July 1, 1924. 1,499,703

W. M. SPRY

MACHINE FOR PACKAGING ARTICLES

Filed March 7, 1921 7 Sheets-Sheet 1

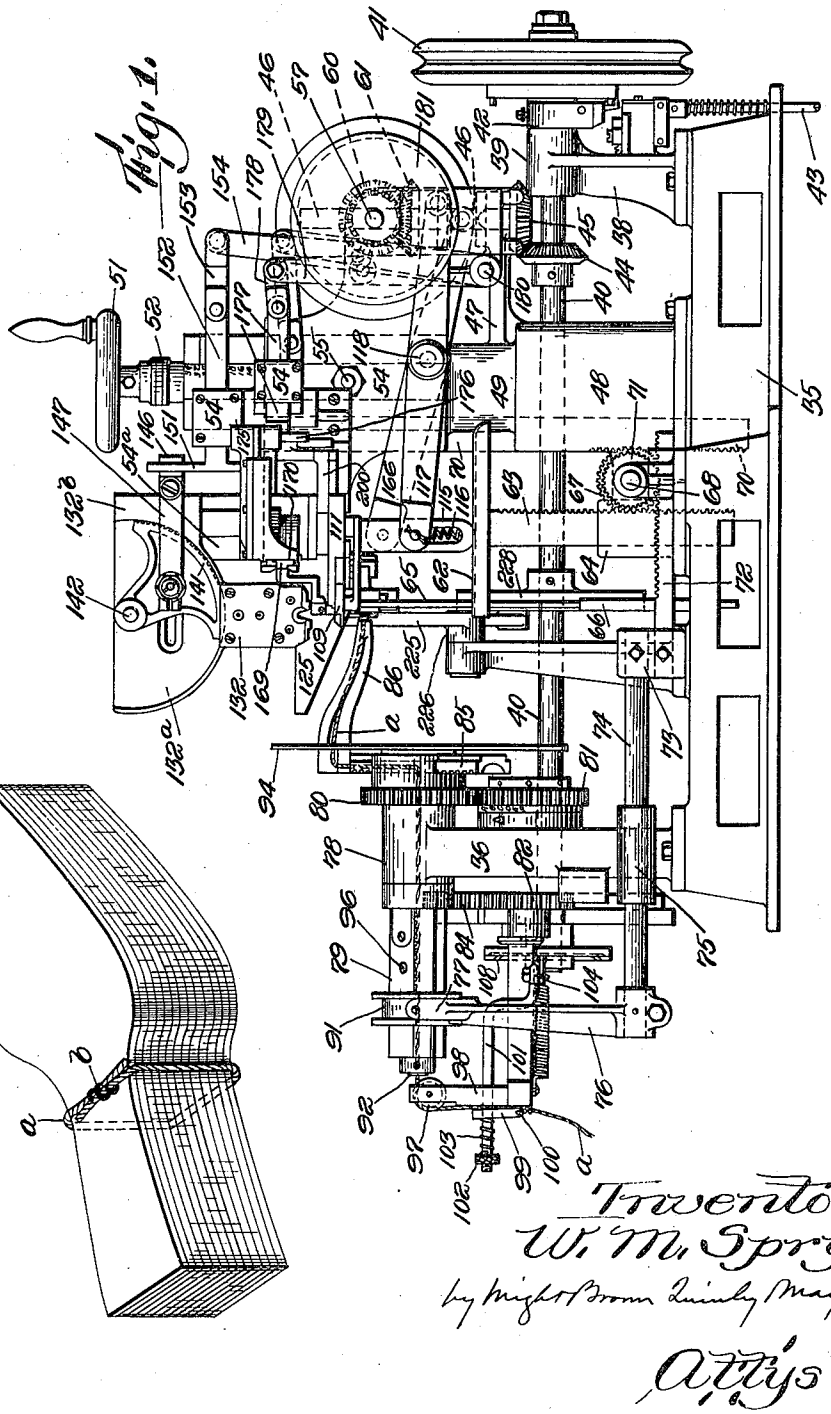


Fig. 1.

Fig. 50.

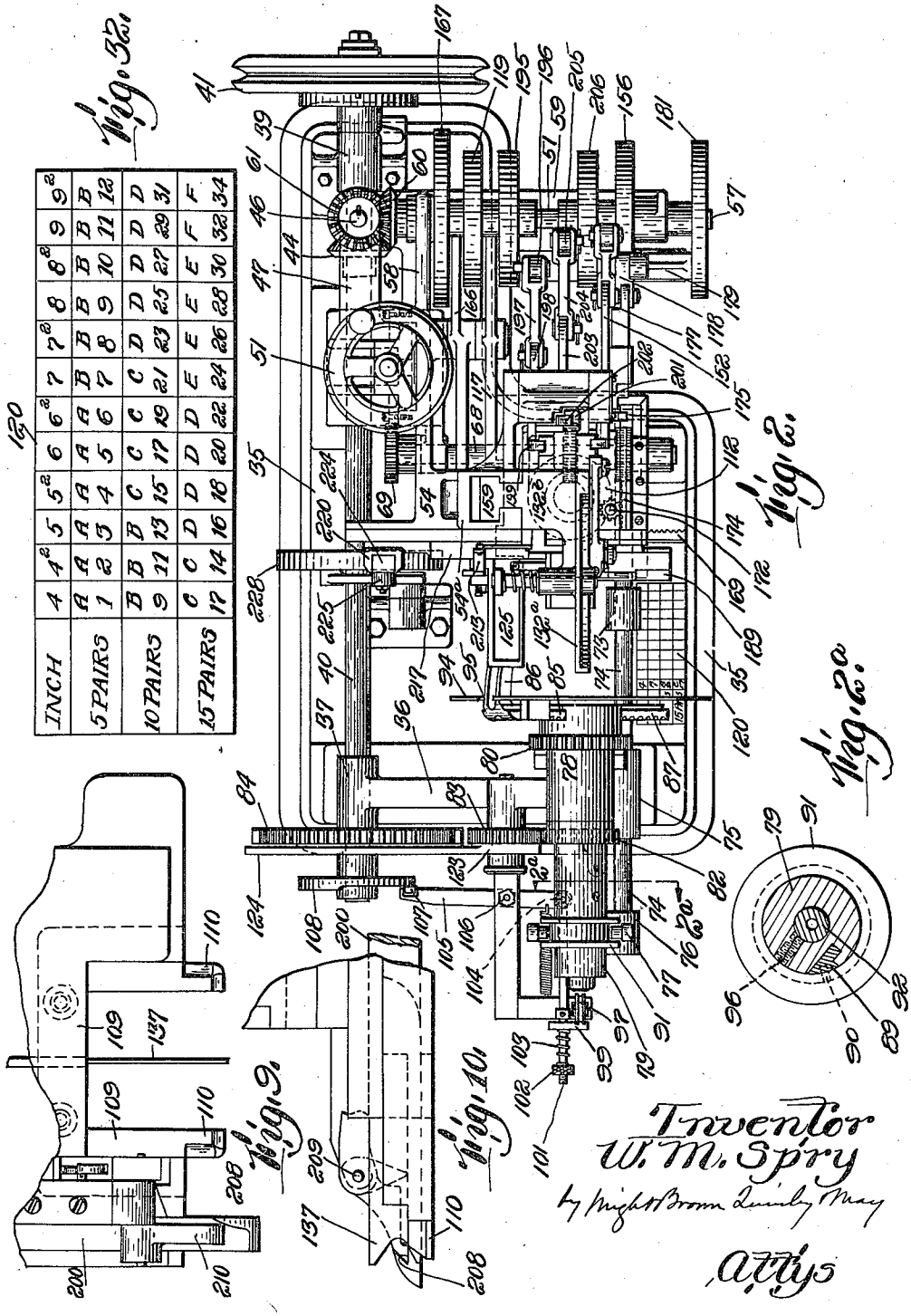
Inventor
W. M. Spry
by Wright Brown Quinby & May
Attys

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MACHINE FOR PACKAGING ARTICLES

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INCH	4	4a	5	5a	6	6a	7	7a	8	8a	9	9a
5 PAIRS	A 1	A 2	A 3	A 4	A 5	A 6	B 7	B 8	B 9	B 10	B 11	B 12
10 PAIRS	B 9	B 11	B 13	C 15	C 17	C 19	C 21	D 23	D 25	D 27	D 29	D 31
15 PAIRS	C 17	C 14	D 16	D 18	D 20	D 22	E 24	E 26	E 28	E 30	F 32	F 34

