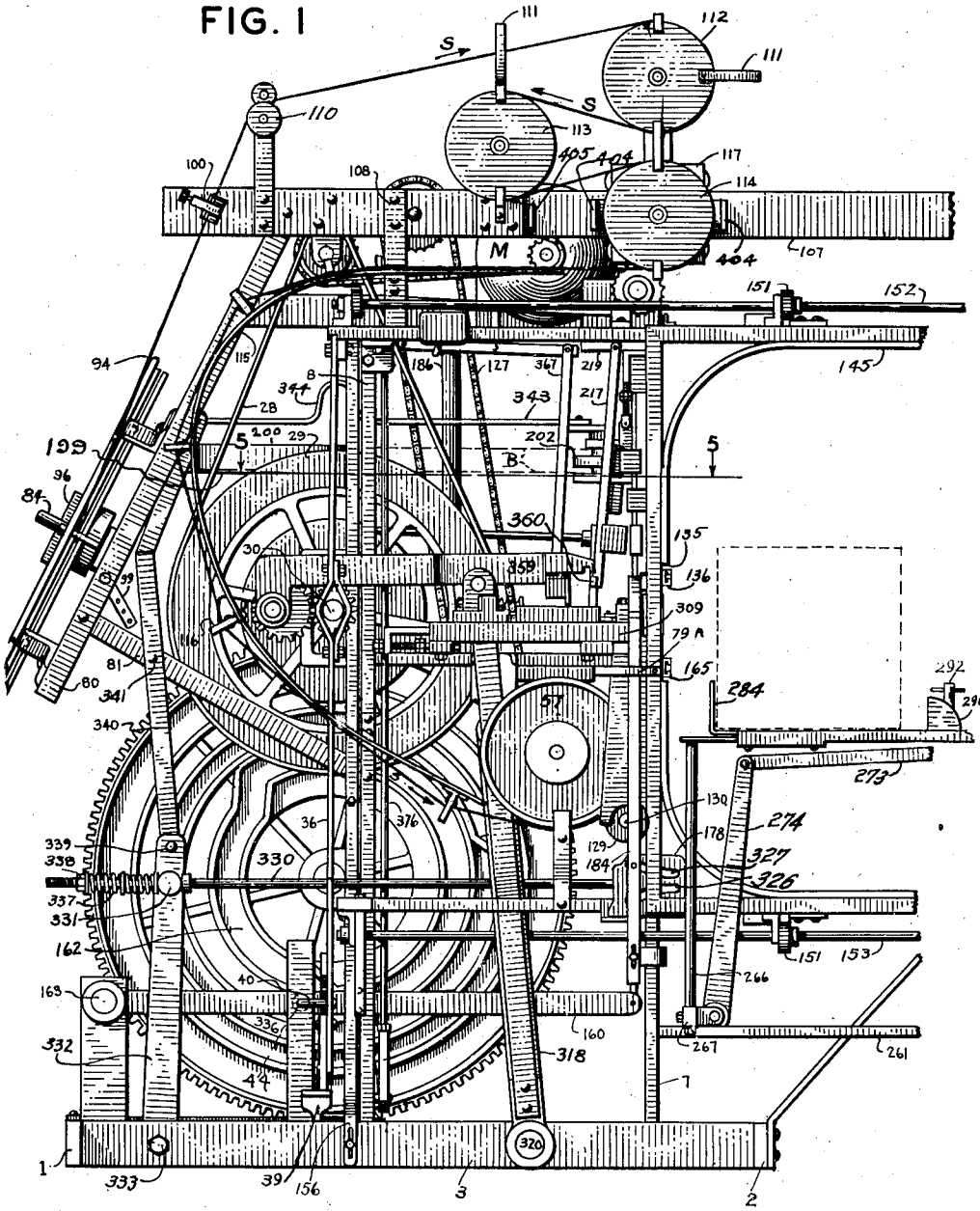
Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

Filed July 27, 1931 21 Sheets-Sheet 1

FIG. 1



INVENTOR

William Edgar Thos Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 2

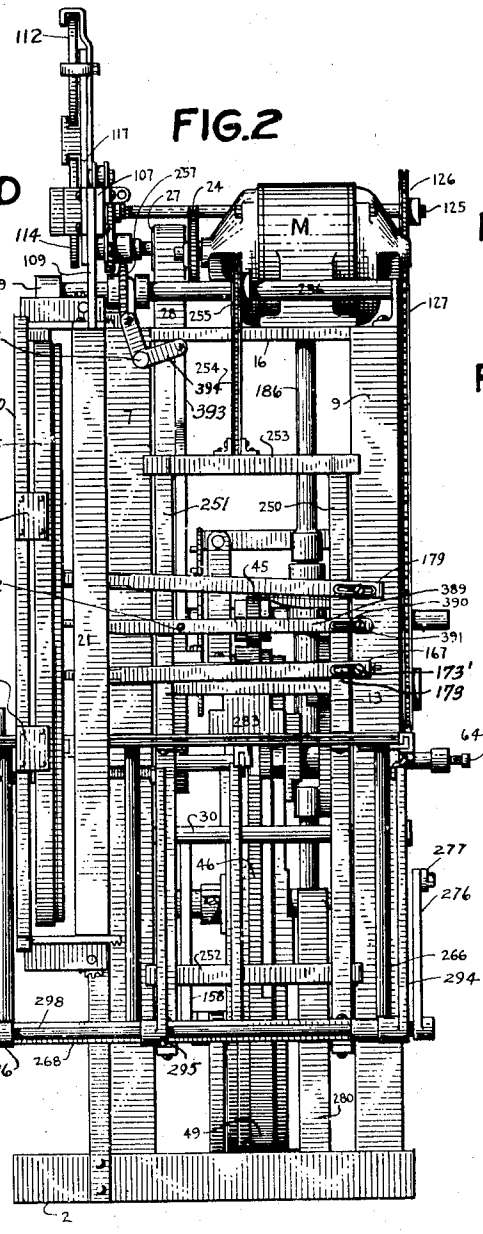


FIG. 2C



FIG. 2D



FIG. 2B



FIG. 2A

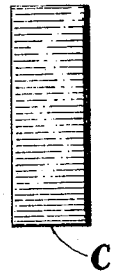
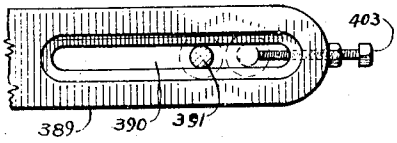


FIG. 2E



INVENTOR

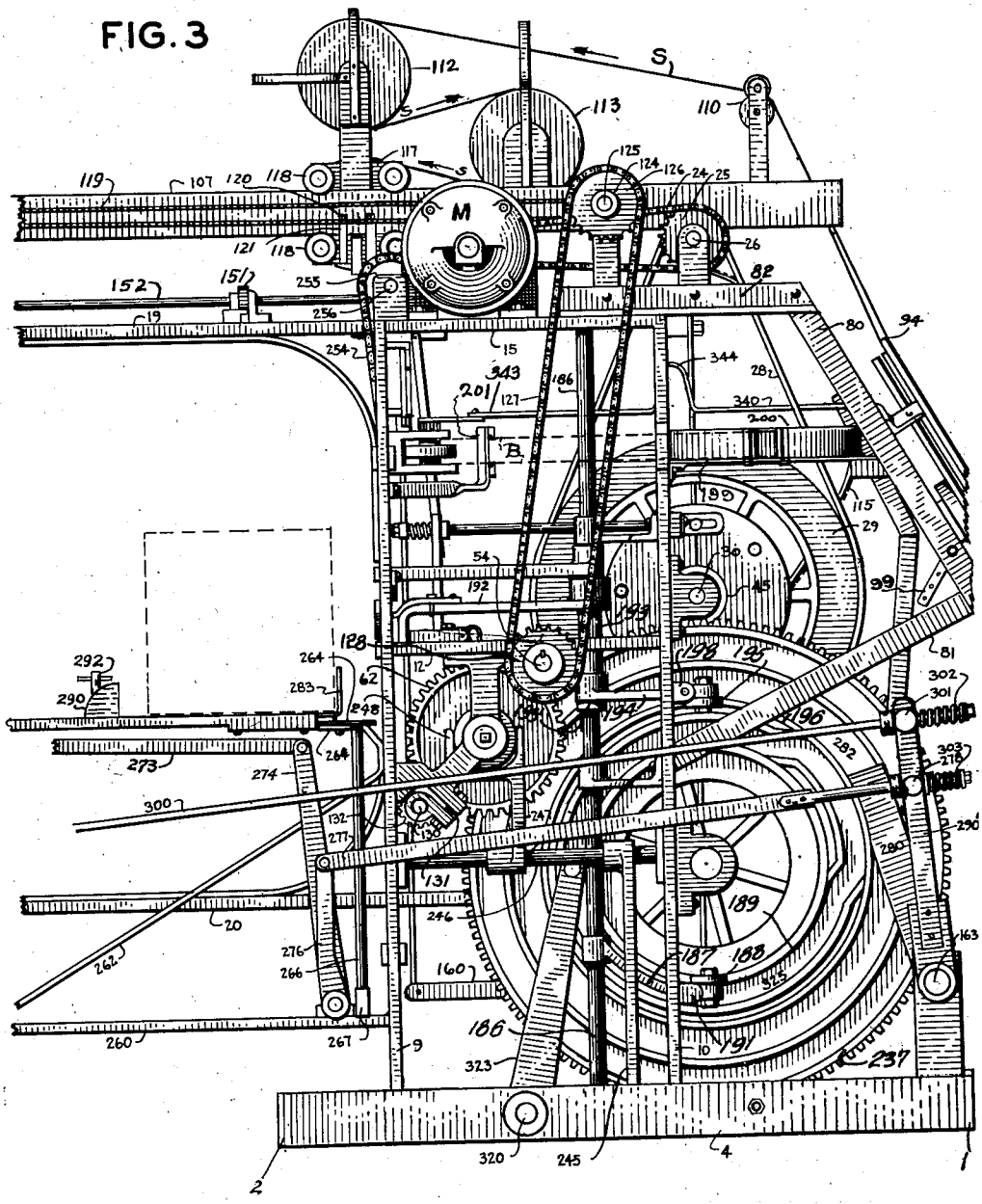
William Edwin Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

Filed July 27, 1931 21 Sheets-Sheet 3

FIG. 3



INVENTOR

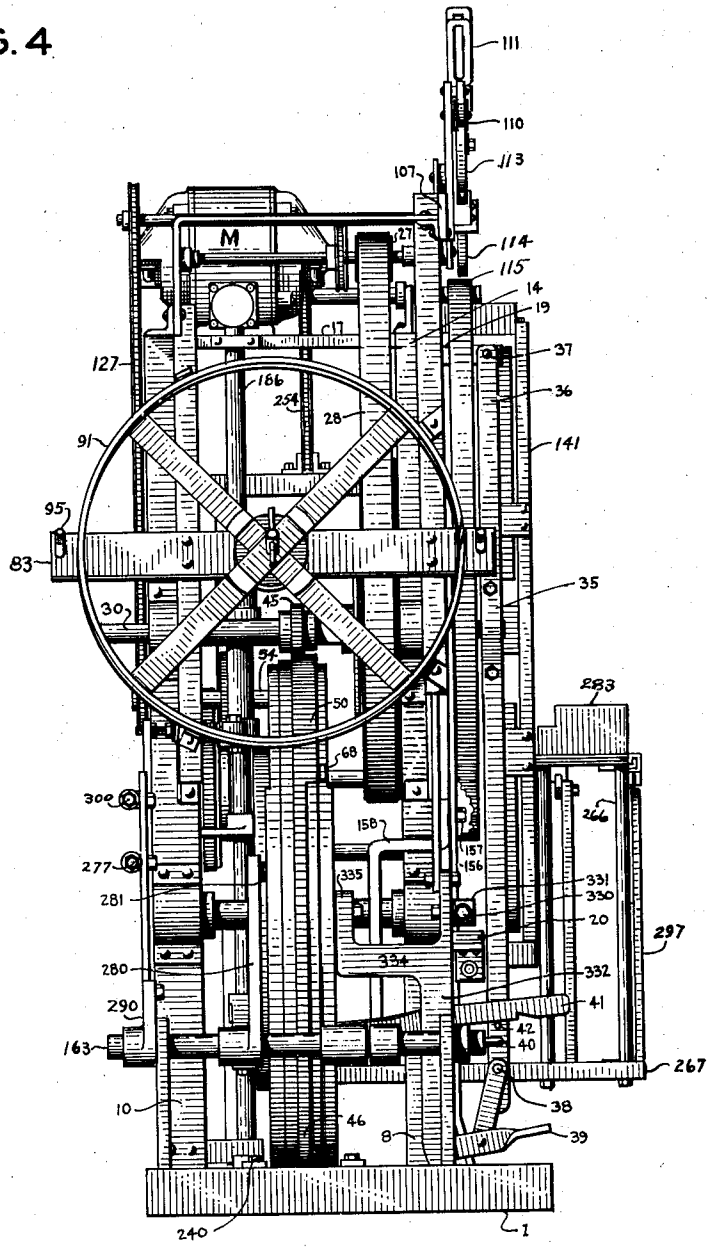
William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 4



INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 5

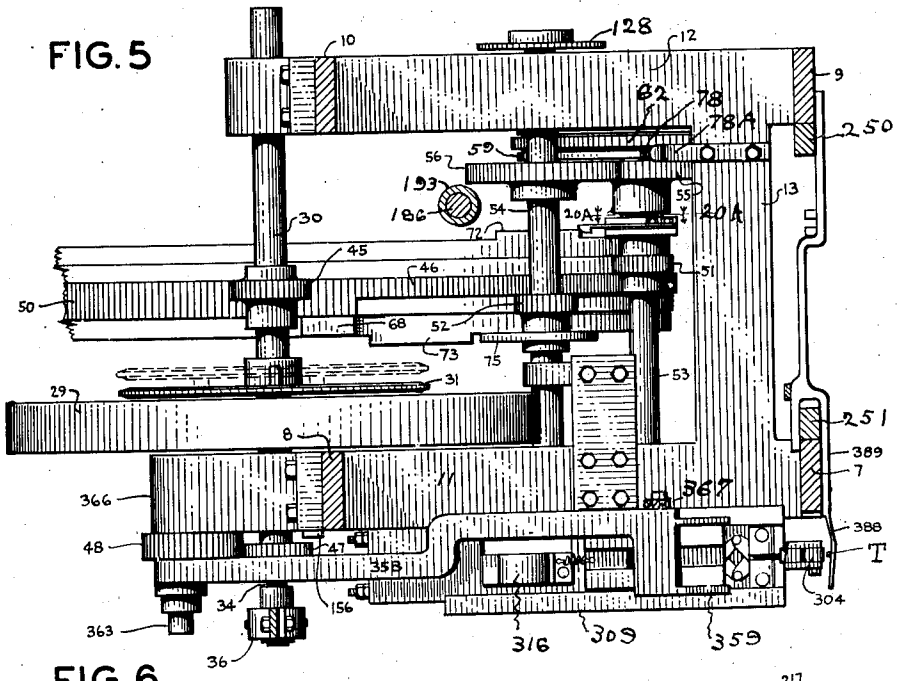
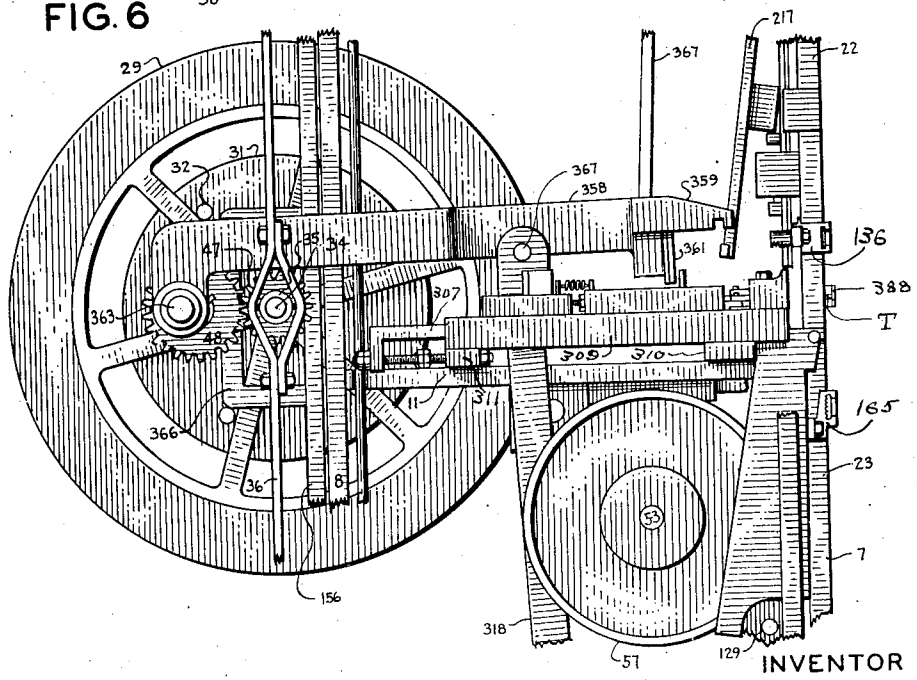


