination of a shaft, a plurality of radially extending arms mounted on said shaft, lacing bundling
55 means rotatably mounted in each of said arms, means for simultaneously rotating the arms about the first said shaft and the bundling means about the shafts in the arms, lacing gripping means arranged on each of the bundling means
60 and tension means associated with said bundling means for winding loops of lacings on the bundling means under tension.

5. In a device of the kind described, the combination with a reciprocating die member of a
65 plurality of lacing bundling means each having a wrapping member adapted to cooperate with said reciprocating die member, means for bringing said bundling means successively into operative position in alinement with the path of movement of the reciprocating die member, and means
70 for moving said reciprocating die member in alternation with the movement of the bundling means into and out of operative relation with the wrapping member associated with the aligned
75 bundling means.

6. In a mechanism for bundling lacings, the combination of a rotatable cylinder, one or more supports secured thereto and rotatable about an axis which intersects the periphery of the cylinder, spaced arms extending from said supports
80 to receive lengths of lacings, gripping means on the arms for anchoring the ends of the lacings, and means for rotating said cylinder and supports about their respective axes whereby the lengths of lacings are formed into a bundle.

7. In a lace bundling and wrapping machine, means detachably to secure the end portions of a plurality of lacings, means to form the lacings into a looped bundle, and means to apply a securing band about a predetermined portion of the
85 bundle, said last-mentioned means comprising a die member which bands a portion of the bundle and a second die member carried by the bundling means for completing the banding operation.

8. The combination with a rotating and traveling two-pin reel for folding and advancing shoe
90 laces, of means for wrapping and securing labels about the folded laces while in said folding reel.

9. The combination with means for folding and
95 advancing shoe laces, of means for wrapping and securing labels about the folded laces while in said folding means, said folding means including operating connections, a rotating two-pin reel having a clip engaging one end of the laces, and
100 a relatively stationary spring guide through which the laces are drawn as they are folded about the pins.

10. The combination with means for folding and advancing shoe laces, of means for wrapping
105 and securing labels about the folded laces while in said folding means, said wrapping means including means for withdrawing the folded laces from the folding means after the wrapping operation is completed.

11. The combination with means for folding and advancing shoe laces, of means for wrapping
110 and securing labels about the folded laces while in said folding means, said wrapping means including means rising behind the folded laces after the wrapping operation is completed and then
120 moving away from said folding means to withdraw the completed package from the same.

12. Means for folding shoe laces for packaging, comprising a rotating two-pin reel having a clip
125 engaging one end of the laces, and a relatively stationary spring guide through which the laces are drawn as they are folded about the pins.

13. In a machine for operating upon shoe
130 laces, the combination of means for winding laces into a bundle, means for applying a band of wrapping material about the bundle on said winding means comprising wrapping means associated with said winding means and a reciprocating die
135 member arranged to cooperate with said wrapping means mounted for movement toward and away from the winding means, means for projecting a strip of wrapping material into the path of movement of said last-mentioned reciprocating
140 die member as the latter moves away from the winding means, and means operated by said reciprocating die member during its movement toward the winding means for severing a piece of wrapping material from the strip.

14. In a machine for operating upon shoe
145 laces, the combination of means for winding laces into a bundle, means for applying a band of wrapping material about the bundle on said winding means comprising wrapping means associated with said winding means and a reciprocating
150