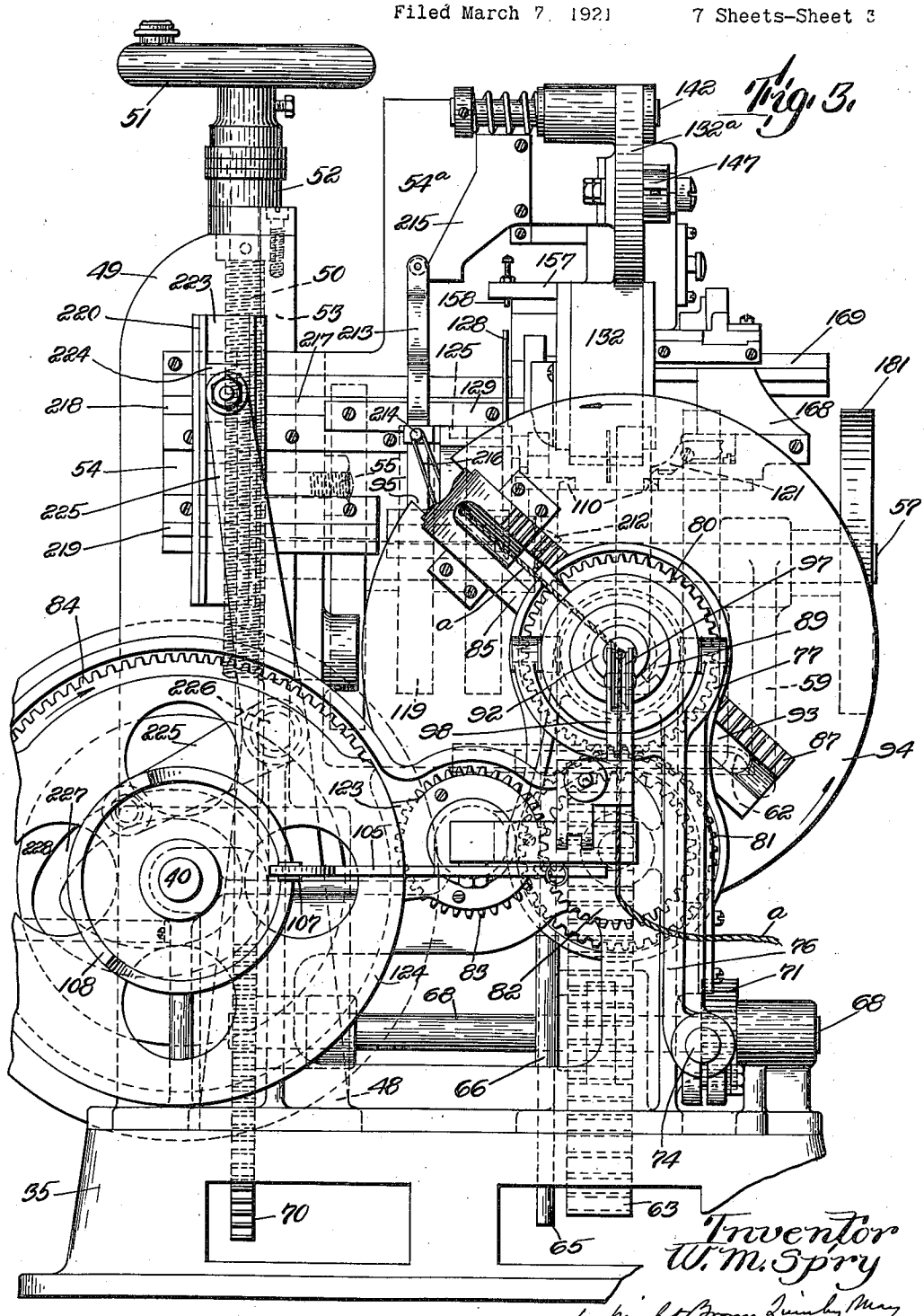
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Fig. 3.



Inventor
W. M. Spry
by Wright Brown Quinby & May
Attys

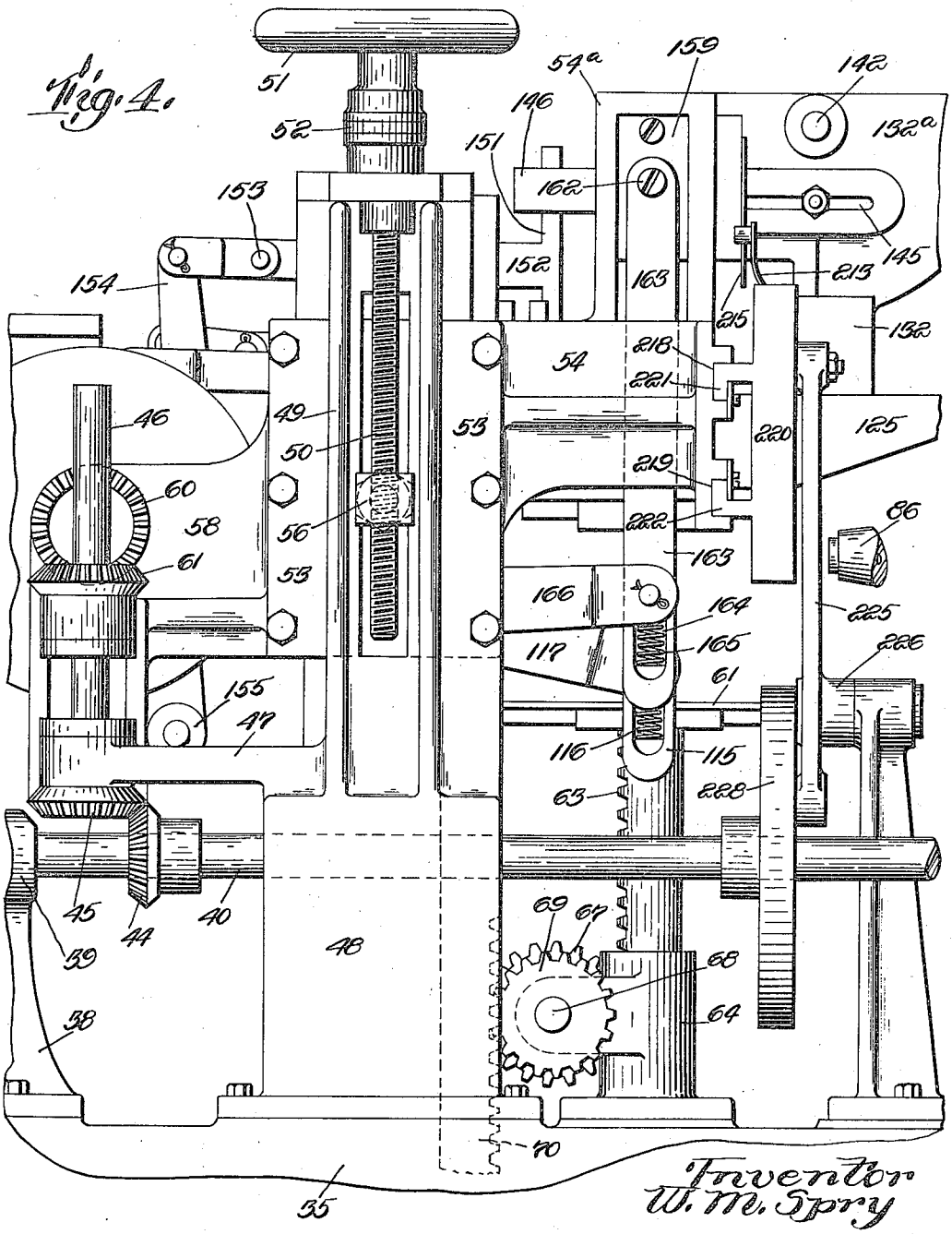
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W. M. SPRY

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Fig. 4.



Inventor
W. M. Spry
by Wright Brown Quinby & May

Attys

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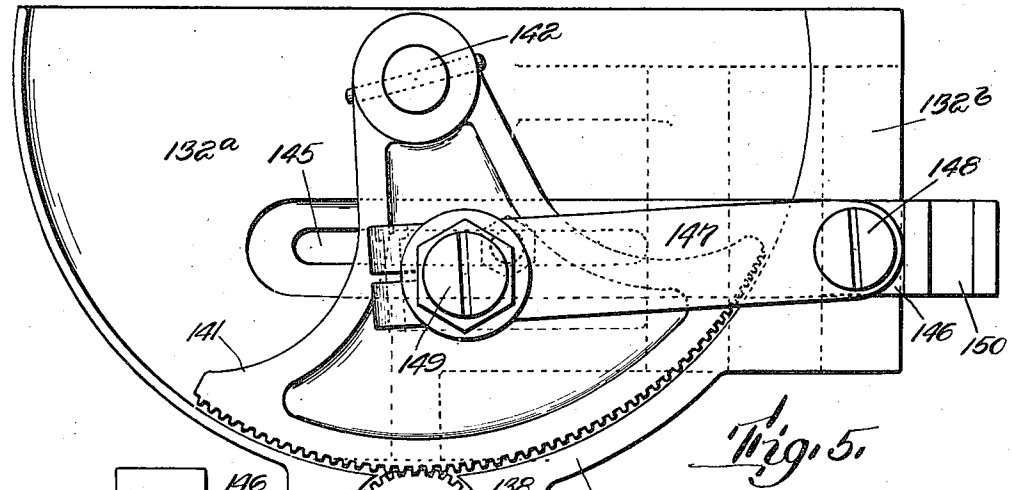


Fig. 5.