FIG. 6



INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 7

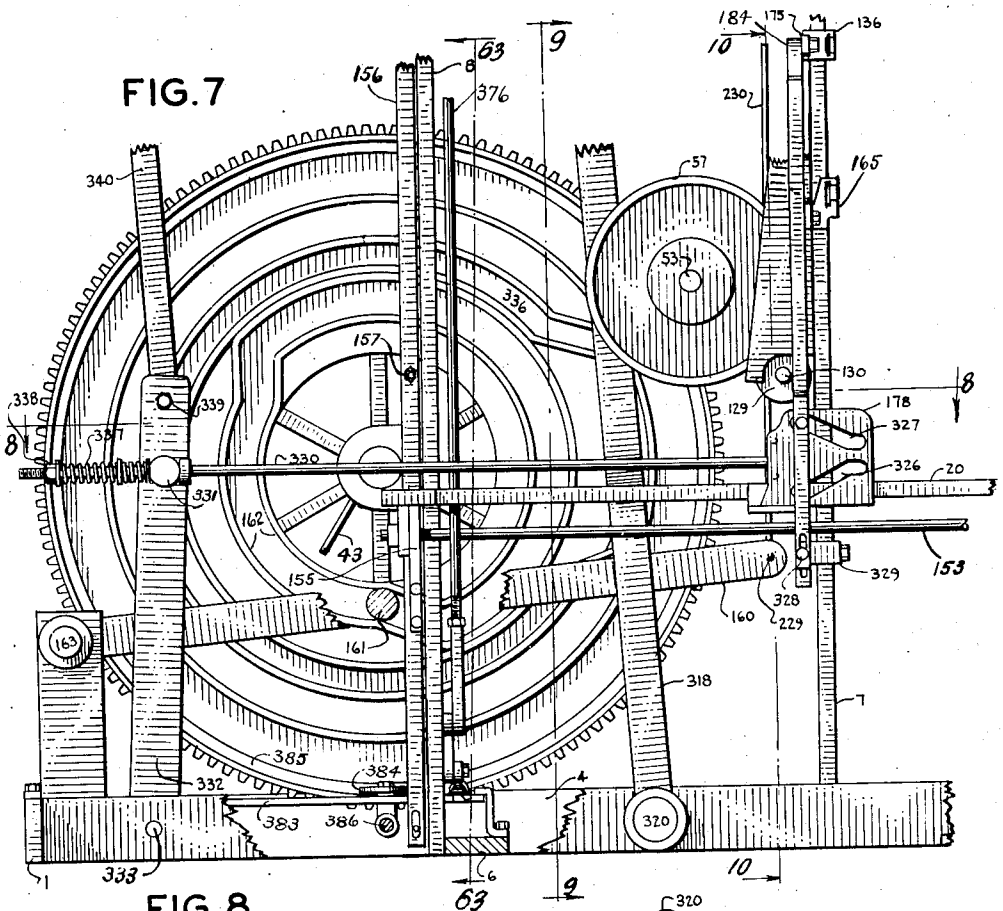
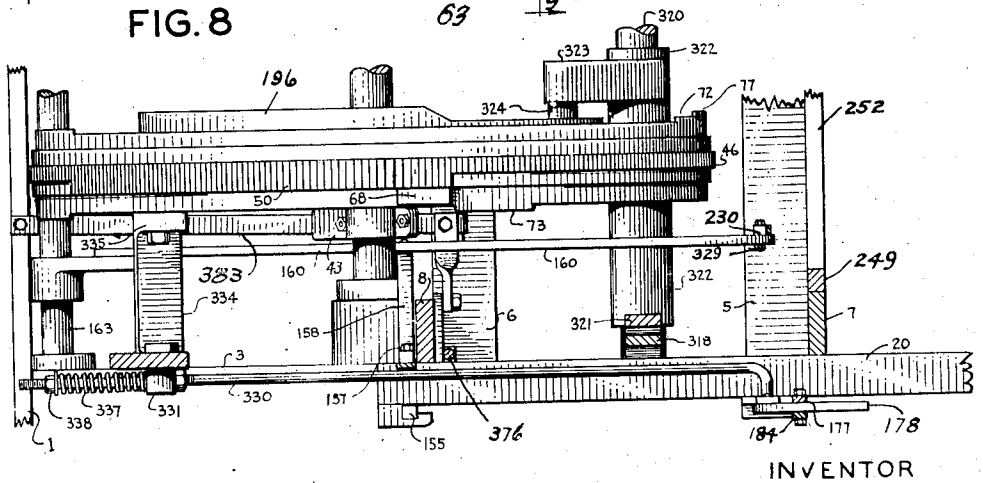


FIG. 8



INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 9

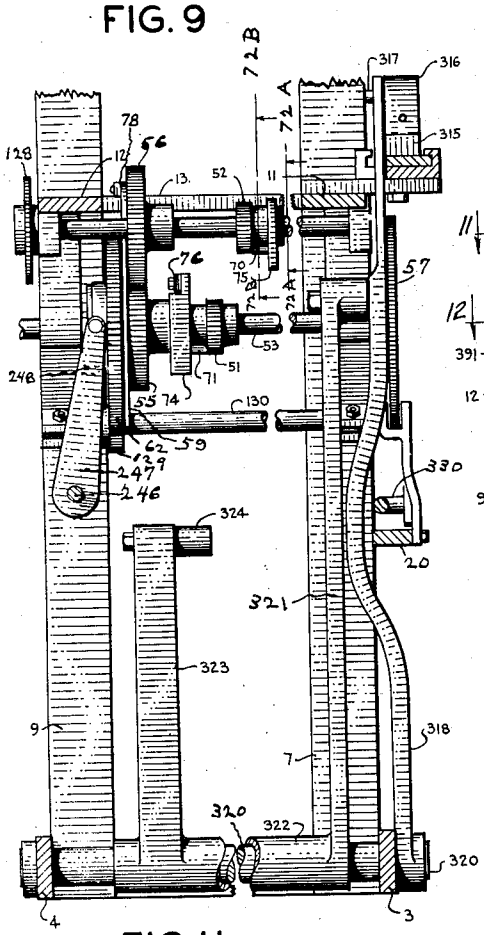


FIG. 10

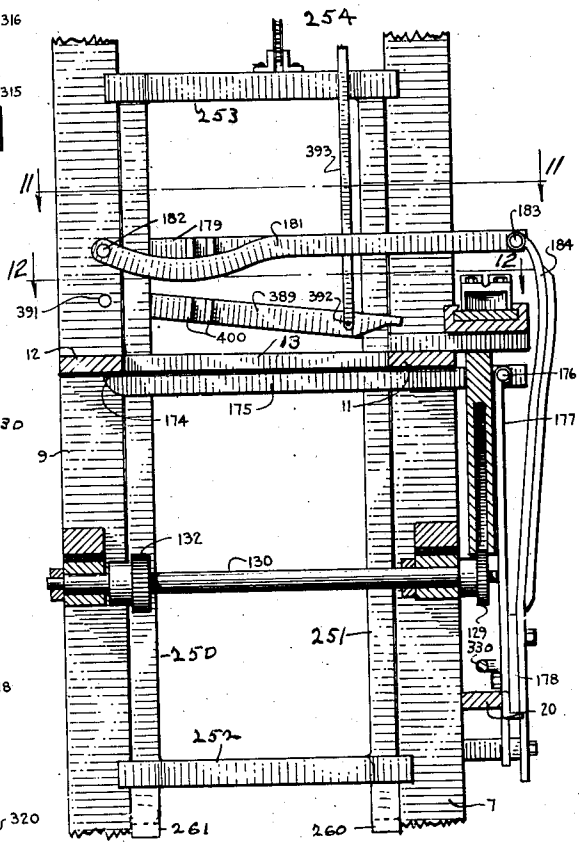


FIG. 11

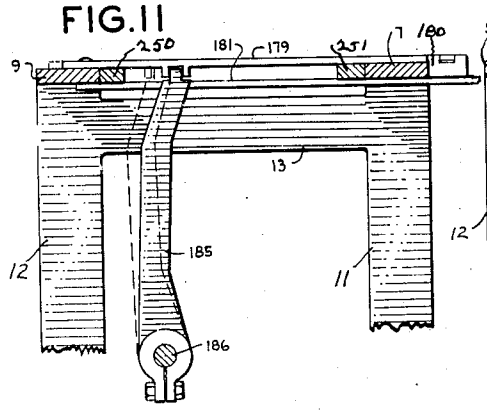
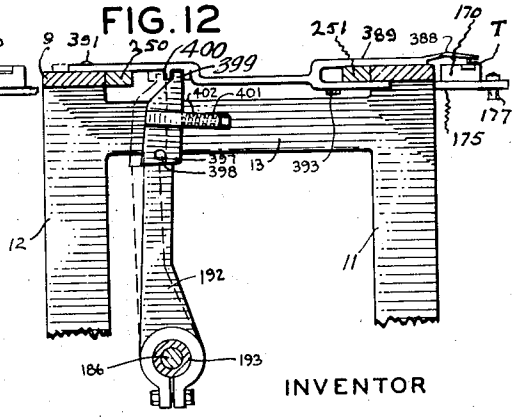


FIG. 12



INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 13A

FIG. 13B

FIG. 13C

FIG. 13

Inventor

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 14

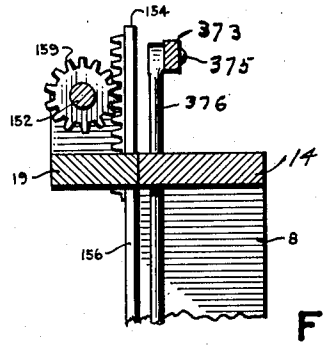


FIG. 15

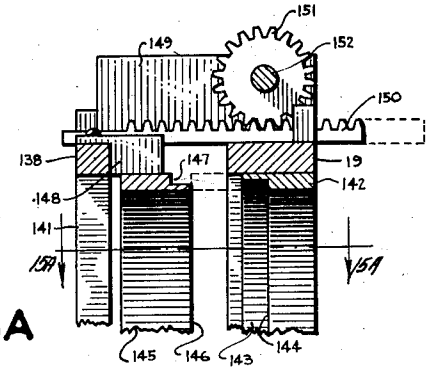


FIG. 15A



FIG. 16

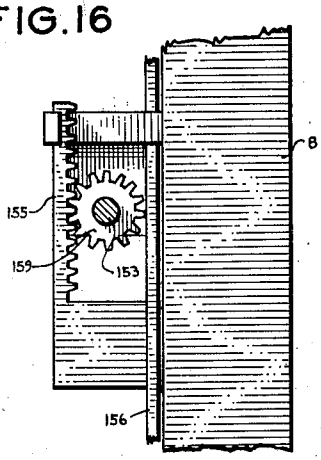


FIG. 17

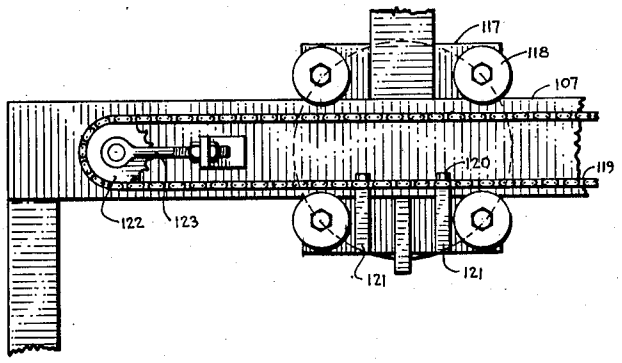


FIG. 20

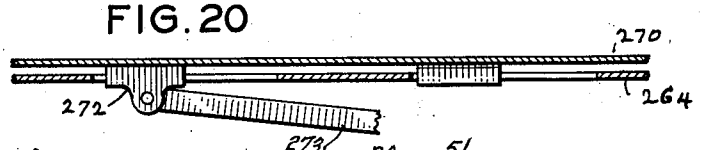


FIG. 20A

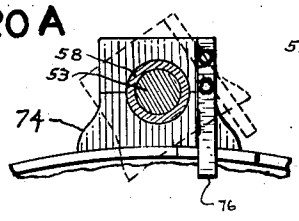
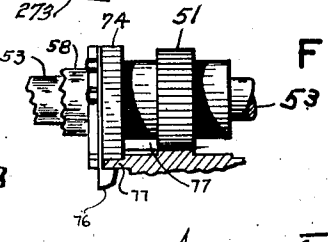


FIG. 20B



Inventor

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 18

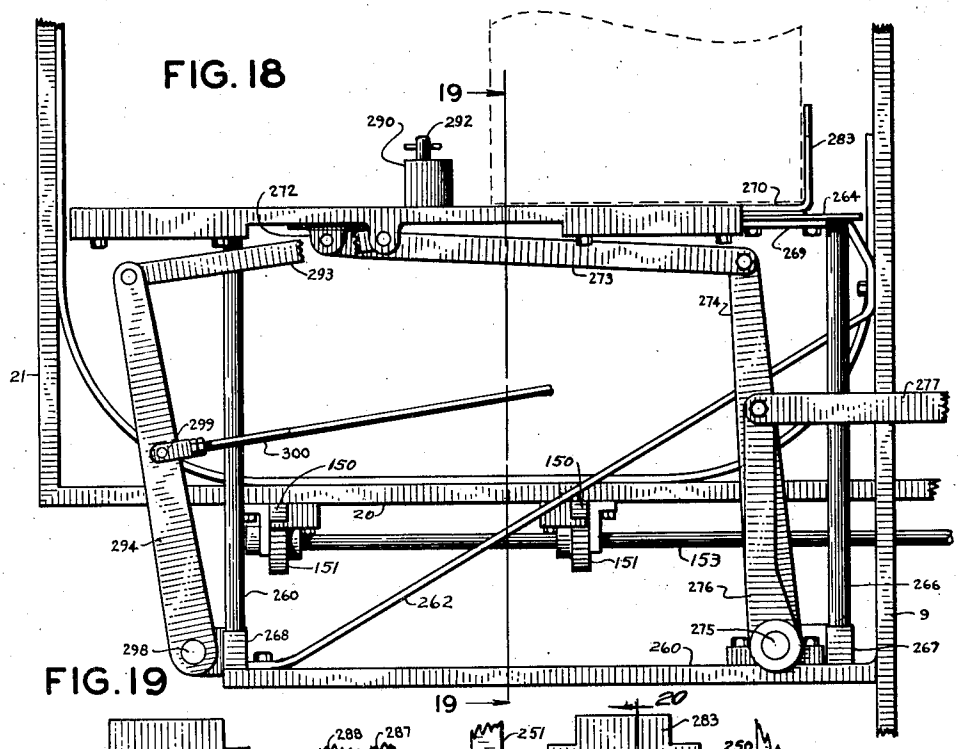
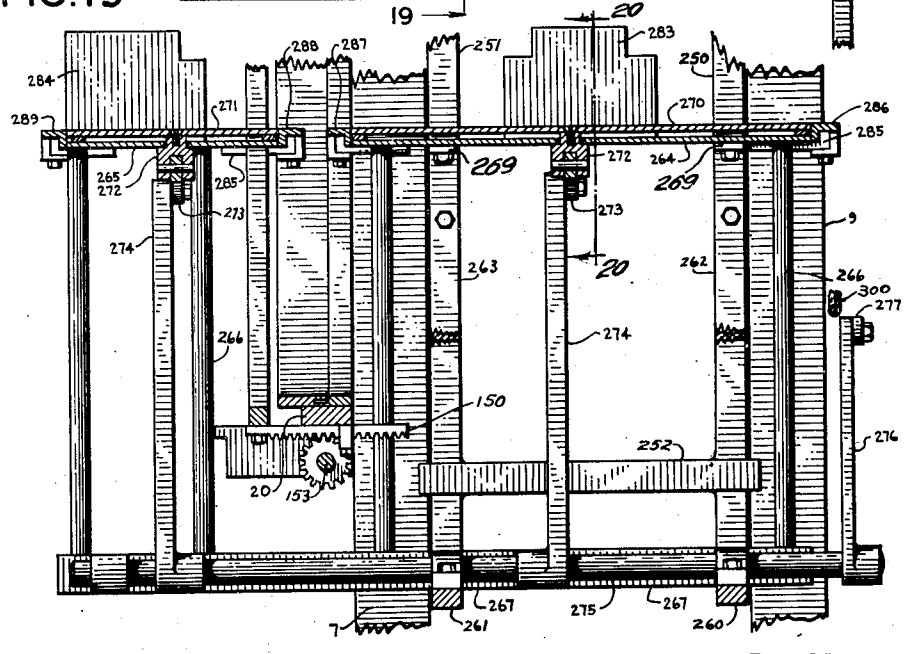