- cating die member arranged to cooperate with said wrapping means mounted for movement toward and away from the winding means, means for projecting a strip of wrapping material into the path of movement of said last-mentioned reciprocating die member as the latter moves away from the winding means, a shear member contiguous to the path of movement of the strip of wrapping material, and a second shear member carried by said reciprocating die member arranged to cooperate with said first-mentioned shear member to sever a piece of wrapping material from the strip during the movement of the die member toward the winding means.
- 15 15. In a machine for operating upon shoe laces, means for winding laces into a bundle, wrapping means associated with said winding means, said winding means being mounted to have limited yielding movement toward said wrapping means,
- 20 a die member cooperating with the said wrapping means mounted for movement toward and away therefrom to cause the ends of a piece of wrapping material disposed between said die and wrapping means to be pressed in superimposed relation against the bundle on the winding means.
- 25 16. In a machine for operating upon shoe laces, the combination of a reel for winding laces in a bundle, wrapping means associated with said reel, the reel being mounted to yield toward said wrapping means, a die member mounted for movement toward and away from and cooperating with the wrapping means to apply a piece of wrapping material about laces on the reel, and means for operating said die member successively
- 30 to cause the bundle on the reel to be moved toward the wrapping means and to cause the ends of the wrapping material to be pressed against the bundle in superimposed relation.
- 35 17. In a machine for operating upon shoe laces, the combination of a reel for winding laces into a bundle, wrapping members mounted for movement relatively to each other toward and away from the bundle to apply a piece of wrapping material about the bundle, means for projecting
- 40 a strip of wrapping material between said wrapping members, means on one of said wrapping members cooperating with a part of said last-mentioned means for severing a piece of wrapping material from the strip as the members are relatively moved toward each other, and means for applying adhesive material to an end of the severed strip before it is applied about the bundle.
- 45 18. In a machine for operating upon shoe laces, a reel for winding laces into a bundle, wrapping members associated with said reel, one of which members and said reel are mounted to move yieldingly toward the other of said members, a die member mounted for movement toward and away from said wrapping members and cooperating therewith to apply a piece of wrapping material about a bundle on said reel, and means for operating said die member successively to cause said reel to yield toward said wrapping members and to cause said yielding wrapping member to be moved with respect to the other.
- 50 19. In a machine for operating upon shoe laces, means for winding laces into a bundle, means for applying a piece of wrapping material about a bundle on said winding means comprising a die member mounted for movement toward and away from said winding means, means on said die member for holding the bundle therein as it is moved away from said winding means thereby to strip the bundle from the winding means, and means disposed in the path of the bundle as it is moved away from the winding means constructed and arranged to strip the bundle from the die member.
- 55 20. In a machine for operating upon shoe laces, the combination of a reel for winding laces into a bundle, means for applying a piece of wrapping material about the bundle comprising die members one of which is associated with said reel and the other of which is mounted for movement toward and away from the reel, means carried by said last-mentioned die member constructed and arranged releasably to hold the bundle therein as the die member is moved away from the reel whereby the bundle is stripped from the reel, and stripping plates disposed in the path of the bundle as it is moved by said last-mentioned die member away from the reel for removing the bundle from the die member.
- 60 21. In a machine for operating upon shoe laces, the combination of lace winding means comprising a reel having arms, spacing members mounted in said arms arranged normally to extend beyond the outer surfaces thereof, means for rotating the reel to cause the laces to be wound on the arms, and means operable at the end of the winding operation for moving the spacing members inwardly with respect to the arms to allow the laces to be removed therefrom.
- 65 22. In a machine for operating upon shoe laces, the combination of rotatable reels having spaced arms, spacing members mounted for movement on said arms and normally defining substantially U-shaped grooves on the outer surfaces of the arms, means for rotating the reel to wind laces into coils thereon, and means for moving said spacing members inwardly with respect to the spaced arms to allow the laces to be removed therefrom.
- 70 23. In a machine for operating upon shoe laces, a plurality of rotatable reels each of which has spaced arms, spacing members mounted for movement on said arms, means for rotating said reels to wind laces into coils thereon, means for applying wrappers about the coiled laces on said reels, means for moving said reels in succession into operative relation to said wrapping means, and means positioned and arranged to operate said spacing members inwardly with respect to said reel arms as the latter are successively moved into operative relation with the wrapper applying means.
- 75 24. In a machine for operating upon shoe laces, means for winding laces into a bundle, means for applying a piece of wrapping material about a bundle on said winding means comprising a die member mounted for movement toward and away from the winding means, and means carried by said die member for releasably holding a bundle thereon as it is moved from the winding means whereby the bundle is stripped from the winding means.

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