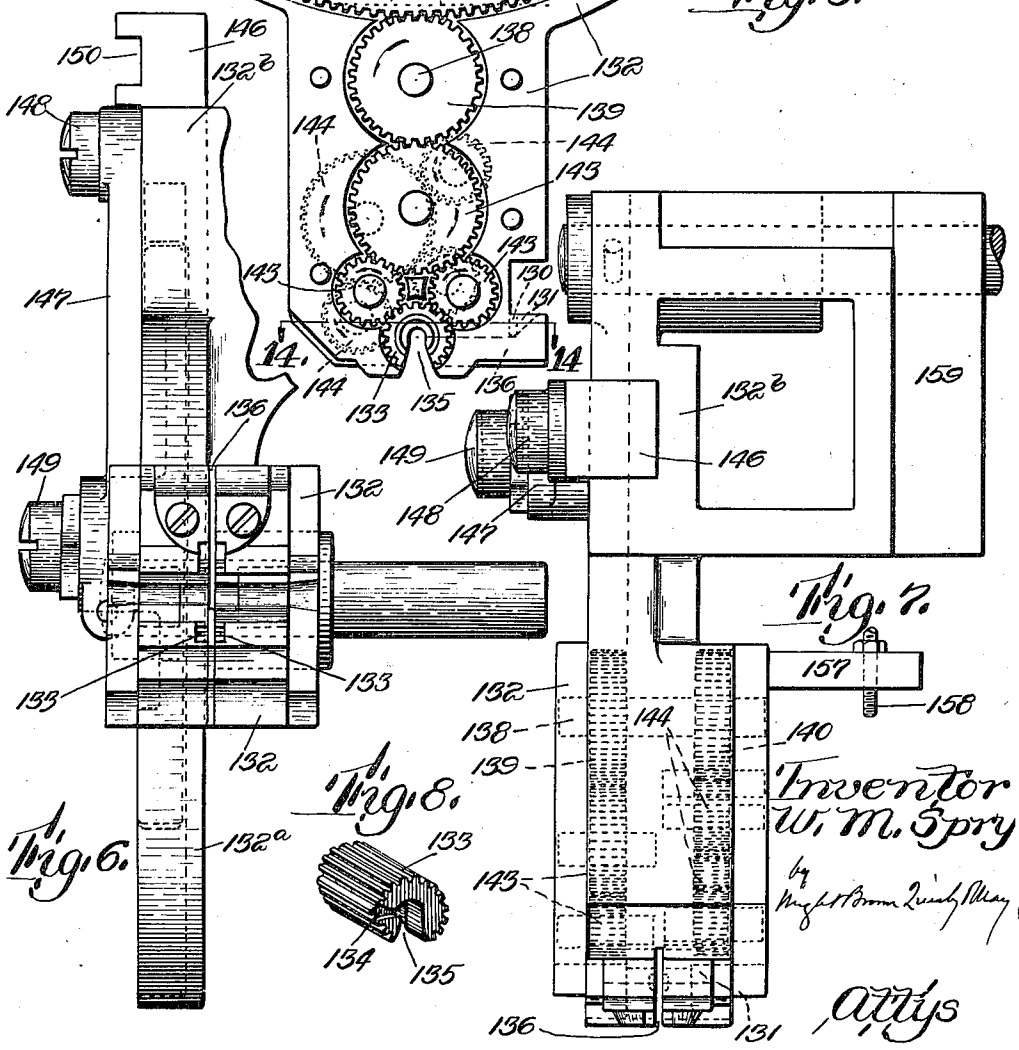


Fig. 7.

Fig. 6.

Fig. 8.

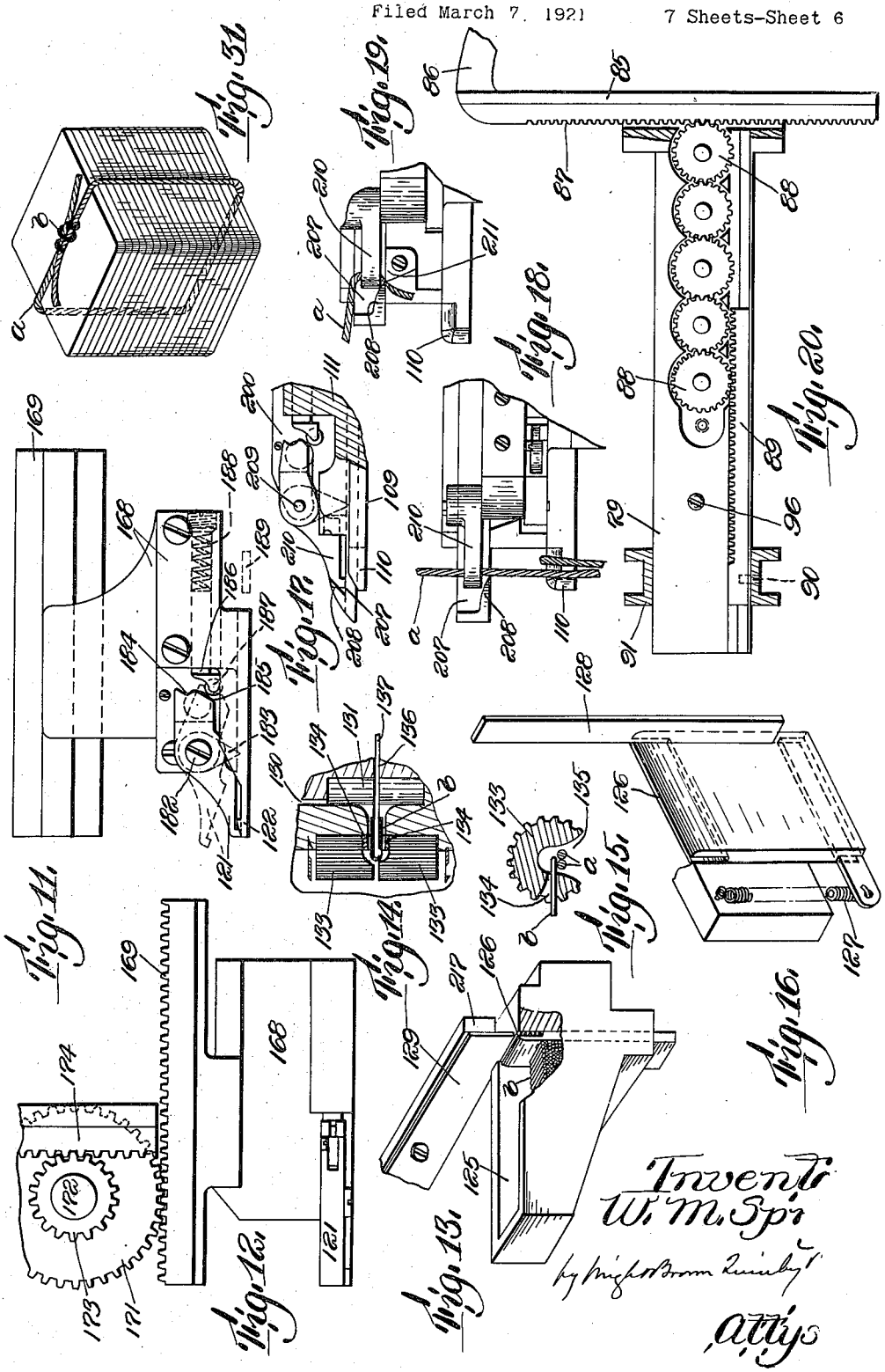
Inventor
W. M. Spry
by
Wright Brown Quinby & May
Attys

July 1, 1924. 1,499,703

W. M. SPRY

MACHINE FOR PACKAGING ARTICLES

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Inventor
W. M. Spry
by Wright Brown Quinby & Atty's
Attys

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W. M. SPRY

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Fig. 21.

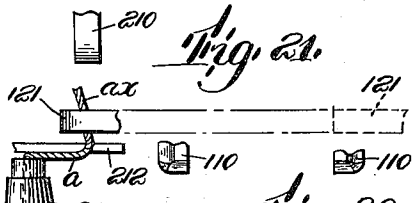


Fig. 22.

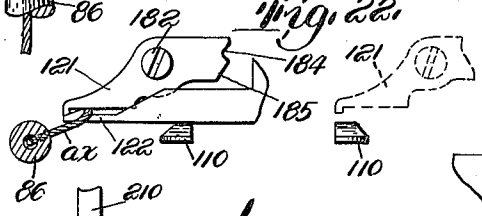


Fig. 23.