FIG. 19



INVENTOR

William Edgar Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 21

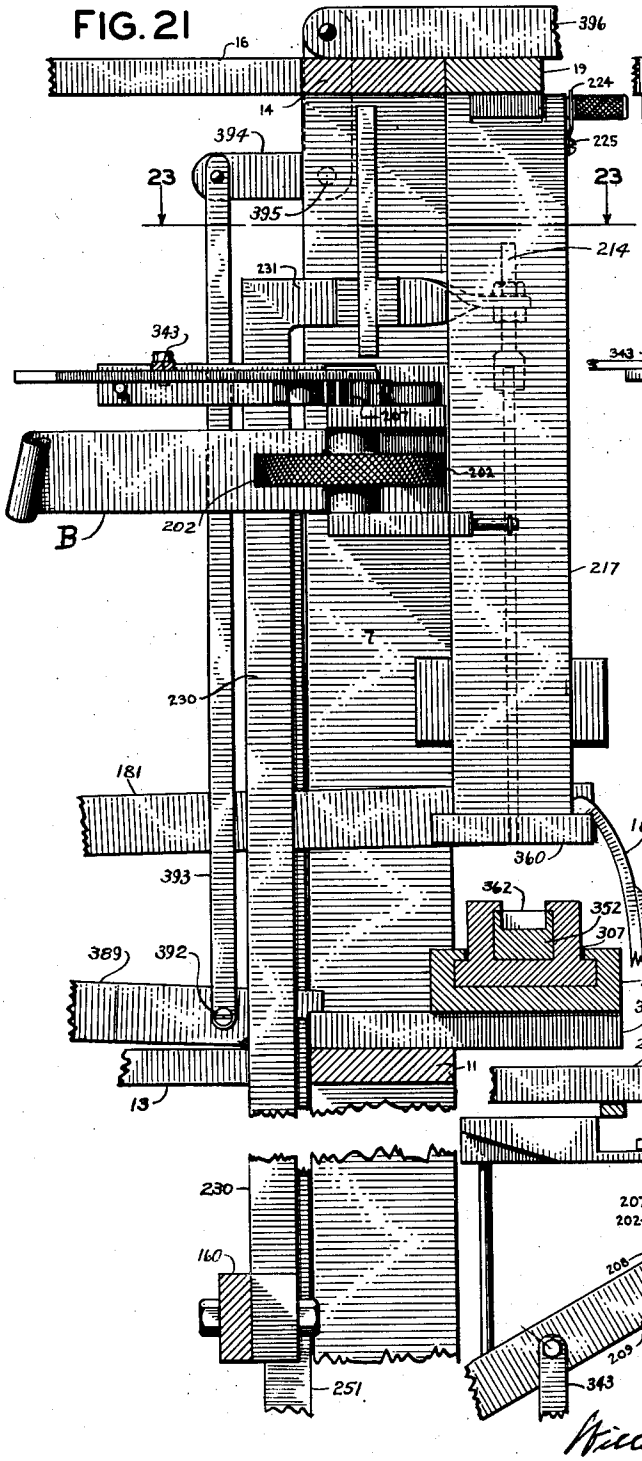


FIG. 22

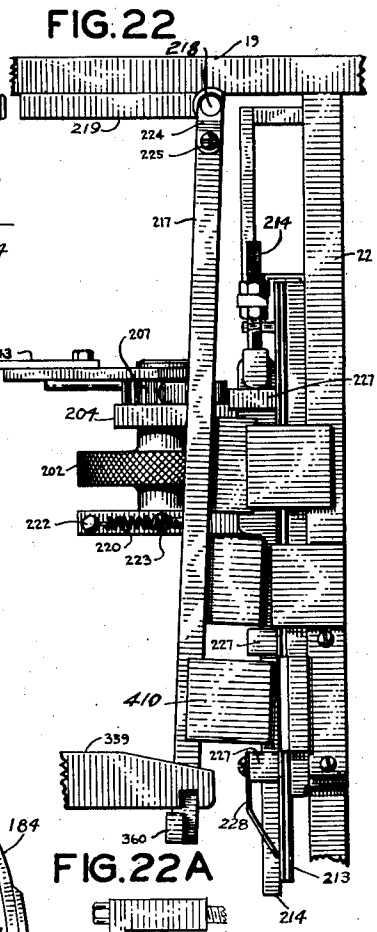


FIG. 22A

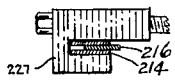


FIG. 23

INVENTOR

William Edwards Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 24

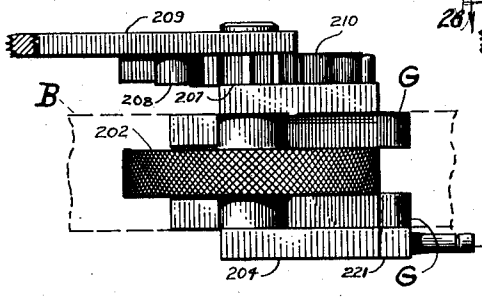


FIG. 25

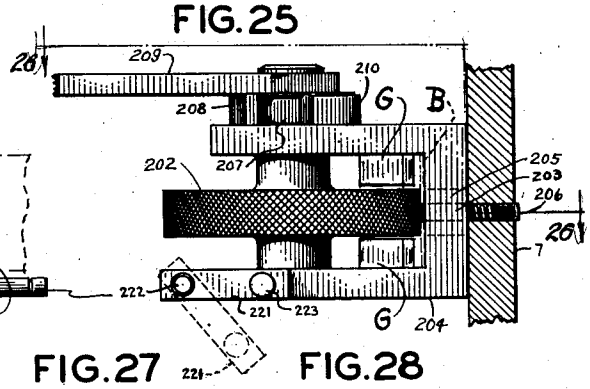


FIG. 26

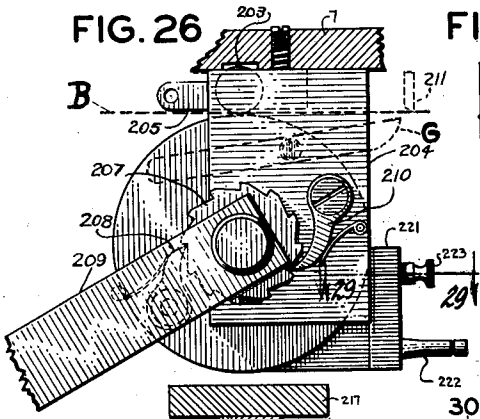


FIG. 27

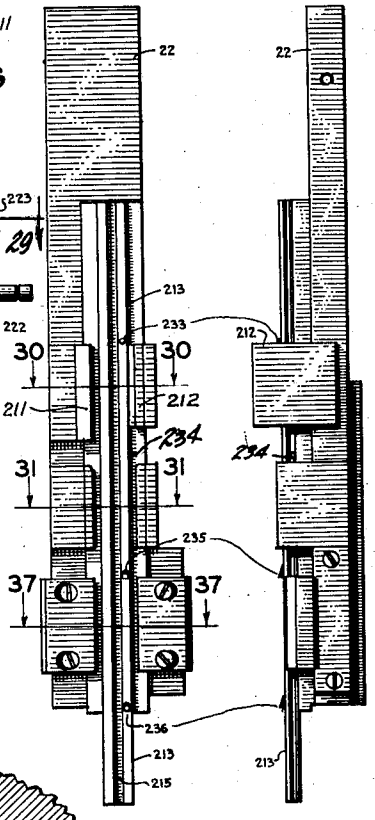


FIG. 28

FIG. 30

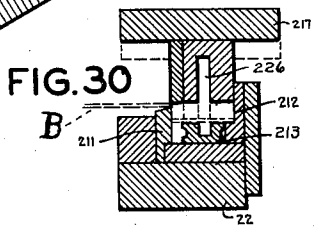
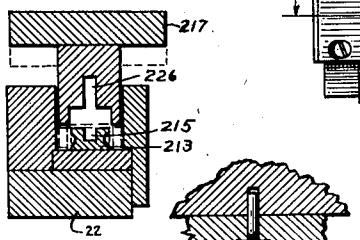


FIG. 31



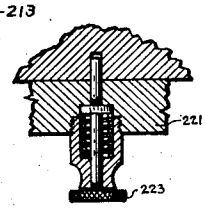


FIG. 29

INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG.32

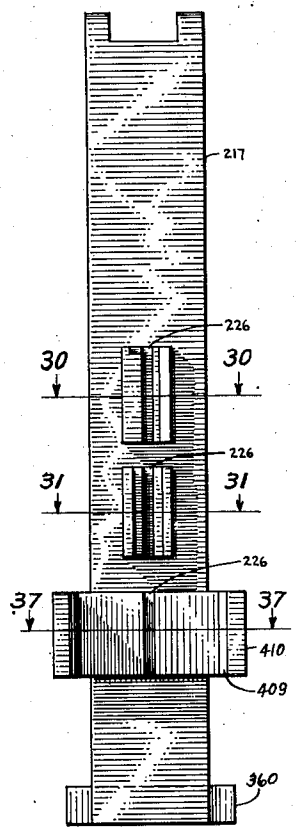


FIG.33

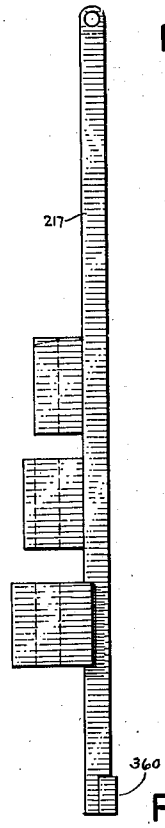


FIG.34 FIG.35 FIG.36

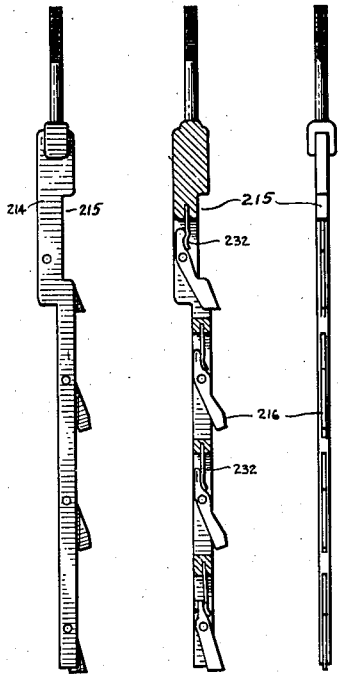


FIG.37

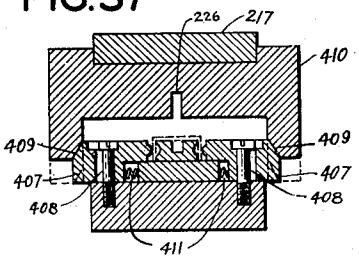


FIG.38

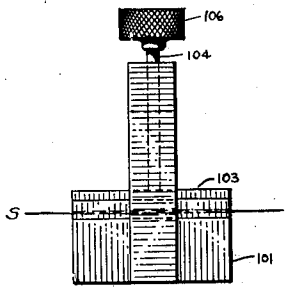
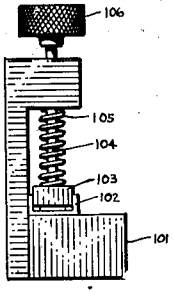


FIG.38-A



INVENTOR

William Earnest Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 39

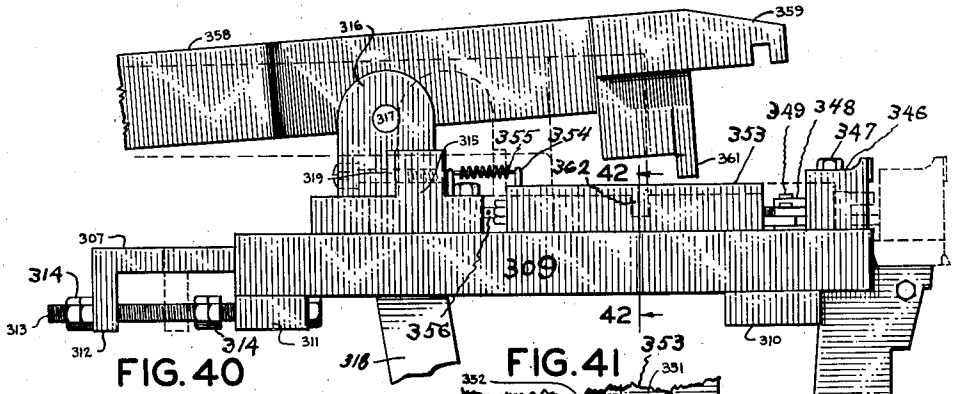


FIG. 40

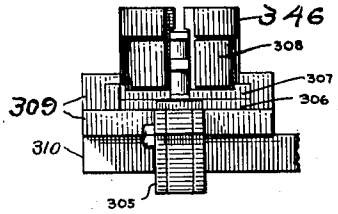


FIG. 41

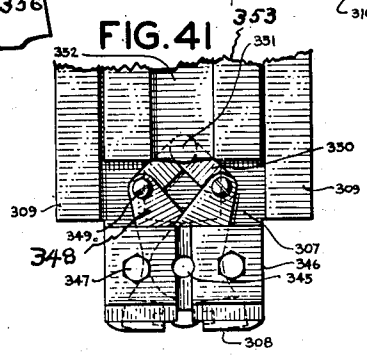


FIG. 42

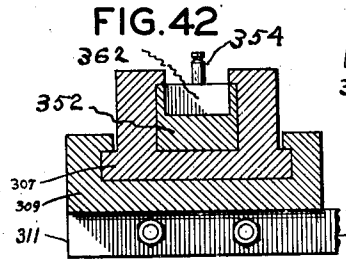


FIG. 43

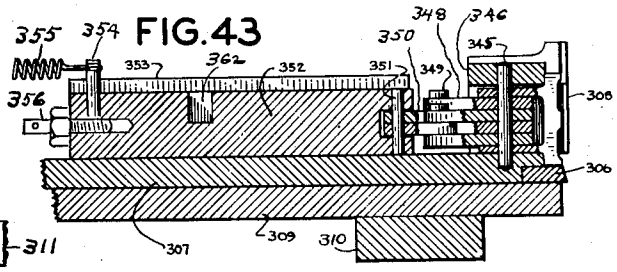
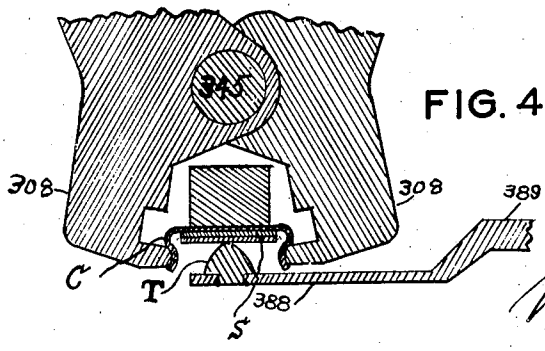


FIG. 43 A



INVENTOR

William Edward Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 44

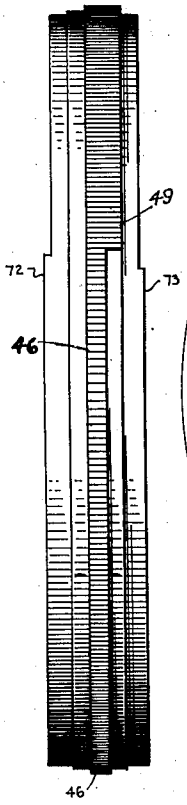


FIG. 45

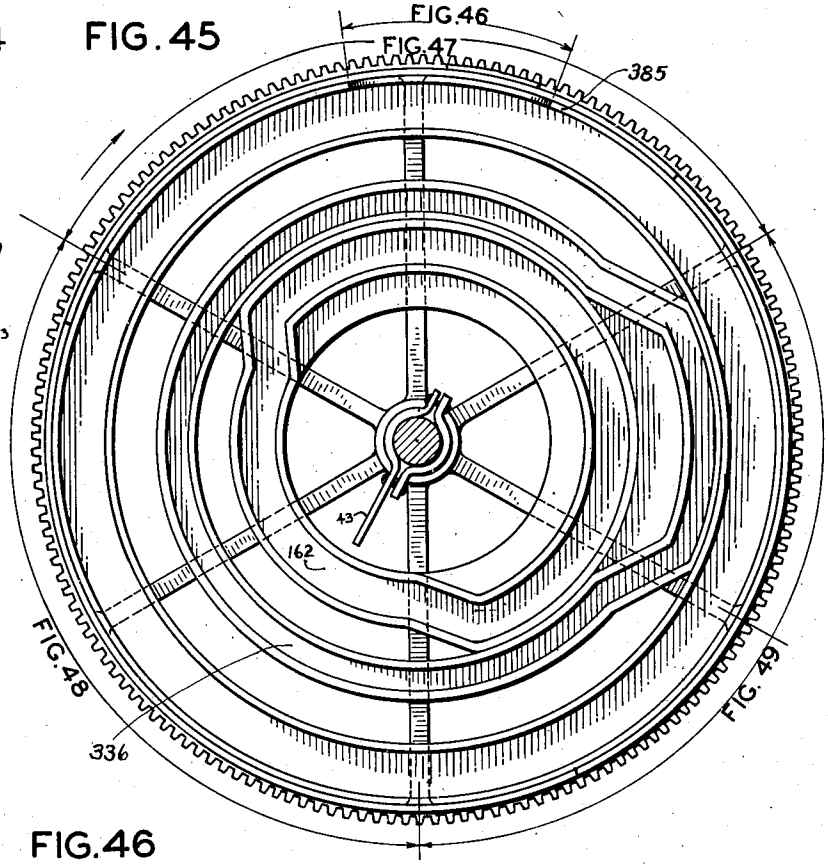


FIG. 46

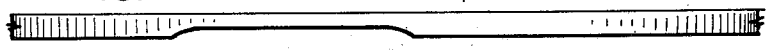


FIG. 47

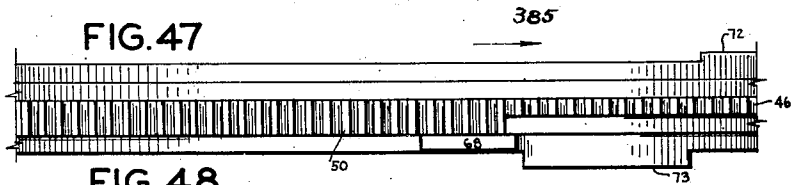


FIG. 48

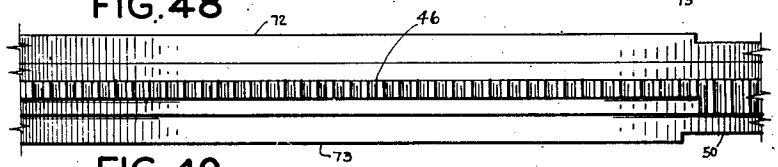
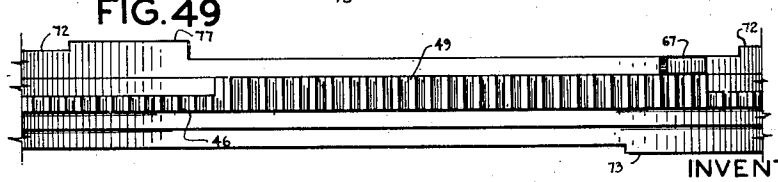


FIG. 49



INVENTOR

William Erastus Williams

Nov. 8, 1938. W. E. WILLIAMS 2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG.50

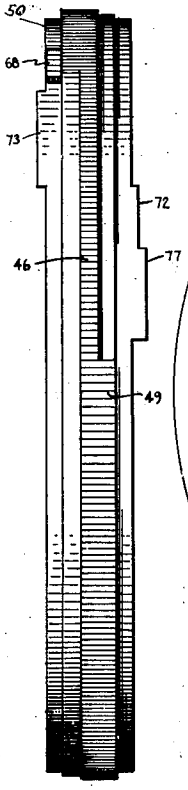


FIG.51

FIG.47

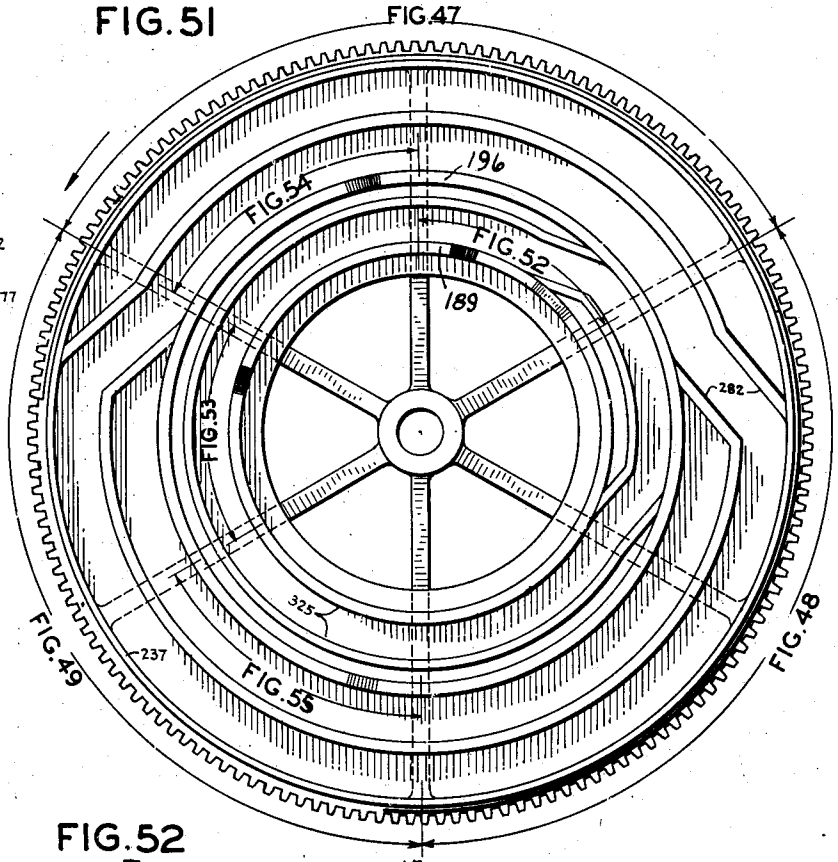


FIG.52



FIG.53

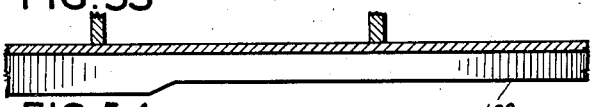


FIG.54

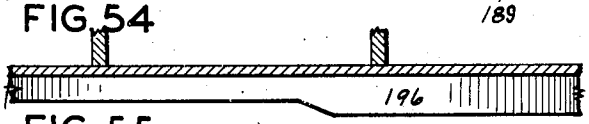
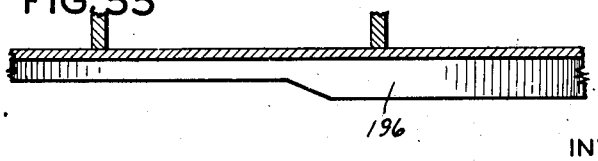


FIG.55



INVENTOR

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AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG.56

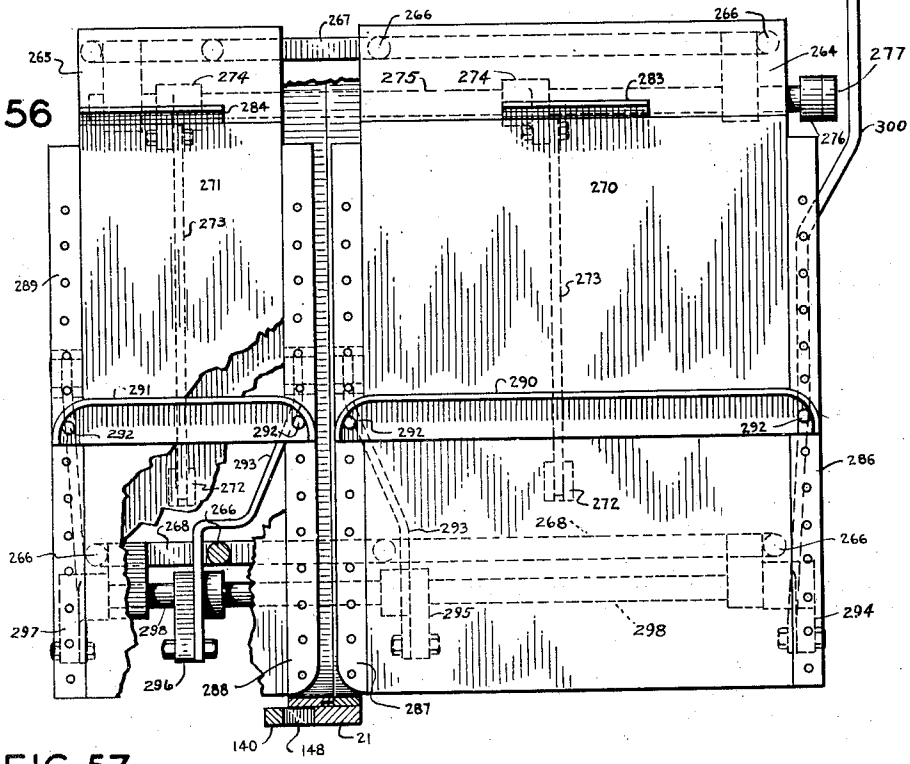
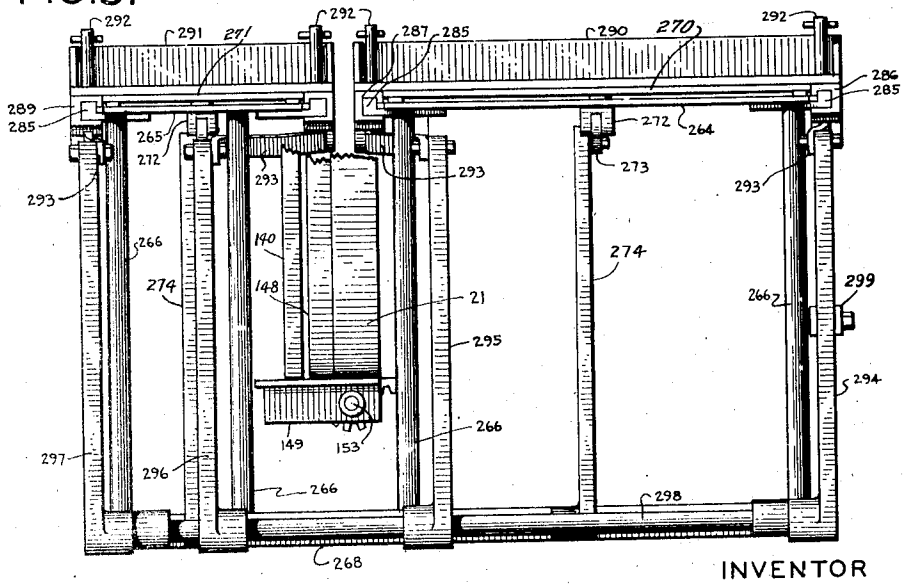


FIG.57



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AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 58

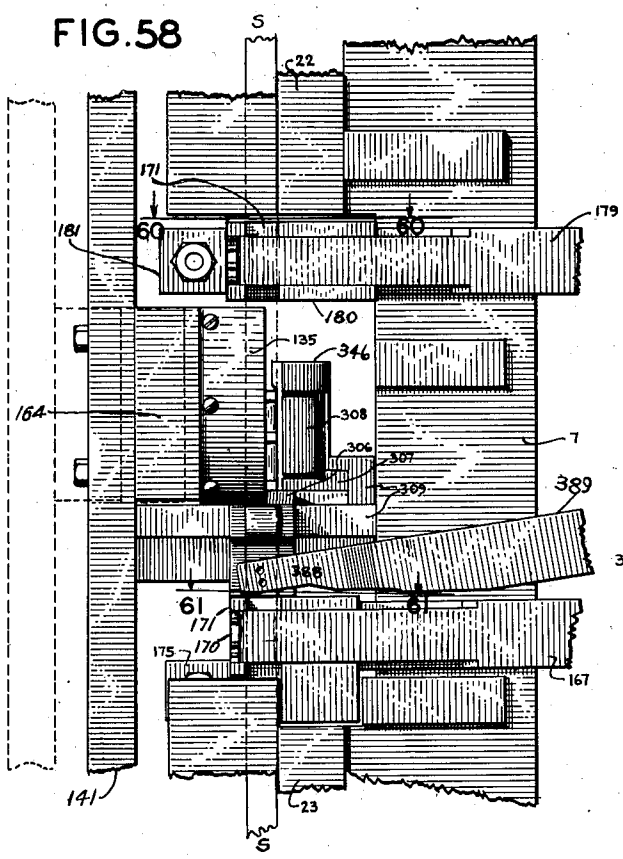


FIG. 59

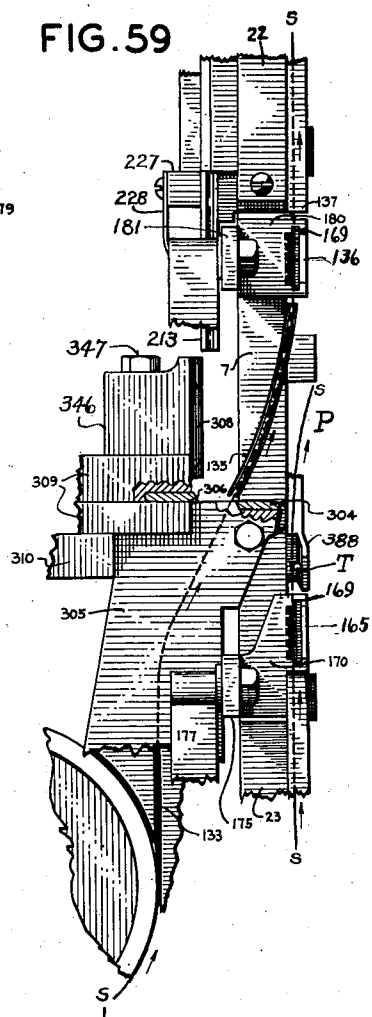


FIG. 60A

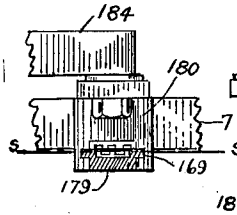


FIG. 60

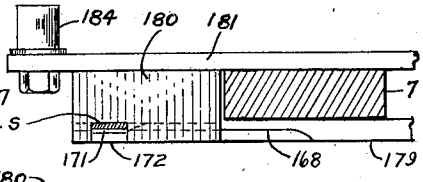


FIG. 61

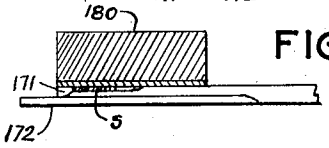


FIG. 61A

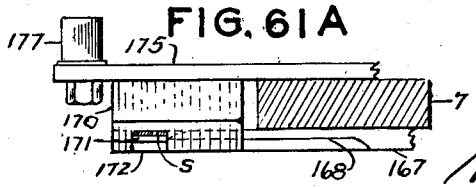
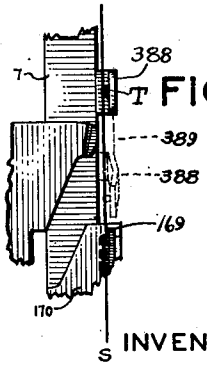


FIG. 62



INVENTOR

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AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG.63

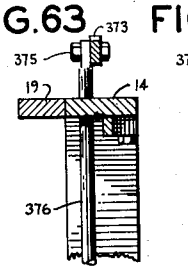


FIG.64

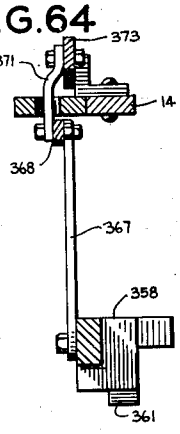
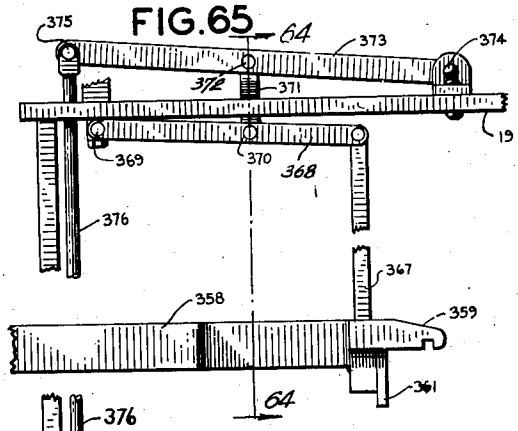