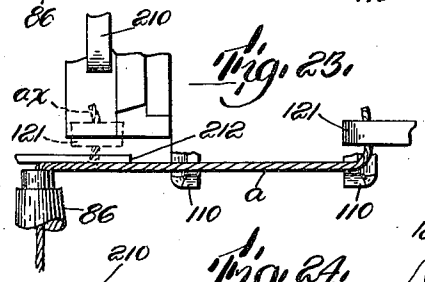


Fig. 24.

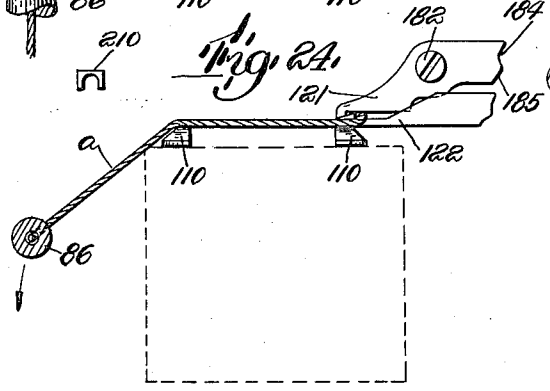


Fig. 25.

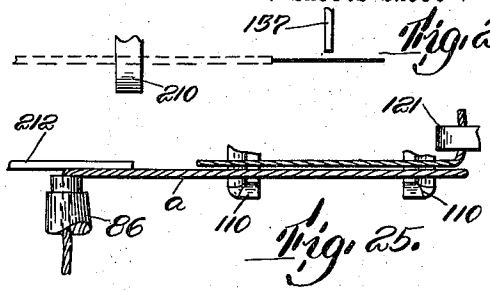


Fig. 26.

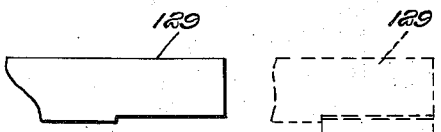


Fig. 27.

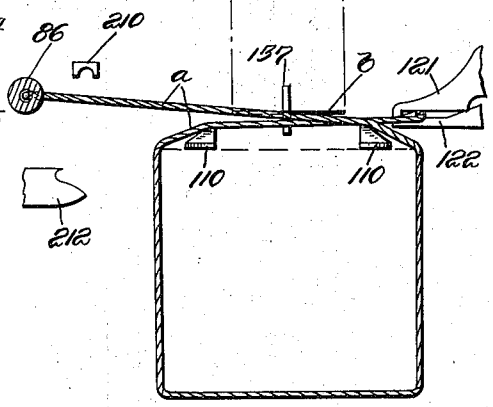


Fig. 28.

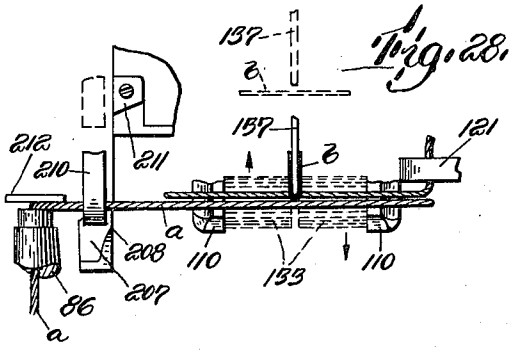
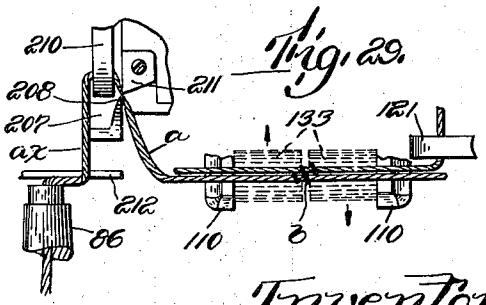


Fig. 29.



Inventor
W. M. Spry
by Wright Brown Quinby & May
Attys

Patented July 1, 1924. 1,499,703

UNITED STATES PATENT OFFICE.

WILLIAM M. SPRY, OF REVERE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO GEORGE BARNABY, OF REVERE, MASSACHUSETTS.

MACHINE FOR PACKAGING ARTICLES.

Application filed March 7, 1921. Serial No. 450,451.

To all whom it may concern:

Be it known that I, WILLIAM M. SPRY, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Machines for Packaging Articles, of which the following is a specification.

This invention relates to the production of bundles or packages of goods, such as cut soles or heel lifts, or other articles capable of being grouped and secured by a surrounding strand, such as string or wire.

It is customary for dealers in cut soles and the like to furnish them to the shoe factories in the form of bundles tied with string, the wrapping of the string and the making of the knot being performed manually. This not only involves considerable time for each bundle, but is very laborious if the string is to tightly hold the pile of articles, because the worker must, while holding the pile under compression, carry the string around the pile or group and tie a knot. By the time the worker has finished a not very great number of bundles, his or her fingers become sore from the cutting of the string thereinto.

One of the objects of my invention is to provide an improved method of packaging articles of the character described, which method dispenses with the necessity of tying a knot in the wrapping strand.

Another object is to provide an improved machine by which the method explained can be carried out automatically.

A further object is to provide a machine which will rapidly produce tightly bound packages of cut soles, or other articles, without requiring any manual labor, other than the placing of the predetermined number of articles in position, and the movement of a treadle or some equivalent to start the machine in operation.

With these and other objects in view, which objects will appear hereinafter, my invention consists in the method and in the machine substantially as hereinafter described and pointed out in the claims.

Of the accompanying drawings forming a part of this specification,—

Figures 1 and 2 are, respectively, front elevation and plan views of a complete machine embodying my invention.

Figure 2^a represents a detail section, on line 2^a—2^a of Figure 2, on a larger scale.

Figure 3 is an end elevation, on a larger scale, looking from the left of Figure 1.

Figure 4 is a rear elevation of a part of the machine, on the scale of Figure 3.

Figure 5 is a detail elevation, on a larger scale than Figure 1, showing the gearing by which the wire twisters are rotated, first in one direction and then reversed.

Figure 6 is a view looking up from below Figure 5.

Figure 7 is a view looking from the right of Figure 5.

Figure 8 is a perspective view of one of the wire twisters.

Figure 9 is a detail plan view of the presser foot and associated devices.

Figure 10 is an elevation from the right of Figure 9.

Figure 11 is a detail elevation of the string-end gripper jaws.

Figure 12 is a plan view of the same, and showing also the operating gearing.

Figure 13 is a detail perspective view, partly broken out, of the supply mechanism for the wires which secure the wrapping string.

Figure 14 is a detail sectional view, on line 14—14 of Figure 5.

Figure 15 is an end view of one of the wire twisters of Figure 5.

Figure 16 is a perspective view of a part of the wire supply mechanism.

Figure 17 is a detail elevation of the rear gripper.

Figures 18 and 19 are plan views of the rear gripper in two of its positions.

Figure 20 is a detail view of gearing which effects radial adjustment of the winder arm.

Figures 21 to 29, inclusive, are detail views to illustrate the operations of different parts of the machine.

Figures 30 and 31 are perspective views of two of the different shapes of bundles of articles which may be tied by the machine.

Figure 32 is a plan view of the gage plate, on a larger scale than in Figure 2.

The following preliminary reference to the operation of the machine will facilitate

an understanding of the invention in the particular embodiment illustrated in the accompanying drawings.

The machine normally has its parts in the relative positions shown in Figures 1 and 3. The articles to be packaged are placed on a table 62, and the machine is started, said machine having a main shaft which can rotate but once for each operation.

First, a presser moves toward the table and compresses the articles. Then a winder-arm 86 moves in the direction of the arrow (Figure 24) to carry the string *a* once around the package, and stops (Figure 22), this occurring during only a part of the rotation of the main shaft, and the string being under tension, which is retained until the string binder or fastening *b* is applied. A piece of wire is supplied to position, then doubled or bent to staple form (Figure 28), and then by a pair of twisters 133 (Figures 8 and 14) the two legs of the staple are bent in opposite directions and coiled tightly on the overlapping portions of the string (Figures 28 and 30). Jaws 121, 122, move from the positions shown in Figures 23, 27 and 29 (dotted in Figures 21 and 22) over to the position shown by full lines in Figures 21 and 22, and take hold of the string at $a^{\times}$. Cutting devices 208, 211 sever the string and the jaws 121, 122 traverse back to initial position (Figure 24), carrying the end of the string *a* ready for the next operation.

Referring to Figures 1 and 2, a suitable frame base 35 is provided with uprights 36, 38, having bearings at 37, 39, for a main driving shaft 40 having a pulley 41 adapted to be connected to, and disconnected from, the shaft by a suitable clutch mechanism, indicated as a whole at 42, but not necessary to illustrate in detail. The clutch may be of any preferred type, known as one revolution clutch, and is brought into action by a treadle (not shown) connected to the clutch-control rod 43 (Figure 1).

The driving shaft 40 carries a bevel pinion 44, meshing with a bevel pinion 45, carried by the lower end of a vertical shaft 46, mounted at its lower end in an arm 47 (Figure 4) of the standard 48 which rises from the base 35. Said shaft 46 transmits power to an upper shaft which carries six cams, hereinafter described. As the cam shaft, and all of the mechanisms which are actuated by the cams thereof, are vertically adjustable, to enable the machine to operate on various sizes of piles or bundles of articles, I will now describe the means for effecting the adjustments.

Located in a vertical channel or space in the upright 49 of the standard 48 is a screw 50, having a crank or hand-wheel 51 secured to its upper end. The screw is rotatable in a bearing 52 at the upper end of the upright 49, and a well-known form of flange and collar construction prevents the screw from having any vertical movement. Mounted to slide on gibs 53 of the upright 49 is a support or carrier 54 for the above-mentioned mechanisms, which are vertically adjustable. In the particular embodiment of the invention illustrated, said support or carrier is an irregular casting. For convenience of reference it is termed a super-frame. A portion of the super-frame (Figure 1) has a bolt 55 which passes through a slot in the upright 49, and carries a nut 56 (Figure 4) which is mounted on the screw 50. Rotation of the screw, by the crank or wheel 51, effects vertical adjustment of the super-frame and the various mechanisms carried thereby, because the screw itself can have no vertical movement.

A cam shaft 57 is mounted at one end in an arm 58 of the super-frame (Figures 2 and 4), and at the other end in the outer end of a bracket 59, and said shaft has a bevel pinion 60, meshing with and driven by a bevel pinion 61 on shaft 46. The pinion 61 is mounted in a bracket or arm of the super-frame, and is rotatable with, and slidable on the shaft 46, so that the cam shaft will be actuated regardless of the vertical position which it occupies when the super-frame is adjusted as to height.

The screw 50 is actuated only when the machine is to be adjusted according to the sizes of the packages to be done up. During the operation of the machine, the articles are automatically held under pressure between two members, which are hereinafter referred to as the table and a presser foot. Rotation of the screw 50 does not effect any clamping or compression of the articles, but serves to bring the table and presser foot into such proximity as will best suit the size of the package, and yet permit introduction of the articles to position before rotation of the main shaft 40, and removal of the tied package after said shaft has completed its rotation. The presser-foot, as will be explained, is carried by the super-frame, and moves down with it to proper preliminary position. At the same time, the table 62 (Figure 1) moves up. Therefore, the two members which are to later compress the package, and hold it during the tying operation, simultaneously approach, or recede from each other, when the screw 50 is actuated, thereby effecting a material saving of time when adjusting the machine for operation on a package, or a succession of packages, of a given height.

I will now explain the mechanism which effects the vertical adjustment of the table 62 in a direction opposite to that of the presser-foot (carried by the super-frame), and simultaneously therewith. Said table is supported by a rack 63 vertically movable

in a guide 64 (Figure 1). A small rod 65 depending from the super-frame, and having its lower end slidingly fitting a tubular guide 66, passes through a hole in the table and acts as a side gage for articles placed on the table. The rack 63 is engaged by a pinion 67, carried by a shaft 68, mounted in suitable bearings supported by the base 35. The rear end of the shaft 68 (Figures 2, 3, and 4) has a pinion 69 engaged by a vertical rack 70, which depends from, and is secured to, the super-frame, so that, when the super-frame (and its presser-foot yet to be described) moves down, the table moves up. This is due to the fact that the two racks 62 and 70, engage opposite sides of the pinions 67, 69, the latter being hidden in Figure 1 by the pinion 67.

The shaft 68 has a third pinion 71 through which, by mechanism presently described, the winder-arm is radially adjusted according to the size or height of the packages to be wrapped by the twine, said radial adjustment being effected simultaneously with the adjustment of the table and presser foot. The pinion 71 meshes with a rack 72, mounted to slide on the base, said rack being coupled at 73 to one end of a rod 74, slidably mounted in a bearing 75, and having at its other end an arm 76, the upper end of which is formed as a yoke 77.

Mounted in a bearing 78 at the upper end of the upright 36 (Figures 1 and 2) is a tubular shaft 79, having a gear 80 meshing with a gear 81 carried by a counter-shaft below the shaft 79. Said counter-shaft also carries a gear 82, meshing with a pinion 83 (Figure 3). Carried by the main shaft 40 is a gear sector 84, so proportioned and arranged at once during each rotation of the main shaft, the gearing just described will be actuated to impart one rotation to the tubular shaft, so that the winder-arm carried by the latter, as presently described, will carry the twine around the articles held between the table and presser foot. The reason for employing a gear sector is to effect complete rotation of the winder-arm, and leave it in a position of rest, or its starting position, while the main shaft is completing its one revolution to effect certain other operations yet to be described. Said arm is locked in its position of rest, as hereinafter described.

The inner end or head of the tubular shaft 79 carries the shank 85 of the winder-arm 86, which at its tip is formed as an eye through which the wrapping string *a* leads. The shank 85 is fitted to move longitudinally in a transvese guideway in the head of the tubular shaft to provide for radial adjustment of the winder-arm as a whole. Said shank has a rack portion 87 (Figures 3 and 20) engaged by one of a train of pinions 88 mounted in one side of the tubular shaft 79. In practice, a suitable strip covers said train. The train is actuated by a rack 89, mounted in a guideway in the shaft 79 (Figure 2ª), and connected by a pin 90 to a flanged collar 91 mounted to slide on the shaft 79. Said collar is engaged by the yoke 77. The arrangement of the gearing and other parts described, is such that when the crank or hand-wheel 51 is actuated to cause the table and presser foot to approach, or receed from each other the winder-arm is radially adjusted, through the gearing described, to effect proper wrapping of the string around the articles.

Within the tubular shaft and rotatable therewith is a tube 92, through which the thread *a*, from a suitable source of supply, leads to the winder-arm. The tube 92 extends through the shank of the winder-arm, which is formed with a slot 93 (Figure 3) for this purpose, and rigidly connected with its inner end is a face plate or disk 94, having a marginal recess 95 through which the winder-arm extends. Said disk serves two purposes: viz, its circular edge acts as a guard to prevent the arms or hands of an attendant from being struck by the arm 86 which, in operation, rotates very rapidly, and the face of the disk presents a wall against which a pile of articles placed on the table may be stacked up by the attendant.

The tube 92 can be shifted longitudinally to cause the disk 94 to be nearer to, or farther from, the table and presser foot, according to the length of the articles to be wrapped, as when the articles are such as shown in Figure 30 or Figure 31. Any suitable means may be employed for securing said tube 92 when adjusted, such as a screw 96 (Figure 1) tapped in the tubular shaft 79 and adapted to bind against the surface of the inner tube 92.

The thread *a*, on its way to the tube 92, and the winder-arm, passes over a small guide pulley 97 (Figures 1, 2 and 3) mounted in the upper end of a fixed bracket 98. A tension plate 99 is pivoted to the bracket at 100. The string *a* passes between the tension plate and bracket. A rod 101 passes through the plate 99, and has a nut 102, between which and the plate a spring 103 is confined. The inner end of the rod 101 is pivotally connected at 104, to one end of a lever 105, pivoted at 106, and having a roll 107, which is acted on by a cam 108, carried by the main shaft 40. The timing of operation of the cam is such as to exert a pull on the rod 101 and, through a spring 103, cause the tension plate to hold the thread firmly at a predetermined point of the operation of the machine, as hereinafter described.

The part of the machine referred to as the presser, consists of the flat under side

of a movable head carrying a plate 109 having horns 110. The head itself comprises a base portion 111 (Figure 1) which carries said plate 109 and the parts hereinafter described, and a top portion 112 (Figure 2). The projections or horns 110 of the plate 109 (Figures 9 and 21 to 24) are spaced apart to permit the introduction between them of the tip of the wire-carrying and twisting device to be described. The string is carred over the horns by the winder 86 (Figures 24, 27 and 28), the tips of the horns being preferably beveled as illustrated.

An important function of the horns 110 is to support the overlapping portions of the string correctly spaced above the top of the pile of articles, to permit of the operation of applying the wire fastener *b*, as hereinafter described.

The presser head is automatically moved and carries the pairs of jaws, a cutting mechanism, and a wire bender, all as hereinafter described.