FIG.65



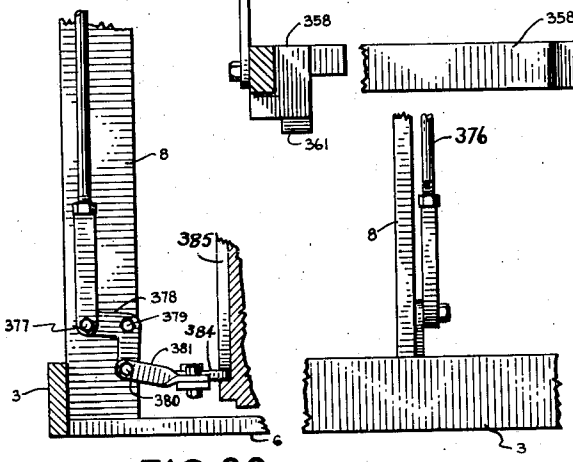
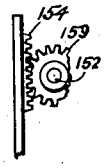


FIG.68



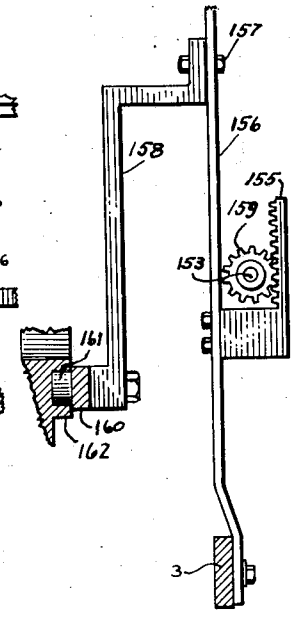


FIG.66

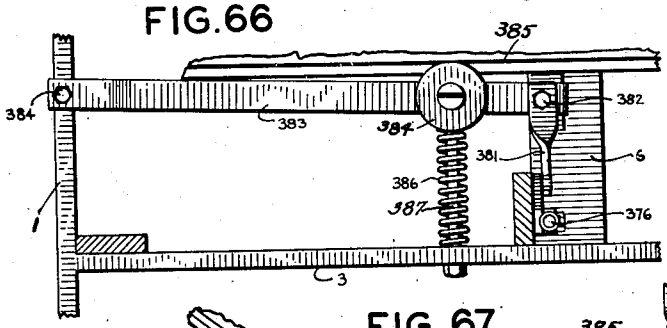
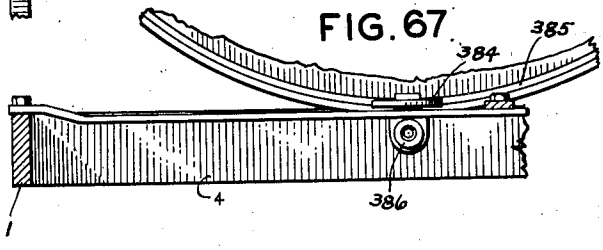


FIG.67



INVENTOR

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AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 69

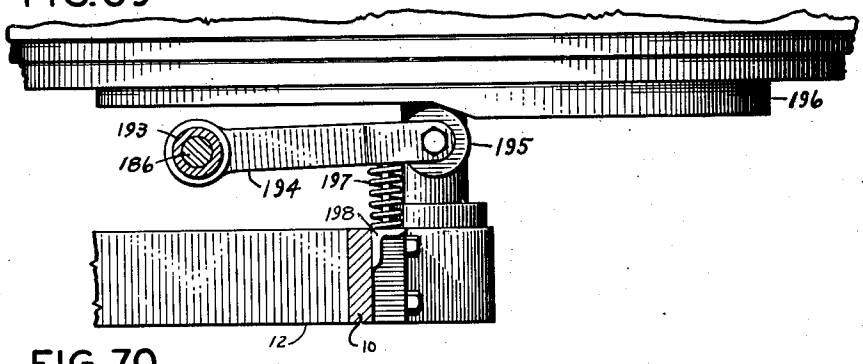


FIG. 70

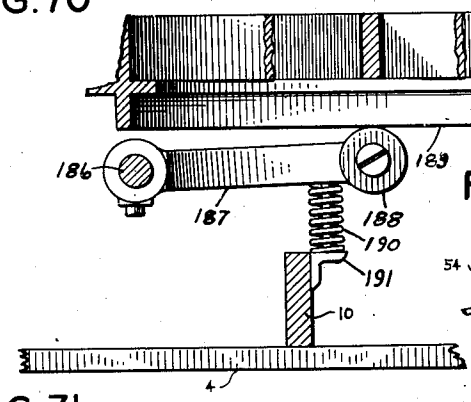


FIG. 72A

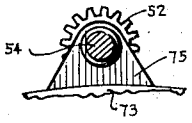


FIG. 72B

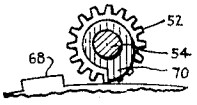


FIG. 71

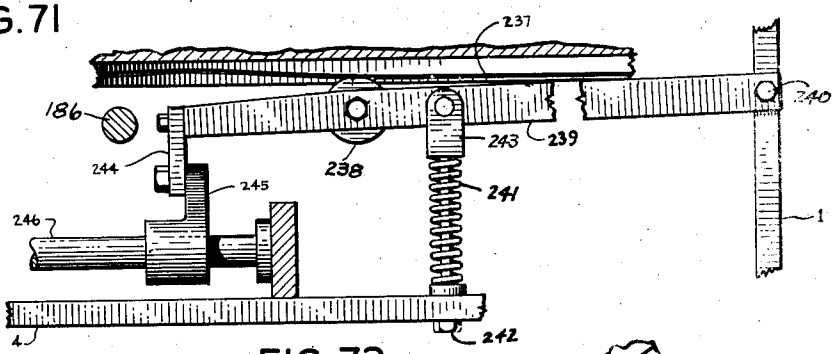
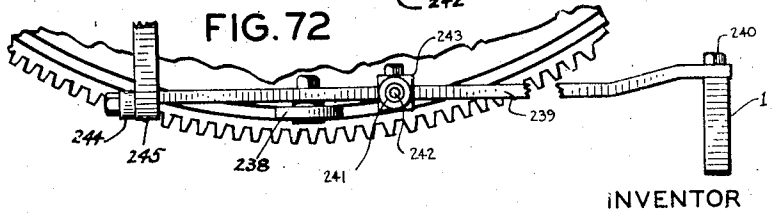


FIG. 72



INVENTOR

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AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

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FIG. 73

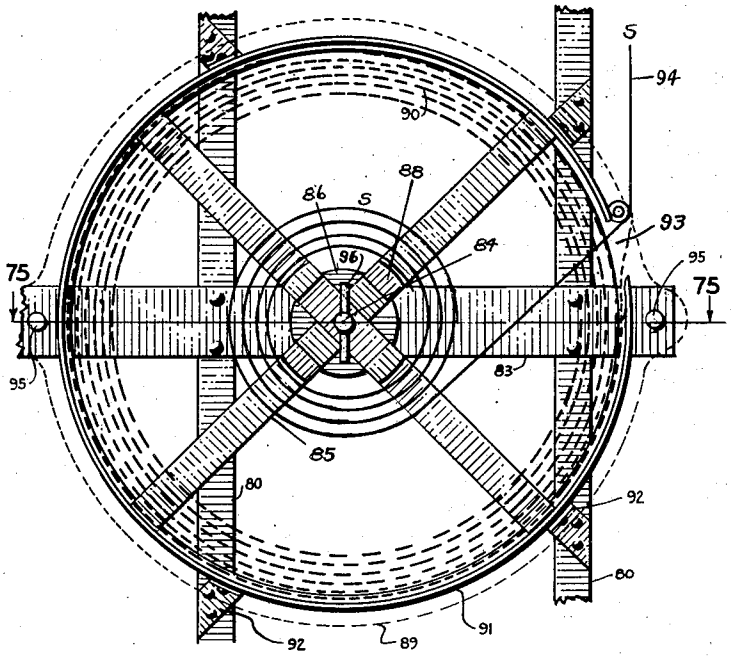


FIG. 74

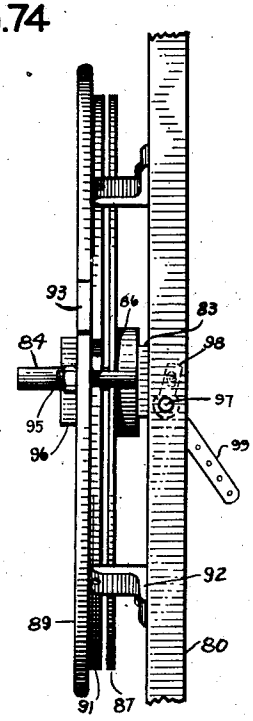


FIG. 75

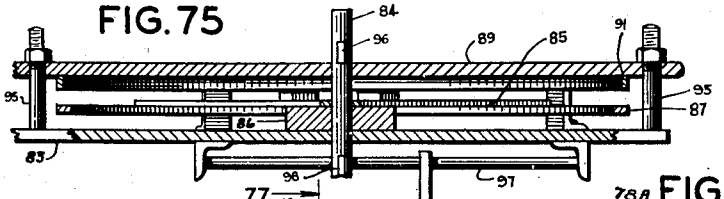


FIG. 76

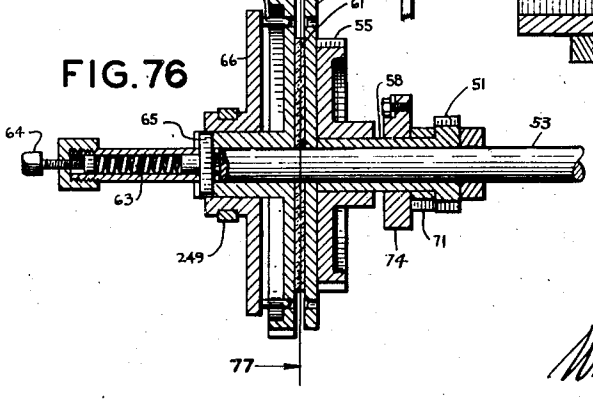
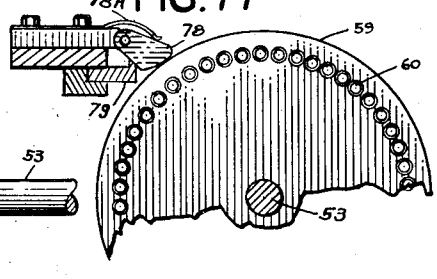


FIG. 77



INVENTOR

William Erastus Williams

Patented Nov. 8, 1938 2,136,225

UNITED STATES PATENT OFFICE

2,136,225

AUTOMATIC MACHINE FOR STRAPPING PACKAGES WITH METAL STRAPS

William Erastus Williams, Palo Alto, Calif., assignor to Signode Steel Strapping Company, Chicago, Ill., a corporation of Delaware

Application July 27, 1931, Serial No. 553,325

8 Claims. (Cl. 100—31)

This application is a continuation in part of my copending application Serial No. 404,822, filed November 4, 1929.

My invention relates to strapping machines that put flat metal straps around boxes and bundles of various kinds, draw the straps tightly around the package, and overlap and join the ends of the strap while under tension and secure them together by means of a seal, clip or a suitable joining means. The strap is held tightly on the package without necessarily nailing the body of the strap to the package.

My invention is especially adapted to perform all the functions of putting straps on packages without hand labor at all, save to supply the packages to the strapping table of the machine and to remove the strapped package from the machine. The machine is set in motion by pressing a foot lever, whereupon the machine applies the strap from a reel of supply stock strap, draws the strap tightly around the package, cuts off the strap on the package from the stock or reel of strap supply, cuts from a reel of flat metal clip seal stock a short piece of metal sufficient for a single seal, forms this metal into a channel shaped clip seal, applies this clip or seal to the strap ends and ejects the package thus strapped from the sealing position ready for its removal from the machine which then stops ready for a new cycle of operation.

The object of the invention is to produce a machine for this work that will be highly efficient in operation, low in cost of construction, simple in its parts, and with mechanisms that allow free access to all the parts for inspection, adjustment and repairs, that they may be easily cleared of clogged parts of straps and seal clip material when by accident defective strap or seal clip material happens to pass through the machine.

Further objects of my invention are to provide readily, adjustable means to apply the strap to the package with any desired tension on the package, to adapt the machine to strap fibre cases or relatively soft packages or heavy strong wooden boxes, or heavy packages of any sort and to provide two systems of tensioning the strap to the package whereby the strap may be made to freely encircle the package without putting distorting strains on any single corner surface of the package, such as does occur when a strap is consecutively wrapped around a package under a tensioning pressure.

After the strap is in position, bearing on the package on all its corners, I then apply a final binding tension that draws the bundle into its normal shape, which thus avoids the distorting stresses above mentioned.

A further object of my invention is to provide means for making a sealing clip or joint clip in a shape that may readily be placed upon the overlapped ends of the strap and in position to be acted upon by sealing jaws in fixing the seal clip to the strap ends for the joint.

A further object of the invention is to provide means to place the overlapped ends of the strap tightly into the sealing clip and sealing jaws in a manner to insure certainty of the formation of a secure joint at each operation. Other objects of the invention will be observed by the description and claims as hereinafter set forth.

The machine operates on the principle of pushing the strap out endwise through a closed guideway of fixed dimensions and then uncovering the guideway and drawing the strap back until it surrounds the package which has been placed within the space surrounded by said guideway.

One of the objects of the invention is to take up the slack strap that is drawn back each time in a manner not to draw from the reel of stock strap more than sufficient at each operation for a strap of any size package without any adjustment required by the operator, no matter how great a variation in size there may be from package to package.

Reference will be had to the accompanying drawings in which Figure 1, Sheet 1, is a side elevation of the machine, being the left side of the machine as it appears to a person standing at the front end where the strapping table is located, which is at the right of Figure 1. Part of the strap guideway is omitted in this figure.

Figure 2, Sheet 2, is a front elevation of the machine.

Figure 2A, Sheet 2, is a plan, and Figure 2B, Sheet 2, an end view of the seal clip used with this machine.

Figure 2C, Sheet 2, is a plan view and Figure 2D, Sheet 2, is a side view of the sealed joint formed on the overlapped ends of the strap.

Figure 2E is a detail to be described later.

Figure 3, Sheet 3, is an elevation of the right side of the machine with the outer end of the table and strap guide broken off.

Figure 4, Sheet 4, is a rear end elevation of the machine.

Figure 5, Sheet 5, is a plan section on 5—5 of Figure 1, Sheet 1.

Figure 6, Sheet 5, is an elevation of a part of the left side of the machine.

Figure 7, Sheet 6, is an elevation of part of the lower rear left side of the machine.

Figure 8, Sheet 6, is a sectional plan of the lower left portion of the machine, some parts being omitted for clearness of illustration, the section being taken on the line 8—8 of Fig. 7.

Figure 9, Sheet 7, is a sectional elevation of parts of the machine looking from the rear toward the front of the machine with parts omitted for clearness of illustration, the section being taken on the line 9—9 of Fig. 7.

Figure 10, Sheet 7, is a similar view to that of Figure 9, the section being taken on the line 10—10 of Fig. 7.

Figure 11, Sheet 7, is a sectional plan of the upper strap gripper and its mounting, the section being taken on the line 11—11 of Fig. 10.

Figure 12, Sheet 7, is a sectional plan view of the lower strap gripper and its mounting, the section being taken on the line 12—12 of Fig. 10.

Figure 13, Sheet 8, is a side elevation from the left side of the machine, showing frame parts and mechanisms in relation to the strap guideway.

Figure 13A, Sheet 8, is a front elevation of what is shown at right side of Figure 13.

Figure 13B is a diagram position of strap and package at commencement of strapping operation.

Figure 13C is a similar diagram to that of Figure 13B, but shows parts at the time of sealing the joint of the strap.

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

Figure 15 is a section on line 15—15 of Figure 13.

Figure 15A is a cross section of strap guideway in closed condition, the section being taken on the line 15A—15A of Fig. 15.

Figure 16 is a section on line 16—16 of Figure 13.

Figure 17, is a rear detail view of part of the mechanism shown in Figure 13.

Figure 18, Sheet 10, is an elevation of details of the strapping table looking toward the left, from the right side of the machine.

Figure 19, Sheet 10, is an elevation partly in section of what is shown in Figure 18 on line 19—19 of Figure 18.

Figure 20, Sheet 9, is a sectional detail of parts of the strapping table, the section being taken on the line 20—20 of Fig. 19.

Figure 20A, Sheet 9, is a sectional elevation on line 20A—20A, Figure 5, Sheet 5.

Figure 20B is an elevation of parts shown in Figure 20A looking from the right of Figure 20A.

Figure 21, Sheet 11, is a sectional elevation of parts at the left front side of the machine looking from the rear toward the front, as it were inside the frame of the machine, showing mechanisms involved in feeding the flat metal strip out of which the seal clips of Figure 2A and 2B, Sheet 2, are made.

Figure 22, Sheet 11, is a similar view to that of Figure 21, but looking from the left side toward the right side of the machine.

Figure 22A is a plan detail of a guide block.

Figure 23, Sheet 11, is a plan view on line 23—23 of Figure 21.

Figure 24, Sheet 12, is an elevation from the rear of the feed wheel that feeds the flat strip out of which the seals are made, adjacent parts being omitted for clearness.

Figure 25, Sheet 12, is a side view of what is shown in Figure 24.

Figure 26, Sheet 12, is a sectional plan of what is shown in Figures 24 and 25, the section being taken on the line 26—26 of Fig. 25.

Figure 27, Sheet 12, is an elevation of the fixed dies that form the clip seals out of the flat strip stock, looking from the rear toward the front of the machine.

Figure 28, Sheet 12, is a side elevation of what is shown in Figure 27.

Figure 29, Sheet 12, is a sectional detail of a locking pin shown in Figures 25 and 26, the section being taken on the line 29—29 of Fig. 26.

Figure 30, Sheet 12, is a section on line 30—30 of Figure 27.

Figure 31, Sheet 12, is a section on line 31—31 of Figure 27.

Figure 32, Sheet 13, is an elevational view of the die side of the movable dies and their carrying block that coacts with the fixed dies of Figures 27 and 28 in forming the clip seals.

Figure 33, Sheet 13, is a side view of what is shown in Figure 32.

Figure 34, Sheet 13, is a side elevation, Figure 35 a sectional elevation, and Figure 36 a front elevation of a feed bar and its dogs that feed the clip seal pieces through the dies of Figures 27 and 32 down into the sealing jaws that secure the seals to the strap ends.

Figure 37, Sheet 13, is a section on line 37—37 of Figure 27, Sheet 12.

Figures 38 and 38A, Sheet 13, show details of a friction brake for the strap.

Figure 39, Sheet 14, is a side elevation of parts in relation to the sealing jaws and the cross heads that carry them.

Figure 40, Sheet 14, is a front elevation of sealing jaws as is shown in Figure 39.

Figure 41, Sheet 14, is a plan of the sealing jaws and the front end of their carrying cross heads.

Figure 42, Sheet 14, is a section on line 42—42 of Figure 39.

Figure 43, Sheet 14, is a vertical central section of the sealing jaws and part of their carrying cross heads.

Figure 43A is an enlarged section through the overlapped strap ends embraced by the seal clip and sealing jaws just before the sealing action takes place.

Figure 44, Sheet 15, is an edge view of the main cam gear wheel looking from the rear of the machine.

Figure 45, Sheet 15, is a side elevation of the main cam gear wheel looking from the left side of the machine, which is the right side of Figure 44.

Figure 46, Sheet 15, is a plan of a side cam 385 in the margin of the main cam gear wheel as indicated by the arc marked Fig. 46 on Figure 45. This cam raises and lowers the end of the pusher bar that actuates the sealing jaws in sealing the clip seals to the strap ends.

In Figures 46, 47, 48 and 49, Sheet 15, the parts are shown as what might be flat surfaces where the curved arcs of Figure 45 are drawn as flats.

Figure 47 is the outside surface of main cam gear wheel drawn flat as of the arc marked Fig. 47 on Figure 45.

Figure 48 is a similar view of the arc marked Fig. 48 on Figure 45.

Figure 49 is a similar view of the arc marked Fig. 49 on Figure 45.

Figure 50, Sheet 16, is an edge view of main cam gear wheel looking from the front of the machine.

Figure 51, Sheet 16, is a side elevation of the main cam gear wheel, looking from the right of the machine and the right of Figure 50.

Figures 52, 53, 54, and 55, Sheet 16, are cam contours of edgewise cams drawn as flats of cams on the side of main cam gear wheel as indicated by the arcs on Figure 51.

These four Figures 52 to 55 inclusive represent the cam heights of complete circles of the

two side cams that actuate the upper and lower grippers for the strap ends. The larger diameter ring shown in Figures 54 and 55 operates the lower gripper and the small diameter ring shown in Figures 52 and 53 operates the upper gripper.

Figure 56, Sheet 17, is a plan with parts broken away of the strapping table on which the package is placed and strapped.

Figure 57, Sheet 17, is a front elevation of the package table.

Figure 58, Sheet 18, is a front elevation of portions of the mechanisms at the front of the sealing jaws, being the surface whereat the sides of the packages are pressed when the strap ends are sealed together, and the parts in this Figure 58 are in the position when the strap is fed through the strap guideway.

Figure 59, Sheet 18, is a side elevation of parts at the left of the machine showing the region similar to that of Figure 58, with parts in same position.

Figure 60, Sheet 18, shows a plan of the upper gripper on approximately line 60—60 of Figure 58.

Figure 60A is an end elevation of what is shown in Figure 60.

Figure 61 is a section through the grippers when gripping the strap.

Figure 61A, Sheet 18, shows a plan of the lower gripper approximately line 61—61 of Figure 58.

Figure 62, Sheet 18, shows a detail to be described later, in relation to a swiping finger.

Figure 63, Sheet 19, is a vertical sectional elevation taken on the line 63—63 of Fig. 7, transversely of the machine and at the left side showing details of the cam connections of the side cam shown in Figure 46.

Figure 64, Sheet 19, is a vertical sectional elevation taken on the line 64—64 of Fig. 65 of details of link connection to raise and lower the end of the pusher bar that actuates the sealing jaws.

Figure 65, Sheet 19, is a side elevation with parts broken away looking from the left side of the machine showing link and lever mechanisms that are connected to raise and lower the end of the sealing jaws pusher bar.

Figure 66, Sheet 19, is a plan and Figure 67, Sheet 19, a side elevation of the cam arm and connections that actuate the link and lever mechanisms that raise and lower the end of the sealing jaws pusher bar.

Figure 68, Sheet 19, is an elevation of details in connection with opening and closing the strap guideway.

Figure 69, Sheet 20, is a plan of the cam roller and its arm that actuates the lower gripper.

Figure 70, Sheet 20, is a plan of the cam arm that actuates the upper gripper.

Figure 71, Sheet 20, is a plan and Figure 72 a side elevation of the cam roller arm that actuates the positive clutch that controls the feed wheel that feeds the strap into and pulls it out of the strap guideway.

Figure 72A, Sheet 20, is a vertical sectional view of the draw block pinion 52, and its curved block on line 72A—72A, Figure 9, Sheet 7.

Figure 72B, Sheet 20, is a sectional view at line 72B—72B on Figure 9, Sheet 7.

Figure 73, Sheet 21, is a plan, Figure 74 an edge view, and Figure 75 a section on line 75—75 of Fig. 73 of the reel that holds the strap stock coil.

Figure 76, Sheet 21, is a vertical section of the friction and positive clutches that drive the feed wheel for the strap.

Figure 77, Sheet 21, is an elevation of the female clutch plate.

The machine is provided with a frame of any suitable construction but here shown composed of steel bars welded together into a unitary piece as it were, having cross base bars indicated by 1 at rear and 2 at front and horizontal base bars 3 at the left and 4 at the right. The horizontal base bars 3 and 4 are tied across at the bottom by bars lying flat, one at the front indicated by 5 and one about midway indicated by 6, see Figure 8, Sheet 6, and Figure 66, Sheet 19.

Extending upward from the base bars, there are the four corner posts, 7 at the left front and 8 at the rear left, 9 at the right front and 10 at the right rear.

About midway up from the floor the vertical posts 7, 8, 9 and 10 are tied across by horizontal bars 11 at left and 12 at right and these bars 11 and 12 are connected across at the front by a bar 13, see Figure 5, Sheet 5.

At the top of the frame the corner posts are connected across by horizontal bars 14 at the left and 15 at the right. Bar 14 is to be seen in Figure 4, Sheet 4, and bar 15 in Figure 3, Sheet 3.

Extending across from bar 14 to bar 15 are transverse bars 16 at front and 17 at rear. 17 is to be seen in Figure 4, Sheet 4.

The frame work just described is supplemented by frame members at the left side of the machine and composed of a top horizontal bar 19 secured to the top horizontal bar 14 and extending forward to form the top frame member that carries at the top the guideway for the strap passage way and the frame piece for the lower or bottom portion of this strap guideway is bar 20 which is fastened to the vertical left corner posts 7 and 8. The outer ends of bars 19 and 20 are connected by a vertical bar 21 which holds the strap guideway at this end. A short vertical bar 22 at the top is secured to the edge of the left front corner post 7 and as it were becomes a part of that post and a short bar 23 at lower position is secured to the corner post 7. A gap between the ends of these bars 22 and 23 allows for space for entry of the strap to the guideway, the cut-off blades, the sealing jaws and the grippers.

The main frame members are welded together but many of the other pieces are bolted or screwed together and usually the screws and bolts are not indicated in the drawings.

A complete cycle of operation of the machine is made by a single revolution of the main cam gear wheel.

The power for operating the machine is here shown as being an electric motor indicated by M mounted on the top of the frame and driving a sprocket chain 24 best seen in Figures 2 and 3, Sheets 2 and 3. The chain 24 drives a sprocket 25 on a shaft 26 which carries a small pulley 27 driving a belt 28 which drives a wooden lagged iron pulley 29 mounted loosely on a shaft 30 on which there is mounted a clutch plate 31 splined on shaft 30 and provided with stud pins 32, see Figures 5 and 6, Sheet 5. The clutch plate 31 is adapted to be moved to and from pulley 29 to engage its stud pins 32 with the spokes of pulley 29 and be disengaged therefrom as per full and dotted positions of clutch plate 31 in Figure 5, Sheet 5. The movement of this clutch plate 31

along shaft 30 is controlled by a key passing through a slot in shaft 30 which slot extends lengthwise of shaft 30 sufficiently to accommodate the movement of clutch plate 31. The shaft 30 at its left end is hollow and in the hollow part there is mounted a sliding rod 34 perforated at its inner end to be engaged by the aforesaid key and the outer end of rod 34 is provided with two collars between which a pintled ring 35 is mounted to move the rod 34. Ring 35 is mounted in a lever 36, hinged at 37 at the top to a bracket on the frame and at the bottom, see Fig. 4, Sheet 4, it is hinged at 38 to a foot treadle bell crank 39 the latter being hinged to a bracket on the frame.

When the machine is in use, the motor M and wooden lagged pulley 29 are operating and when a package is to be strapped the operator depresses the foot lever 39 and engages the pulley 29 to drive the clutch plate 31. The release of the clutch plate 31 from pulley 29 is by a return spring 44, Figure 1, which is connected to a rod 40, Figure 4, Sheet 4. The rod 40 is connected to pull the lever 36 to the left as viewed in Fig. 4 toward the machine and release the clutch. The clutch is locked in driving engagement by a lever 41, see Figure 4, Sheet 4, which drops down a notch in the lever and engages a pin 42 on lever 36 and holds it until the main cam and gear wheel have made a complete revolution, at which time an arm 43, on shaft of main cam and gear wheel, see Figure 45, Sheet 15, hits the inner end of locking lever 41 and releases it from the lever 36, permitting the aforementioned spring 44 to release the clutch and stop the machine.

While I have shown the clutch mechanism described for engaging the operation of the machine with the source of power, I may use instead any suitable device in common use for such a purpose, such as the clutches commonly found with punch press machinery.

The shaft 30 has two gear pinions 45 and 47 fixed thereon. The pinion 45 drives the main cam gear by means of a complete circle of gear teeth 46. The pinion 47 which is mounted on the shaft 30 outside the main frame drives a crank gear 48 that operates the pusher bar that moves the sealing jaws.

On each side of the circle of gear teeth 46 on the main cam gear wheel, there are segments of gear teeth. The one on the right side indicated by 49 feeds out the strap into the strap guideway and the one on the left side indicated by 50, draws back the strap into contact with the package, and this is accomplished by the said gear teeth 49 and 50, see Figure 5, Sheet 5; Figures 44 and 45, Sheet 15 and Figures 50 and 51, Sheet 16, engaging pinions 51 and 52 on shafts 53 and 54. Pinion 52 is fixed at all times to drive shaft 54 and pinion 51 is mounted on a hollow shaft 58, see Figure 76, Sheet 21, which is mounted to revolve on shaft 53 at intervals and with the shaft 53 at other intervals being controlled by a clutch mechanism. The hollow shaft 58 of pinion 51 has fixed thereon a gear 55, which is at all times in engagement with a gear 56 on said shaft 54, so that any movements of shaft 54 and the shaft 58 on shaft 53 work together, the shaft 54 in reverse direction to the hollow shaft 58.

The revolution of shaft 53, which has fixed thereon the strap feed wheel 57, see Figure 6, Sheet 5, is brought about by clutch mechanism that connects the drive shaft 53 to the hollow shaft 58, mounted thereon.

The clutch mechanism which connects the feed wheel shaft 53 to the hollow shaft 58, on which pinion 51 is fixed, is shown in Figures 76 and 77, Sheet 21.

Fixed to the gear 55 which is fixed on hollow shaft 58, there is a clutch plate 59, provided with a series of clutch pin holes 60. Lying loosely against this plate 59, there is a composition friction disc 61. Adjacent friction disc 61 there is a smooth friction surface of a gear wheel 62, through the web of which there is a series of holes that register as to spacing with the holes 60 of the clutch plate 59. The hub of gear 62 slides longitudinally on shaft 53 under the influence of a spring 63 mounted in the right end of shaft 53, which is hollow. Spring 63 is adjusted to suitable pressure by a screw 64 threaded into a cap in the end of shaft 53.

The inner end of spring 63 abuts against a plug which is slidable within the shaft 53 and abuts against a flat pin 65, located within a slot in the hub of gear 62. The shaft 53 is slotted for a short distance to permit the spring 63 to move the gear 62 into engagement with the friction disc 61, and thus frictionally connect shaft 53 to hollow shaft 58.

When desired to drive shaft 53 positively from hollow shaft 58, the clutch pin disc 66, which is mounted to slide on the hub of gear 62 and is operated by a cam 237, to be described later, is moved to cause the pins 69 of disc 66 to enter holes 60 of plate 59, and thus make a positive connection between the hollow shaft 58 and the shaft 53. The clutch pin disc 66 is mounted in gimbal ring 249, to be later described.

The pinions 51 and 52, as before mentioned, are revolved by their respective gear segments 49 and 50, which are so arranged that while one pinion is engaged by its driving teeth on the main cam gear wheel; the other pinion is running idle in reverse direction. These pinions 51 and 52 are provided with what I term big teeth 71 and 70 on the side of their regular teeth, for the purpose of taking up the inertia shock of starting and these big teeth are engaged by a single big tooth 67 or 68 on the main cam gear wheel in the paths of the big teeth 71 and 70 on the pinions 51 and 52. See Figure 4, Sheet 4; Fig. 5, Sheet 5; Fig. 9, Sheet 7; Figs. 47 and 49, Sheet 15; Figure 50, Sheet 16.

The hollow shaft 58 and shaft 54 are held against revolving in their periods of rest by means of narrow mutilated flange 72 for the feedout pinion 51 and a narrow mutilated flange 73 for the drawback pinion 52, and these flanges are engaged by a curved faced block 74 on pinion 51 and a curved faced block 75 on pinion 52. See Fig. 9, Sheet 7; Figs. 72A and 72B, Sheet 20.

The curved faced block 74 for pinion 51 is provided with a back lash spring catch 76; see Figs. 20A and 20B, Sheet 9, and Fig. 9, Sheet 7, which engages a short flange 77 on the outer edge of the right side of main cam gear wheel. See Figure 8, Sheet 6; Fig. 49, Sheet 15; Fig. 50, Sheet 16.

This feature of back lash is also taken up by a back lash pawl 78, see Fig. 77, Sheet 21, held by a spring 78A into engagement with disc 59 on hollow shaft 58.