The presser head includes a rib 115 fitting a vertical guideway in the upright 54ª (Figure 2). Said rib extends down (see Figure 1) and has a recess in which is a compression spring 116. A lever 117, pivoted at 118 to the adjustable frame 54, has a projection entering the said recess and bearing on the spring. The other end of the lever has a roll engaging a path cam in the side of cam disk 119 (Figure 2), carried by the shaft 57. The result of employing the spring 116 is that when the cam 119 lowers the presser-foot head, the pile of articles on the table is yieldingly compressed. It is so held during the ensuing operation of wrapping and securing the bundle.

With the exception of the reference to the operation of the presser, the description so far relates mainly to the mechanism which provides for adjusting the machine to do up packages of different sizes.

To enable the operator to quickly determine the extent to which the hand-wheel 51 should be operated to effect the proper adjustment for the work to be done, a gage or scale plate 120 (Figures 2 and 32) is mounted on the base 35. This plate is to be referred to by the operator in connection with certain scales borne by other parts of the machine, but as such gage and scales are not claimed herein, a description of their use will not be necessary.

It being now understood that the machine has been properly adjusted, and that a pile of articles has been placed on the table under the presser-foot, said pile nearly but not quite filling the space between the table and the presser-foot, the operator actuates the clutch mechanism so that the shaft 40 will make one turn. Before this is done the first time, however, the attendant, assuming that the machine has been threaded up as indicated in Figures 1 and 3, carries the end of the string from the eye of the winder-arm 86 over the horns 110, and across to the position shown in Figures 23 and 24 (which are, respectively, plan and front detail views), and engages the string between the jaws 121, 122.

After this first manual engagement of the string with the jaws, the latter act automatically, as will be explained, to ensure the proper location of the end of the string for each succeeding operation. Said jaws are reciprocated in a plane close above the horns 110, and are opened and closed at the proper times, by mechanism hereinafter described.

The parts shown in Figure 3 are in the positions which they occupy when the machine is idle and ready to start. The winder-arm and disk 94 are locked in the correct positions for starting by the following mechanism: Secured to one side of the pinion 83 is a plate 123, having a concave edge corresponding with the corner edge of a plate 124, secured to the wheel having the gear sector 84. The corner edge of the plate 124 presents a continuous smooth surface from one end of the sector 84 to the other, and in operation it leaves the concave edge of the plate 123 just as the gear sector engages the pinion 83, and it re-engages said plate 123 and arrests rotation of the pinion when the sector passes from the pinion. This, through the gearing before explained, effects rotation of the winder-arm during about one-third of the operation of the main shaft, and locks the winder-arm at the end of one rotation, and holds it locked during the balance of the rotation of the main shaft, during which time the string, which has been carried around the articles by the winder-arm, is having its overlapped ends bound together, and the string then cut.

I will now describe the method and means for binding the overlapped portions of the string, as shown in Figures 30 and 31.

Secured to the super-frame 54 is a hopper 125 (Figures 1, 2 and 13) for short lengths of wire *b*. For each operation of the machine, one of these wires is transferred to position to be first bent to the form of a staple (Figures 14 and 28), and then twisted around the string ends (Figures 29 and 30). A vertically movable wire selector 126 is mounted in a guideway in the hopper, and has a narrow pocket in its upper edge (Figures 13 and 16). The selector is normally urged upwardly by a spring 127, and has an upwardly extending arm 128. The pocket is preferably made deep enough to contain several wires to avoid liability of the selector rising with its pocket empty.

A reciprocating pusher 129 (Figure 13) transfers a single wire from the top of the

selector 126, through an aperture 130, into a pocket 131 (Figures 5, 6, and 14) in the lower end of a twister head 132, which is vertically operated by mechanism presently described, to present its lower end or tip at the proper time between the horns of the presser-foot and in position to receive said wire.

The lower end or tip of the twister head is formed to bestride the lapped string-ends when said head is in its lower position. Mounted to rotate in opposite directions in the tip of said head are two twisters 133 (Figures 6, 8, 14, 15, 28 and 29). Said twisters are mounted end to end, with a slight space between them, and in the inner end of each is a recess or notch 134. When in normal position the notches of the two twisters are directly opposite each other, and they are in such position that their mouths 135 bestride the string *a* (Figure 15).

The tip of the twister head has a transverse slit 136, which intersects the mid-length of the wire pocket 131, and communicates with the notches 134 of the twisters. A bender blade 137 is moved through the slit 136, from the position indicated by dotted lines in Figure 28, to the position shown by full lines in that figure, and in doing so doubles the wire to staple form, and pushes it over the lapped string-ends (Figure 15) with one leg of the staple in the notch 134 of one twister (Figure 14), and the other leg in the notch 134 of the other twister.

The twisters are externally toothed, and they are rotated in opposite directions, so as to cause the walls of their notches to act on the legs of the staple, to convert said staple into a coil tightly drawn or rolled around the lapped string-ends. Mounted in the twister head is a short shaft 138 (Figures 5 and 7), having two pinions 139, 140. The pinion 139 is engaged by an actuating toothed sector 141, pivotally connected at 142 to the enlarged upper portion 132^a of the twister head, said portion being flanged to act as a guard for the oscillating sector. The pinion 139 also engages the upper member of a gear train 143, which transmits motion to one of the pair of twisters 133, while the pinion 140 transmits motion through another gear train 144 to the other twister. The two trains 143, 144, as will be clear in Figure 5, act to transmit motion to the two twisters in opposite directions.

The twister head has a block-shaped portion 132^b, which is guided and actuated as presently described, to cause the entire head 132, 132^a, 132^b to move vertically at proper times. In order that changes in the vertical position of the twister head will not affect the connections for oscillating the sector 141, the following provisions are made: Fitting a horizontal guideway 145 in the head portions 132^a, 132^b is a slide 146. A link 147 is pivotally connected at 148, 149, to the slide and sector respectively. The slide 146 has a vertical recess 150, which receives a vertical arm or rib 151 of a horizontal slide 152 (Figure 1) mounted in a guide in the superframe, and connected by a link 153 with a lever 154 pivotally supported at 155 (Figure 4). At an intermediate point the lever has a roll engaged with a path cam in a disk 156 (Figure 2) carried by the cam shaft 57.

It will now be understood that owing to the engagement of the vertical rib 151 with the recess 150 in the slide 146, oscillations of the sector 141 will not be affected by changes in the vertical position of the twister head.

Projecting from the twister head 132 (Figures 3 and 7) is an arm 157, having a screw 158 adapted, when the head moves down, to act on the arm 128 of the wire selector 126 (Figure 16), and push the selector down to charge it with one or more wires *b* (Figure 13). When the head rises again, the spring 127 lifts the selector.

The portion 132 of the twister head (Figures 2 and 7) has a vertical rib 159, fitting a vertical guideway in the upright 54^a, said rib 159 being above the rib 115 of the presser head hereinbefore described. Pivoted to the back of the rib 159, at 162 (Figure 4) is the upper end of a link 163, having a recess 164 in its lower end. A compression spring 165 is located in said recess. Bearing on the spring is a pin or block carried by one end of a lever 166, pivoted in alinement with the pivot of lever 117, and having a pin or roll engaged by a path cam in the side of a disk 167, carried by the cam shaft 57. The object of the spring 165 is to avoid risk of damage to the upper article, or the presser-foot horns when the tip or lower end of the twister head temporarily extends down between the horns of the presser-foot, and contacts with the upper article of the pile.

The jaws 121, 122, as hereinbefore stated, grip the string when the machine is first started. They are then in the position shown in Figure 24. As will now be described, they afterward move across the presser horns 110 to take hold of the string after it has been cut. The portion of string so gripped by the jaws is indicated at a^x in Figures 21, 22, 23 and 29, and the jaws then travel back to the position shown in Figure 24 for the next operation. Hence, to distinguish from other jaws yet to be described, the jaws 121, 122 are referred to as traversing jaws.

The jaw 122 is fixed to a bracket 168 having a rack-bar 169 (Figures 11, 12), slidable in ways 170 (Figure 1), formed in the top 112 of the presser head. The rack 169 meshes with a pinion 171 (Figure 12), carried by a shaft 172 (see also Figure 2), which shaft is mounted in the head 111, 112,

and carries a smaller pinion 173, meshing with a rack 174, slidable in ways in said head. The rack 174 has a head 175 (Figures 1 and 2), in which is a vertical recess, fitting a vertical rib 176 at the inner end of a horizontal slide 177 fitted to ways in a portion of the super-frame 54. The slide 177 is connected by a link 178 to the upper end of a lever 179, pivoted at 180, and having a roll engaged in a path cam in the side of a disk 181, carried by the shaft 57. The mechanism described, including the vertical rib 176, results in the cam 181 actuating the rack 174, no matter what may be the vertical position of the presser head. The rack 174 transmits reciprocating motion to the bracket 168 (Figures 11 and 12) and traverses the jaws 121, 122.