The pawl 78 is released from engagement with disc 59 by a cam bar 79 which extends transversely and has its turned over end 79A secured to the movable frame of the strap guideway, see Figure 1, so that as the guideway opens for draw-

ing back the strap, the pawl 78 is released from clutch plate 59 to permit its reverse movement.

These back lash mechanisms are provided to prevent the recoil of the feed out wheel on completion of the feeding out of the strap into the strap guideway when the feed wheel stops suddenly on completion of the feeding out movement. This back lash, if not prevented, would draw back a small part of the strap fed out.

The strap S indicated as a single line in all figures in which it appears, excepting Figure 43A, and Figures 60, 61 and 61A, is supplied to the machine in the form of a ribbon coil and is mounted on a reel at the back of the machine being the left of Figure 1.

This strap reel is supported on inclined frame bars 80 that are connected at their lower ends to the main frame by brace bar 81, and at the top by horizontal bars 82 (Fig. 3). A cross bar 83, see Figures 73 to 75 inclusive, Sheet 21, supports by a short shaft 84, revolving spider arms 85 connected to a hub block 86. The arms 85 are connected at their outer ends on their under sides by a ring 87 and central support for the strap coil is provided by blocks 88, on the inner ends of the arms 85.

Ribbon coils of strap come from the factory, bound by wire ties, in a flat disc and when the wire ties are removed from the disc coil, care in handling must be exercised to prevent the coil from being deformed and snarled up. By the arrangement of the reel the ribbon coil can be placed on the reel while bound in shape and the binding wires removed from the coil in the region between the arms 85, and this is done when the top cover plate 89 of Figure 75 is removed or off as shown by Figure 73.

When the binding wires of a coil of strap are removed the coil of strap tends to unwind like a clock spring and assume the position of dotted lines 90 in Figure 73, Sheet 21, and to prevent the coil of strap from escaping beyond the arms 85, there is provided a fixed ring 91 supported by brackets 92 in frame pieces 80. A notch 93 in ring 91, permits the strap to be drawn out of the fixed ring 91 to the feeding mechanism in the line 94 of Figure 73, Sheet 21.

As the strap is drawn from the reel it has a tendency to climb out of a flat coil, and to prevent this a cover plate 89 is placed on top of the coil and is held in place by stud bolts 95. The distance between the top of the arms 85 and the top of fixed ring 91 is a little less than the width of the strap used with the reel, so that the cover plate acts as a brake to the unwinding of the coil of strap. The nuts on the stud bolts 95 are not set down tightly, allowing the cover plate 89 which is usually made of wood to float on the surface of the flat coil of strap, to act as a brake on the coil. The braking action of this plate 89 is increased as desired by the removable key 96 bearing on the cover plate 89 and supported in shaft 84, which is adapted to slide up and down and is connected to a rocker shaft 97 by an arm 98 connected to the lower end of shaft 84. A weight connected to arm 99 as desired, is adapted to move the rocker shaft 97.

When a coil of strap is first put on the reel and the binding wires removed from it, the coil unwinds more or less to the position shown in dotted lines 90 of Figure 73. But as the strap is drawn from the coil the braking action of the plate 89 usually causes the coil of strap to rewind and come snugly to contact the spool blocks 88 and revolve the reel as the strap is drawn out, thus keeping the strap in better service shape.

As the strap is drawn from the reel it passes through a braking device indicated in Figure 1, as 100, and shown in Figures 38 and 38A, Sheet 13.

This brake has a base block 101 supporting a channel piece 102 through which the strap S slides. Friction is applied by a block 103 carried by a rod 104, on which is mounted a pressure spring 105. The block 103 may be lifted free of the strap by the milled head 106 on rod 104.

This brake device 100 is fixed to a horizontal rail bar 107 supported from the main frame by a post 108 and a front post 109, see Figure 13, Sheet 8.

From brake 100 the strap S is trained between guide rollers 110, Fig. 1 and over between guiding fingers 111 to and over a movable pulley 112 and thence back to a fixed pulley 113 and then over a movable pulley 114, and then around a guide bar 115 to the feed roll 57, see Fig. 1. On guide bar 115 there are a series of anti-friction rollers 116, over which the strap S passes.

The pulleys 112, 113 and 114 act as a strap supply feed device and a slack strap take-up device for the feed roll 57, and this is accomplished by pulleys 112 and 114 moving away from pulley 113 and returning thereto. Pulleys 112 and 114 are mounted on a carriage 117, see Fig. 13, 13A, Sheet 8, Fig. 17, Sheet 9, composed of a plate provided with rollers 118, rolling on the horizontal rail bar 107. In the position of carriage in Figures 1 and 3, the carriage 117 is not back to its full retreat as feed out limit. The carriage 117 is connected to a horizontal sprocket chain 119, by bolts 120 into blocks 121 integral with the carriage. The sprocket chain 119 is trained over a tightener sprocket 122 adjustable by a bolt 123 to keep the sprocket chain 119 taut. The chain 119 is trained over and driven by a sprocket 124 on a shaft 125, suitably mounted to the frame and driven by a vertically arranged chain 127, on the right side of the machine, and driven by a sprocket 128 on shaft 54, being the shaft that is driven by the draw back pinion 52, see Fig. 3, Sheet 3.

Thus as the strap in the guideway is drawn back to contact with the package indicated by dotted lines in several of the figures, the carriage 117 with the pulleys 112 and 114 move from position shown in Figures 1 and 3 and to the front of the machine taking up strap that is drawn back by the feed wheel 57 until the strap snugly surrounds the package and as the movement of the carriage 117 is sufficient to take up the full length of strap that is fed out into the strap guideway, the carriage 117 draws from the stock of strap on the reel a length of strap each time that is consumed on any size package. The friction on the strap coming from the coil on the reel being greater than that on the part of the slack strap drawn back by feed wheel 57, causes this slack to be first taken up by the forward movement of the carriage and the balance of length of strap is taken from the coil on the reel.

When the feed wheel 57 starts to feed the strap into the guideway the carriage 117 is in the dotted position shown in Figure 13, Sheet 8. The full line position of carriage 117 in Figure 13, is about midway of its movement, which might be the position when the slack of the strap has been taken up and the drawing of strap from the coil on the reel is about to commence.

As feed wheel 57 feeds out the strap the carriage 117 moves back farther than the position of

Figs. 1 and 3 in time with the feed wheel 57 to supply the right length of strap as fed by the feed wheel 57, so as not to require the feed wheel to draw any strap from the coil on the reel, thus giving an unrestricted supply of strap for the feed wheel while driving the strap endwise through the closed strap guideway, permitting the substantially full power of contact of feed wheel 57 with the strap for thrust to overcome the resistance of the strap against being pushed through the guideway.

Were the feed wheel 57 required to pull the strap from the coil on the reel as well as to push it through the guideway, the contact pressure of the feed wheel would necessarily be much greater and likely to damage the protective coating usually used on straps of this kind. Furthermore such double duty of the wheel 57 would be apt to deliver short lengths of strap to the guide in some cases, due to variation in friction of the strap. These difficulties are avoided when the feed wheel receives its supply of strap with little or no resistance as provided by the mechanisms above mentioned.

The strap feed wheel 57 is assisted in driving the strap by a coacting small feed wheel 129 on a shaft 130 suitably adjustably mounted to clamp the strap S to the feed wheel 57, by means of bolts 131, see Figures 1, 3, Sheets 1 and 3, and Fig. 7, Sheet 6, Figure 10, Sheet 7, adapted to adjust the shaft 130 to the feed wheel shaft 53. A pinion 132 on shaft 130 engages the gear 62 on shaft 53 and causes the two feed wheels 57 and 129 to drive the strap between them.

From the feed wheels 57 and 129 the strap passes forward through a closed passage way indicated by 133, Fig. 59, Sheet 18, out over a fixed cutter blade 304 and up through a curved guideway 135 through the upper gripper 136 to the entrance of the strap guideway at 137.

The strap guideway is composed of a fixed member and a movable member made up in pieces, having a rectangular outline with curved corners, but amounting in each case to a single unit, the fixed member being mounted in the supplemental frame bars 19, 20, 21, 22 and 23 and the movable member being mounted to a rectangular frame composed of a top bar 138, bottom bar 139, outer vertical bar 140 and inner vertical bar 141, see Figure 13, Sheet 8, Figs. 15 and 15A, Sheet 9.

The guideway is formed by the fixed bars 142, secured in the supplemental frame bars before mentioned and having the lip portion 143 and a shoulder 144. The movable portion of the guideway is composed of the bars 145 having the lip portion 146 and shoulder 147, making when closed a rectangular opening as shown by Figs. 15A, Sheet 9, and Fig. 56, Sheet 17.

The movable portion of the guideway is connected to the rectangular frame by suitable brackets 148, at intervals around the guideway, see Fig. 13A, Sheet 8. The rectangular frame is supported in place by a series of blocks 149, fastened to supplemental frame bars 19 and 20 to permit the rectangular frame to be moved to open and close the strap guideway. The movement of the rectangular frame is produced through a series of rack bars 150, fastened to its bars 138 and 139 and engaged by gears 151 on an upper horizontal shaft 152 and a bottom shaft 153. These shafts are revolved by gears 159 engaged by rack 154 for upper shaft and 155 for lower shaft, see Figures 13, 13A, Sheet 8, Figs. 14, 15 and 16, Sheet 9. The vertical racks 154 and 155 are fixed to a vertically sliding bar 156 having a hinge pin bolt 157 connecting it to an offset bar 158, hinged to a lever 160 provided with a cam roller 161, working in a cam track 162, in main cam gear wheel, see Figure 4, Sheet 4, Figures 7 and 8, Sheet 6. The cam lever 160 is hinged to the cross shaft 163 at rear of machine.

At the proper time the cam track 162 opens and closes the strap guideway, as desired. The curved guideway 135 at the entrance 137 of the strap guideway, is fastened by a block 164 to the rectangular frame bar 141 and is moved thereby to the dotted position shown in Fig. 58, Sheet 18, to clear the overlapped strap ends to be acted upon by the sealing jaws.

The normal position of the machine at the commencement of a strapping operation is with the strap guideway closed and the strap extending therethrough in the form as per diagram Fig. 13B, Sheet 8, and the position of the slack take-up carriage 117, in position of retreat with the free end P of the strap, see Fig. 59, Sheet 18, held fixed in the lower gripper 165, and the body of the strap embraced but not gripped by the upper gripper 136. The grippers 165 and 136, see Figures 9 to 12 inclusive, Sheet 7, and Figures 58 to 62 inclusive, Sheet 18, may be any suitable gripping mechanism adapted to grip and hold the strap from endwise movement and I prefer to make them in the form of cross bars with inclined ends, which bars slide endwise in guideways and in blocks mounted to move up and down in the application of secondary tension of the strap on the package. The lower gripper 165 and upper gripper 136 are composed of cross bars 167 and 179, and are provided with narrow flanges 168 at the gripper ends of the slide in cross guideways 169 in blocks 170 and 180, which blocks are provided with vertical grooves 171 across the guideways 169 and these grooves amount to a strap guideway across the blocks 170 and 180 and the ends 172 of the gripper cross bars 167 and are made flat and thin to cover as desired the grooves 171 of block 170 and 180 at the time that the strap is fed through the strap guideway. The bodies of the cross bars 167 and 179 adjacent to the flat end 172 are inclined in wedge form to act on the strap and wedge it against the bottom of the grooves 171 in block 170 and 180, as the bars 167 and 179 are moved to the left of the machine when the strap is to be gripped. The wedge portion of the bars 167 and 179 are milled or corrugated lengthwise to match a similar form in the bottom of grooves 171, to cause a firm grip on the strap as desired. The lower grip cross bar 167 is provided with a slot 173 (Fig. 2) at its right end, through which a flat headed bolt 173', passes and provides a pivotal mounting for the bar 167. This bar may be moved lengthwise across the path of the strap S, in the guideway bar to grip or release the strap, as desired.

The block 170 is secured by screws or other means to a cross bar 175. This bar extends to the rear side of post 9 and is hinged thereto by the inner end of bolt 173'. The bar 175 is hinged by a bolt 176 to a vertical bar 177 extending down to a sliding cam block 178, that raises and lowers the end of bar 175 and the gripper 165, to produce the secondary tension. The gripper cross bar 167 hinges about a flat headed bolt 173' in post 9, in this movement. The upper gripper 136 is made substantially like the lower one just described. Its block 180 is secured to cross bar 181 and bars 179 and 181, are hinged on a flat head bolt 182, in frame post 9 in like manner to that of

the lower gripper. Bar 181 is hinged by a bolt 183 to a vertical bar 184, extending down to the aforesaid sliding cam bar 178, by which this gripper is moved up and down. The cross bar 179 of the upper gripper 136, is moved endwise by a rocker lever arm 185, the end of which is engaged by a block fastened on bar 179 on each side of the arm in a manner to allow the bar 179 to move slightly up and down and at all times be under the endwise control of arm 185. Arm 185 is fixed on a vertical rocker shaft 186, mounted in bearings blocks in the frame and is provided with a cam roller arm 187, (Fig. 3) carrying a cam roller 188, which is engaged by an endwise cam 189 that positively moves the upper gripper cross bar 179 in covering the strap guideway in block 180 and for gripping the strap in said block 180.

The return movement of upper gripper cross bar 179 is by a return spring 190 abutting against the cam roller arm 187 and a block 191, and the lower gripper cross bar 167 is moved in a manner similar to that of the upper gripper cross bar, by an offset ended rocker shaft arm 192 fixed on a tubular rocker shaft 193 mounted over rocker shaft 186, and sustained in vertical position by a suitable collar 193' on said shaft 186. On the lower end of the tubular rocker shaft 193 there is fixed a cam roller arm 194 carrying a cam roller 195 which is engaged by a side cam 196 on the right side of main cam and gear wheel. The return of the lower gripper cross bar 167 is by a spring 197 abutting against the cam roller arm 194 and a block 198 on the frame. The timing of the said side cams 189 and 196 that move the upper and lower grippers is such that when a strap is being fed through the strap guideway the flat ends of upper and lower gripper cross bars 179, 167 cover the vertical grooves in the blocks 170 and 180 to make a closed guideway portion for the strap across said blocks 170, 180. Then on completion of pushing the strap S into the guideway, the lower gripper cross bar 167 is moved by its cam to cause its wedge portion to grip the strap end and hold it firmly against retreat until the package is strapped, whereupon the grippers are released, the flat ends of both gripper cross bars clearing the grooves in blocks 170 and 180 to permit the discharge of the sealed package.

The upper gripper timing differs from the lower gripper, in that its flat end portion covers the strap until it is drawn out of the strap guideway and drawn tightly on the package, whereupon the gripper cross bar is moved to cause its wedged end to grip the strap and hold it during the application of the secondary tension of the strap on the package.

The seal clips that are used for making the joints, are indicated by C, see Figs. 2A and 2B, Sheet 2. The seals are made from a coil of flat metal band B, supported edgewise on a horizontal flat plate 199, see Fig. 3, Sheet 3, and having a curved boundary flange 200 for confining the coil of band B, which is mounted thereon. The end of the band B is passed out through an opening in the boundary flange 200 and trained through a guide 201, Fig. 3, to a set of feed rolls composed of a large roll 202 and a small feed roll 203, see Figures 21 to 37 inclusive, Sheets 11 to 13. The roll 202 is journaled in fixed bearing blocks 204 supported on the left front frame corner post 7. The roll 203 is a small roll journaled in an adjustable bearing block 205, hinged to the fixed bearing block 204 and adjustable to clamp the band B to large roll 202, by means of a screw 206 which extends through the post 7.

The large roll 202 has a rachet 207 fixed on its shaft which is driven by a pawl 208 on a lever 209, hinged to a reciprocating bar 343, that at the right intervals moves the roll 202 to feed out a length of band B of right width to make a seal C. A delay pawl 210 prevents back lash of the ratchet. The band B is as wide as the seal is long.

The end of the band B is guided by blocks G, to pass over a fixed cutter blade 211 and abut against a block 212 that assists in insuring the right length to be cut from the band for a single seal and also helps to hold the cut off piece in place to be fed down to forming dies below. The several steps of the formation of the seal clips are indicated in outline by Figs. 13C and 13B, Sheet 8, wherein B indicates the band blank for a seal clip. D is the blank after being formed in channel shape with straight flanges on its two edges, and C a finished seal clip as shown in Figs. 2A and 2B, Sheet 2. CD is an intermediate position of the seal just before it enters the sealing jaws to be carried by them to place on the overlapped ends of the strap.