As stated, the jaw 122 is fixed relatively to the bracket 168. The jaw 121 is pivoted to the bracket at 182, and has a downwardly projecting lug 183, and its rear is formed with a notch 184 (Figure 22) and an inclined edge 185. A plunger 186 mounted in the bracket 168 has a roll 187, and is projected by a spring 188, said plunger serving to hold the jaw 121 open when the roll is in the notch 184, and to hold the jaw tightly closed toward jaw 122 when the roll is bearing against the inclined edge 185. Cooperating with the lug 183 are suitable stop or bunter devices, such as indicated by dotted lines at 189 in Figure 11, to effect opening and closing of the jaw 121 at the proper times.

During the packaging operation the presser head remains in position, with the horns 110 under the string. At the end of that operation the presser head is shifted far enough to withdraw the horns, or, in other words, to shed the string. This does not result in such slackness in the string as to leave the package loosely secured, because during the packaging operation, the group of articles has been under such pressure, and the string under such tension that the letting of the string down on top of the package by the withdrawal of the horns, does not permit such slackness of the string as to loosen its binding effect. The means for reciprocating the presser head consist of a cam path in one side of the disk 195 (Figure 2), carried by shaft 57, said cam path receiving a roll carried by a lever 196, which is connected by a link 197 to a slide 198. Said slide is mounted in ways provided in the super-frame 54, and at its other end has a vertical rib 199, engaging a recess in a lug of the presser head. The provision of the vertical rib 199 in the said recess is to ensure the reciprocations of the presser head by the cam 195, regardless of its vertical position.

Mounted on the base portion 111 of the presser head is a forked slide 200 (Figure 1) which carries the wire bender 137 previously described. Said slide also carries a knife member and a pair of displacing jaws, presently described. Said slide has a recessed lug 201 (Figure 2) engaging a vertical rib 202 of a slide 203, connected by a link 204, with a lever 205, having a roll engaging a cam path in the side of a disk 206, carried by the shaft 57. The provision of the vertical rib 202 in the recess of the slide 200 is to ensure reciprocation of the slide and the parts carried thereby, by the cam 206, regardless of the vertical position of said slide.

A portion of the slide 200 is shown in each of Figures 9, 10 and 17, and fixed thereto is a hook-shaped finger having a horizontal portion 207, which acts as a stationary jaw, and an inclined portion sharpened to present a knife edge 208. A stationery knife member 211 cooperates with the knife 208 (Figures 19 and 29) in severing the thread when the slide 200 moves back.

Pivoted at 209 is a jaw 210 (Figure 17) to cooperate with jaw 207. It is opened and closed by means practically the same as already described in connection with the traversing jaws 121, 122 in Figure 11. The jaws 207, 210, are termed displacing jaws, because they serve not only to grip the thread and carry it back (Figure 29) until it is severed, but also hold the end displaced so that the portion of the thread indicated at a^x can be taken hold of by the traversing jaws 121, 122, for the next operation.

It is desirable that the portion a^x of the thread shall occupy a quite accurate position to be grasped by the traversing jaws. To effect this I provide a slide 212. Its top portion is shown in Figures 27 and 29. The shape thereof is also indicated by dotted lines in Figure 3. It moves from a retracted position (Figure 27) to operative position (Figures 3 and 29), so that its notch will locate the displaced portion a^x of the thread properly. Said slide is retracted by a lever 213 pivoted at 214 (Figure 3) and having a roll at its upper end engaged by an edge cam 215 attached to the twister head. A spring 216 is engaged with the lever to cause its roll to remain in engagement with the cam as the twister head descends. When the twisted head rises, as a packaging operation is finished, the locating slide moves to the position indicated in Figures 3 and 29, so as to hold the thread properly to be gripped by the jaws 121, 122.

The mechanism which actuates the pusher 129 (Figure 13) to transfer a piece of wire b from the selector 126 into the pocket 131 (Figure 14) is as follows: Said pusher is secured to a slide bar 217 (Figures 2 and 3)

mounted in the upper one of two parallel horizontal ways 218, 219, provided in a portion of the super-frame 54. Secured to or integral with the rear end of slide 217 is a vertical bar 220, having upper and lower ears 221, 222, fitted to slide in the ways 218, 219 (Figure 4). The outer faces of the vertical bar 220 has a guide way 223 for a block slide 224 (Figures 2 and 3). Pivoted to the block slide is the upper end of an elbow lever 225, pivotally supported at 226, and having a roll engaging a cam groove 227, in one face of a disk 228 carried by the shaft 40. Owing to the mechanism including the block sliding in the vertical guide-way of the bar 220, the action of the cam in reciprocating the pusher 129 is not affected by the changes occurring in the vertical position of the super-frame in which said pusher is mounted.

It is to be understood that by the term "string" employed herein, I do not mean to limit myself to the particular strand material commercially known by that name, although I consider it preferable. Any kind of strand material which will serve the purpose described, is intended to be included by the term employed.

The operation of the machine as a whole is as follows:

The table 62 and the disk or face plate 94 are first adjusted to the positions required by the dimensions of the bundle to be tied, these adjustments being effected by operating the hand-wheel 51, as hereinbefore described.

Before operating the machine the end of the string is moved across the space above the bundle and engaged with the traversing jaws 120, 121 of the thread end carrier, which is now in its retracted position.

The driving shaft is then started on its one revolution.

The presser, which was left at the end of the preceding operation in its extreme upward position, then moves down and bears on the top article with yielding pressure.

While the presser is descending, the wire pusher 129 (Figure 13) moves forward and deposits a wire in the pocket 131 (Figure 14), the deposited wire lying in position to be bent into staple form. The wire pusher immediately moves backward.

The winder arm then commences its revolution, the interrupted gear 84, which revolves the arm, commencing to act after the presser-foot is seated on the bundle. The winder-arm carries a wrap of the string from the now stationary jaws 121, 122 (Figure 24) around the bundle and across the horns, 110, fixed to and projecting from the presser, said winder-arm then stopping in its starting position. When the winder-arm has made about half of its revolution (more or less), the tension plate 99 (Figure 2) operates to put the thread under suitable tension while it is being carried by the winder-arm across the horns. The tension remains on during the winding operation and the string fastening operation to ensure tautness of the string around the completed package.

When the winder-arm stops the twister head 132 descends and brings the opening or pocket of its lower gear immediately over the string on and between the horns of the presser-foot, the opening bestriding the string. In its downward movement an arm 157 on the twister head contacts with arm 128 on the wire selector and pushes the separator down through the magazine to be charged with wires.

The wire bender 137 is then projected and bends the wire into staple or U form, and places the same in the twisting gears 133, one leg in the notch of each gear. The gears subsequently turn in opposite directions and oppositely twist the wire so tightly around the overlapping portions of the string as to press into or indent the string in a plurality of places due to the coil.

At the same time that the wire is bent and placed, the string grippers 207, 210, associated with the string cutters, grip the string close to the winder-arm (Figure 28) and hold it while the twisting gears are twisting the wire around the string portions between the two pairs of jaws. The movable knife moves to cut the string, and the grippers 207, 210 still hold the string and recede with the knife.

The twister gears turn back to their normal position, and the presser slightly rises and moves laterally to withdraw its horns from under the thread, the thread being confined against movement with the horns by the lip of the twister head acting as a shedder for the thread while the horns are receding.

The described partial movement of the presser-foot is accompanied by an opening of the jaw 210, to release the end of the string now to be gripped by the jaws 121, 122, for the next operation.

The twister head now rises to its upper position, and while it is rising the cam plate 215 on the back of the head (Figure 3) acts on lever 213 and causes the latter to push forward the thread-placing slide 212 which cooperates with the rear gripping jaws which still hold the thread, in holding a portion of the thread taut in the path of the jaws 121, 122, and at right angles to said path.

The jaws 121, 122 now open and advance, and grasp the string, the upper jaw being closed upon the thread by contact of its lug 183 with the fixed stop 189.

Just before the jaws 121, 122 recede and draw the string from the looper arm for the next wrapping, the jaw 210 releases the thread.

I claim:

1. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, means for wrapping string around the group and overlapping portions of the string under tension while the articles are under pressure, and means for applying a fastening to the overlapped portions of the string while the latter is under tension.

2. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, means for wrapping string around the group and overlapping portions of the string under tension while the articles are under pressure, and means for coiling a metal fastener tightly around the overlapped portions of the string while the latter is under tension.

3. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, means for adjusting said members to accommodate groups of various sizes, means for wrapping string around the group and overlapping portions of the string under tension while the articles are under pressure, and means for applying a fastening to the overlapped portions of the string while the latter is under tension.

4. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, a third member in a plane perpendicular to the plane of the two compressing members and in position to present a gage for the ends of the group of articles, and means for wrapping a string around the group and fastening it.

5. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, a third member in a plane perpendicular to the plane of the two compressing members and in position to present a gage for the ends of the group of articles, means for wrapping string tightly around the group while the articles are under pressure, and means for applying a fastening to the string to secure it in article-confining condition.

6. A packaging machine having two members provided with surfaces for engaging opposite sides of a group of articles, one of said members being movable relatively to the other, to compress a group of articles between said surfaces, means for wrapping string around the group while the articles are under pressure, and means for applying a fastening to the string to secure it in article-confining condition.

7. In a packaging machine, a table for supporting a group of articles thereon, a presser for tightly confining the articles between it and said table, means for applying a band to the articles while confined, and means for applying a fastening to the band.

8. A packaging machine comprising means for imparting an orbital path of movement to strand material, a table for supporting articles with portions thereof within said path, a presser movable toward and from said table, and means movable in a path at an angle to the strand to apply a fastener to the strand material.

9. In a packaging machine, a table for supporting a group of articles thereon, a presser for tightly confining the articles between it and said table, means for applying a band to the articles while confined, means for applying a fastening to the band, and means for cutting the band after the application of the fastening.

10. In a packing machine, a support for a group of articles, a presser, means for simultaneously adjusting both the support and presser to vary the space between them, means independent of the adjusting means for causing the presser to confine the articles between it and the support, and means for applying binding material to the group while confined.

11. In a packaging machine, a support for a group of articles, a presser for confining a group between it and the support, a winding arm for carrying a thread around the confined group, and means for simultaneously adjusting the radial length of the winding arm and the distance between the support and presser.

12. In a packaging machine, a support for a group of articles, a presser, means for simultaneously adjusting both the support and presser to vary the space between them, means independent of the adjusting means for causing the presser to confine the articles between it and the support, a thread-carrying arm movable around the confined group, and means for simultaneously adjusting the said arm radially when the support and presser are adjusted.

13. In a packaging machine, a support and a presser for confining a group of articles between them said support and presser having parallel acting surfaces, a rotary thread-guiding member movable in a path around

the confined group, thread-gripping and cutting mechanism adjacent the presser, and means for applying fastener material to the thread supplied by said rotary member.

14. In a packaging machine, a support for a group of articles, a vertically adjustable super-frame, a presser and thread-gripping and cutting devices movably mounted on said super-frame, means for simultaneously lowering the super-frame and raising the support, and means for wrapping strand material around a group held between the support and presser.

15. A machine of the character described, having means for gripping articles to be packaged, a shaft having a transverse guideway, a thread-guiding arm mounted in said guideway, and means for rotating said shaft and arm to carry thread around the articles.

16. A machine of the character described, having means for gripping articles to be packaged, a shaft having a transverse guideway, a thread-guiding arm mounted in said guideway, and radially adjustable therein, and means for rotating said shaft and arm to carry thread around the articles.

17. In a machine having upper and lower flat-surfaced members for grasping a pile of superposed articles, means for wrapping a length of string around such pile of articles, with portions of the string overlapping each other, means for coiling a piece of wire tightly around the overlapping string portions.

18. In a machine having means for wrapping a length of string around a group of articles, with portions of the string overlapping each other, means for coiling a piece of wire tightly around the overlapping string portions, said means comprising a pair of rotatably mounted members having notched ends facing each other, and means for oppositely rotating said members.

19. A packaging machine having two oppositely facing members, one of which is movable relatively to the other, to grasp a group of articles between them, a string winder movable entirely around the group in one direction, a string-end carrier movable in the opposite direction to cause portions of the string to overlap, and means for applying a fastening to the said overlapped portions.

20. A packaging machine having two oppositely facing members, one of which is movable relatively to the other, to grasp a group of articles between them, a string winder movable entirely around the group in one direction, a string-end carrier movable in the opposite direction to cause portions of the string to overlap, means for applying a fastening to the said overlapped portions, and means for holding the string under tension until the fastening is applied.

21. A packaging machine having holding mechanism for a group of articles, a string-carrier movable around the group, a reciprocating string gripper for holding an end of the string, means for applying a fastening to the string, and a cutter for severing the string.

22. A packaging machine having holding mechanism for a group of articles, a string-carrier movable around the group, a reciprocating string gripper for holding an end of the string, means for applying a fastening to the string, a cutter for severing the string, and string-deflecting mechanism for holding the string in position for the reciprocating gripper to engage it.

23. A packaging machine having a table and a presser for articles, means for simultaneously adjusting them toward each other, a string carrier movable around articles held between the table and presser, and means for applying a fastener to the string.

24. A packaging machine having a table and a presser, and an abutting wall for articles between the table and presser, means for simultaneously adjusting the table and presser and abutting wall, and means for applying a confining element to the articles.

25. A machine of the character described, having flat-surfaced gripping members for stationarily holding a pile of superposed flat articles, and means for packaging said articles, said means including a rotary hollow shaft having a radially adjustable arm provided with a string guide.

26. A packaging machine having a table and a presser, and a rotary abutting wall for articles on said table, a guide rotatable with said wall to carry string around articles between said table and presser, and means for applying a fastener to the string.

27. A packaging machine having a table and a presser, and a rotary abutting wall for articles on said table, a guide rotatable with said wall to carry string around articles between said table and presser, and means for applying a fastener to the string, said abutting wall having a circular periphery to act as a guard for said rotatable guide.

28. A packaging machine having a table for articles, a presser having a pair of horns, means for wrapping string around the articles and over said horns, and means for applying a fastener to the string supported by said horns.

29. A packaging machine having a table for articles, a presser having a pair of horns, means for wrapping string around the articles and over said horns, and means for coiling a piece of wire around the string supported by said horns.

30. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the

string, means for holding said overlapping portions with an open space between them and the bundle, and rotary wire-coiling means for enclosing said overlapping portions in a binder.

31. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, and a rotary wire-coiling mechanism movable toward and from said overlapping portions and including means for enclosing the string in a coil of wire.

32. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, and a rotary wire-coiling mechanism movable toward and from said overlapping portions and having a mouth to receive said portions, means being provided to coil a piece of wire around said portion.

33. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, and means for applying a fastening to said portions, said fastener-applying means including a bender to double a piece of wire to staple form, and twisters to turn the legs of the staple in opposite directions around the string.

34. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, and means for applying a fastening to said portions, said fastener-applying means including a bender to double a piece of wire to staple form, and oppositely rotatable twisters in alinement and having recessed portions to engage the legs of the staple and coil them in opposite directions around the string.

35. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a frame having a pocket, means for locating a piece of wire in the pocket, a bender movable transversely of the pocket to convert the wire into the form of a staple, and means for wrapping the wire staple around the overlapped string.

36. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a frame having a pocket, means for locating a piece of wire in the pocket, a pair of twisters adjacent the pocket, and a bender movable across the pocket to convert the wire into the form of a staple and transfer it to the twisters.

37. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a pair of string-gripping devices for holding the string at two separated points, and rotary wire-coiling means for applying a fastener to the overlapped string at a point between the two string-gripping devices.

38. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a pair of string-gripping devices for holding the string at two separated points, one of said devices being movable in a direction parallel with the string, and the other being movable in a direction at an angle thereto, and means for applying a fastener to the overlapped string at a point between the string-gripping devices.

39. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a pair of string-gripping devices for holding the string at two separated points, one of said devices being movable in a direction parallel with the string, and the other having a cutting member operatively connected with it and movable in a direction at an angle to the string, and rotary wire-coiling means for applying a fastener to the overlapped string between the two gripping devices.

40. A packaging machine having a base frame, and means supported thereby for wrapping string around a bundle of articles, a super-frame vertically movable relatively to the base frame, and string-gripping members and fastener-applying mechanism carried by said super-frame.

41. A packaging machine having a base frame, and means supported thereby for wrapping string around a bundle of articles, a super-frame vertically movable relatively to the base frame, and string-gripping members, fastener-applying mechanism and string-severing devices carried by said super-frame.

42. A packaging machine having means for wrapping string around a bundle of articles and overlapping portions of the string, a pair of string-gripping devices for holding the string at the separated points, one of said devices being movable parallel with the string, and the other being movable transversely thereof, a pair of spaced string supports below the plane of operation of said gripping devices, and means for applying a fastener to the string between said supports.

43. A packaging machine having means for wrapping string around a bundle of articles, a gripping device movable from one position to another to carry an end portion of string to operative position, means for deflecting another portion of string and holding it for the gripping device to engage it, and means for correctly locating the position of the deflected portions of the string.

44. A packaging machine having means for wrapping string around a bundle of articles, a gripping device movable from one position to another to carry an end portion of string to operative postion, means for deflecting another portion of string and holding it for the gripping device to engage it, and means for correctly locating the position of the deflected portions of the string, said locating means comprising a notched slide and means for reciprocating it.

In testimony whereof I have affixed my signature.

WILLIAM M. SPRY.