The operations last above described are performed by a set of fixed dies, Figs. 27 and 28, Sheet 12, a set of moving dies, Figs. 32 and 33, Sheet 13, and a feed bar, Figs. 34, 35 and 36, Sheet 13, that feeds the clips down through the dies into the sealing jaws. The fixed dies are fastened to the inside of supplemental frame bar 22 at the left corner of the machine, and in general terms are called the male dies, the central male portion 213 extending through the several dies and stages of movement of the seal clip by the feed bar 214. This portion 213 has a central vertical groove 215, into which the feed dogs 216 of feed bar 214 enter and slide in feeding the clips downwardly to the sealing jaws.

The movable dies are carried on a swinging bar 217, hinged to a block 219, fastened to the top frame bar 19 and normally held inclined in inactive position, as shown by Fig. 22, Sheet 11, by a spring 220, see Fig. 23, Sheet 11, which spring holds the bar when idle against a movable stop block 221. The stop block 221 is hinged to a stud 222, fixed in the lower member of fixed bearing block 204 of large feed roll 202. A spring actuated locking pin 223, see Fig. 29, Sheet 12, holds the block 221 in service position. When the bar 217 with its dies are taken out of the machine for any purpose a latch 224 hinged at 225, Figs. 21 and 22, which holds the hinge pin 218 in place, is swung clear of the pin 218 and it is withdrawn, but before this is done the stop block 221 is dropped to dotted position as shown by Figure 25, Sheet 12, and then on withdrawal of hinge pin 218, and unhooking either end of spring 220, the bar 217 with its dies may be taken out.

The female dies of bar 217 are provided with slots 226, into which the feed bar 214 projects when the dies are set on the seal clip stock.

The feed bar 214 is at all times held closely to the face of the male portion 213 of the fixed dies by a series of clasp or guide blocks 227, see Figs. 22 and 22A, Sheet 11, and the lower one of the guide blocks has mounted thereon a spring finger 228, see Fig. 22, Sheet 11, which holds the finished seal clip from gravity displacement when in the stage CD, as indicated by Figs. 13C and 13B on Sheet 8.

The dies in Figure 30, Sheet 12, cut off the blank from the band B, after the end of the band B has been fed in place against abutment block 212. The blank passes the feed bar 214 in the

notched side 215, see Figs. 34 and 35, Sheet 13, when the feed bar 214 is down. At the same time the dies of Fig. 31, Sheet 12, turn the sides of a blank to straight flanges forming a channel shaped blank and the dies of Fig. 37, Sheet 13, press the straight flanges of a blank to the curved flaring shape shown by Figure 2B, Sheet 2, thus completing the shape of the seal clip there. A finished seal clip is pushed to CD position and at the same movement a finished seal clip is pushed from CD position into the embrace of the sealing jaws, as indicated by Fig. 43A, Sheet 14.

The dies in Figure 37 that crimp in the flanges of the seal clip C are provided with sliding blocks 407, held in place by screw bolts 408 in slots in the blocks 407. The blocks are pushed sidewise by the beveled flanges 409 of a block 410 fixed to swinging bar 217. The blocks 407 are retreated from the contact with the flanges of the clip seal C by springs 411.

The feed bar 214 is reciprocated vertically by the cam arm 160, controlled by cam track 162 before described, the outer end of which, see Figs. 7 and 8, Sheet 6, is connected by hinge pin 229 to a vertical bar 230 offset at its top 231, see Figs. 21 and 22, Sheet 11, to extend above the feed bar 214 to which it is secured by nuts. Thus synchronously with the opening of the strap guideway before described, the feed bar 214 feeds down and delivers into the sealing jaws a full formed seal clip ready to embrace the strap ends.

The feeding dogs 216 of feed bar 214 are held in feeding position by little springs 232, which allow the dogs to spring back and clear the seal clip pieces on the up stroke of the fed bar 214. To prevent the dogs 216 from pushing up the several pieces of seal clip during the up stroke, a pin 233 is provided on the upper part of male portion 213 of male dies, pin 234 at the side of male portion 213, and spring pins 235 and 236 in top of male portion 213, see Fig. 27, Sheet 12.

The said pin 234 engages a flange of the formed channel clip above the spring pins 235 and 236, and prevents any tendency of the clip to move upwardly. The pin 233 performs the same function for the blank from which the clip is to be formed. The spring pins 235 and 236, located at progressively lower positions are taper headed and are depressed under the clips as they are forcibly fed down by the dogs of the feed bar.

The positive clutch, see Fig. 76, Sheet 21, having the clutch disc 66 with the pins 69 that engage holes 60 in clutch plate 59 is controlled by an edgewise cam 237 in the right side of the main cam and gear wheel adjacent to the rim of the wheel, see Figure 3, Sheet 3, Fig. 51, Sheet 16; Figs. 71 and 72, Sheet 20. A cam roller 238 is engaged by the cam 237 and is mounted on a cam lever arm 239 hinged at 240 to the rear cross frame bar 1. The roller 238 is held against cam 237 by a spring 241, see Fig. 71, on a rod 242 connected to a block 243 on cam lever 239. The other end of spring 241 and rod 242 are engaged by the frame member 4. The outer end of cam lever 239 is hinged to a link 244 hinged to a vertical lever 245, mounted on a shaft 246 which is suitably mounted in frame posts 9 and 10, see Fig. 3, Sheet 3. On shaft 246 there is fixed a yoke lever 247 having a yoke 248 which engages the pintles of gimbal ring 249, which moves the clutch disc 66, as before described.

The strapping table is adjustable vertically in order to arrange the location of the sealed joint of the strap in the middle of the side of the package as may be desired. To provide for this the table is supported by a frame having the vertical sliding bars 250 at the right and 251 at the left connected across at the bottom by a short bar 252 and at the top by a short bar 253. This part of the frame is provided with gibs that engage the inside edges of the front corner posts 7 and 9 to hold the table in vertical sliding arrangement.

The short bar 253 is connected by a sprocket chain 254 trained up over and fixed to a sprocket 255 on a windlass shaft 256 mounted in bearings at the top of the frame, and provided with a ratchet 257 and pawl detent (not shown). An operating crank handle socket 259 is provided on the left end of the shaft 256, whereby the operator may raise and lower the table as desired.

The table frame bars 250 and 251 are provided with horizontal forward extending lever ends 260 and 261 respectively, which ends are tied to the vertical bars by a diagonal bar 262 at right and 263 at left.

The strapping table is composed of a set of fixed plates 264 at right and 265 at left, supported on vertical posts 266, fixed in cross bars 267 and 268 fixed to the horizontal bars 260, 261. See Figures 18 and 19, Sheet 10, and Figs. 56 and 57, Sheet 17. The fixed table plate 264 is connected to be braced by the turned over ends 269 of the bars 262 and 263.

Mounted above the fixed table plates 264 and 265, there are the sliding surface plates 270 at right, and 271 at left and these plates are connected to blocks 272 which are connected by hinge pins to links 273, which are hinged to rocker shaft levers 274, fixed on a rocker shaft 275. On the right end of the shaft 275 is fixed a lever arm 276 connected to a link rod 277, which is connected by hinge blocks 278 to a rocker shaft lever 290, fixed on cross rocker shaft 163. The spring 303 on the end of the link rod 277 provides an elastic connection for this link to adjust for variation in the elevation of the table. On cross rocker shaft 163 is fixed a cam roller arm 280, which carries a cam roller 281, see Fig. 4, Sheet 4, travelling in a cam track 282, see Fig. 3, Sheet 3, in the right side of main cam gear wheel.

The sliding surface plates 270, 271 are provided with vertical portions 283 and 284, that move with the surface plates and move the package outward from strapping position after it has been strapped. These vertical portions 283 and 284 enter between the frame posts and behind the front faces of the posts, when the strap is being sealed.

Fixed in suitable guideway blocks 285, fixed to the table plates 264 and 265 are mounted a series of reciprocating bars 286, 287, 288, 289, reading from right to left from front of machine, see Fig. 19, Sheet 10, and Figs. 56 and 57, Sheet 17, which bars are provided with a series of screw threaded holes by which angle guide bars 290 and 291 are secured in position as desired by hand bolts 292.

The bars 286, 287, 288 and 289 are connected by links to rocker shaft levers 294, 295, 296, 297, which are fastened to a rocker shaft 298, held in bearings fixed to the front cross bar 268 of the table frame. The rocker shaft lever 294 is connected at 299 to a rod 300 extending rearwardly and connected to rocker shaft lever 290' by a block 301 hinged in lever 290'. The rod 300 extends through the block 301 and is provided with a spring 302 for elastic adjustment of the guide clamping bars 290 and 291 in clamping the package on the table. Thus the one cam track 282 in main cam gear wheel actuates both the sliding

surface plates 270 and 271 of the table and the angle clamping guide bars 290 and 291.

The springs 303 and 302 on connecting link 277 and rod 300 accommodate the variations that occur when the table is raised and lowered as well as to furnish elastic contact for the sliding surface table plate 270, 271 and the guide bars 290, 291.

The shear or cutter that cuts the body of strap on the package from the stock of strap is composed of a fixed cutter blade 304, see Fig. 5, Sheet 5, Fig. 59, Sheet 18, mounted in the front side of the strap passageway 133. This fixed blade 304 is a small sharp edged block as seen in Fig. 59. The movable cutter blade 306 is also shown in Fig. 59. This cutter blade 306 is fastened to a cross head 307 (Fig. 58) that carries the sealing jaws 308. The cross head 307 is mounted to slide in a guideway 309, supported by a short block 310 at front and 311 at rear, see Figures 39 to 43A inclusive, Sheet 14.

The cross head 307 has at its rear end a projection 312 (Fig. 39) through which project stud screws 313, which are fixed in the block 311. The screws 313 are provided with adjusting stop nuts 314 by means of which is obtained an exact location of the cross head 307 in its rear position to receive into the sealing jaws a seal clip C from the male portion 213 of the clip dies as previously described and in its forward position to locate the sealing jaws with the seal clip carried to exact sealing position with respect to the overlapped ends of the strap.

The cross head 307 has fixed thereto, by any suitable means, a block 315, to which is adjustably secured a hinge bearing block 316 provided with a bearing pin 317 by which the connection is made to the operating rocker shaft lever 318 (Fig. 9).

The adjustment of block 316 to 315 is by varying thickness of shims 319 held by a horizontal screw or other means of adjustable connection between the two blocks for the purpose of accommodating for errors in construction and wear of parts.

The rocker shaft lever arm 318 is fixed on a cross rocker shaft 320 mounted in the lower frame bars 3 and 4. A companion arm 321, see Figure 9, Sheet 7, is fixed to a hollow shaft 322, mounted on shaft 320. A cam lever arm 323, on which is mounted a cam roller 324 which a cam track 325 in the right face of main cam and gear wheel, see Fig. 3, Sheet 3; Fig. 51, Sheet 16, is mounted on the hollow shaft 322. The timing of cam track 325 is such that it moves the cross head 307 out to cut the strap and place the seal clip on the overlapped ends of the strap and holds the sealing jaws in position while the jaws are opened and closed, and then returns the cross head to retreated position whereat the next seal clip is fed to the sealing jaws.

After the strap has been cut and the seal clip C placed on the overlapped ends of the strap by the sealing jaws the cut end of the strap on the package is free from the strap passageway 133, as indicated by diagram 13C, Sheet 8, which permits the upper gripper 136 to draw down the strap end during secondary tensioning.

The grippers 165 and 136 are drawn together during secondary tensioning, by the sliding cam block 178, see Fig. 1, Sheet 1, Figs. 7 and 8, Sheet 6, Fig. 10, Sheet 7. This block has a slot 326 which engages a cam roller on the bar 177 to lift the lower gripper 165 as the cam bar 178 is moved toward and left of Fig. 7, Sheet 6. A cam slot 327 in cam block 178 engages a roller on bar 184 and draws down the upper gripper 136. The lower ends of bars 177 and 184 are slotted to pass over a pin 328 in a bracket 329, fixed to the frame post 7 in order to hold the bars 177 and 184 from swinging due to the action of the cam tracks.

The cam block 178 is fixed to a rod 330 that extends to the rear of the machine and passes through a block 331, which is hinged in a cam lever arm 332. The arm 332 is hinged at its lower end by a bolt 333 to the frame member 3. At the top of the region of cam lever arm 332, it is provided with an offset portion 334, see Fig. 4, Sheet 4, having a projection 335 carrying a cam roller engaged by a cam track 336 in the left side of main cam gear wheel, which moves the cam block 178 at the right time to produce the secondary tension as desired by the grippers 165 and 136. A spring 337 on rod 330 controlled by an adjustable nut 338 on rod 330 controls the amount of secondary tension put on the package strap.

The upper end of the cam lever arm 332 is connected by a pin 339 to a rocking lever 340, hinged at 341 to the brace bar 81. The upper end of lever 340 is offset and inclined and connected at 342 to a reciprocating bar 343, connected to lever 209 (see Fig. 23), which actuates the feed roll 202, that feeds the band B (see Fig. 25), out of which the seal clips are made. A resilient bent portion 344 (Fig. 3) in bar 343 acts as a spring to insure the full stroke of lever 209 against maladjustment of the parts as a stop limits the end of the stroke of lever 209 to insure a full feed of band B at each cycle of operation.

The sealing jaws 308 are composed of two members hinged to a common hinge pin 345, see Figs. 39 to 43A inclusive, Sheet 14, passing through a supporting block 346, which straddles the jaws, and is secured to the cross head 307 by screws 347. The jaws 308 are provided with rear legs 348 hinged at 349 to links 350 hinged at 351 to a reciprocating block 352, mounted in guideway 353 on cross head 307. A pin 354 in the rear of reciprocating block 352 is connected to a spring 355 connected to fixed block 315, and holds reciprocating block 352 normally in idle position back to cause an adjusting screw 356 to contact with fixed block 315, which permits the sealing jaws to be adjusted in relation to each other to hold by friction the seal clip C when fed into the embrace of the jaws 308 as shown by Fig. 43A, Sheet 14.

The mechanisms that form the seal clips C and the movement of the reciprocating block 352, which actuates the sealing jaws 308, are actuated by a pusher bar 358 which is provided with engaging lugs 359, notched to engage a cross block 360 on swinging die bar 217, see Fig. 1, Sheet 1, and Fig. 22, Sheet 11.

A downward projection 361 on pusher bar 358 is adapted to engage a rectangular hole 362 in reciprocating block 352 and move it to close and open the sealing jaws as desired. The pusher bar 358 is offset to pass by the blocks 315 and 316 on the cross head 307. A crank 363 on gear 48 mounted on a short shaft mounted in a supplemental bearing frame block 366, see Figs. 5 and 6, Sheet 5, and gear 48 are continuously driven by the shaft 30, as it revolves, so that the pusher bar vibrates an excess number of times in the strapping cycle than is needed to actuate the sealing and seal clip dies, as only a part of one of the strokes of pusher bar 358 is used to perform that work. Thus mechanism is arranged to engage and disengage the pusher bar 358 to

the swinging bar 217 and reciprocating block 352 as will now be described.

The front end of pusher bar 358 is hinged to a vertical link 367, see Figs. 63 to 65 inclusive, Sheet 19, connected to a lever 368 hinged to a bracket on the frame at 369 and connected at 370 to a link 371. This link is hinged at 372 to a lever 373, hinged at 374 to a bracket on the frame, connected at 375 to a vertical rod 376 extending down and connected at 377 to angle block 378 hinged at 379 to frame post 8 and connected at 380 to a link 381. This link is connected at 382 to a cam roller lever arm 383, having a cam roller 384 engaged by an edgewise cam 385 on the margin of the left side of the main cam and gear wheel. The cam roller is held against the cam 385 by a spring 386 on a rod 387, the end of which is supported in the frame bar 3. The timing of cam 385 is such that the front end of pusher bar 358 is dropped to working engagement and withdrawn therefrom at the right time to do the work above described.

The end of the strap as fed through the strap guideway assumes the position of P, Fig. 59, Sheet 18, which is curved away from the sealing position and to straighten this end up and hold it tightly on the overlapped other end of the strap into the seal clip and sealing jaw position of the strap and the seal parts shown by Fig. 43A, Sheet 14, there is provided a tapered ended block T, mounted on a swiping finger 388, on the end of a bar 389, see Figs. 2 and 3, 5 and 6, Sheet 5, Figs. 10 and 12, Sheet 7, Figs. 58, 59 and 62, Sheet 18.

The bar 389 is provided with a slot 390 at its right end which rides on and in the embrace of flat headed screw 391. The bar 389 is connected at 392 to a vertical link 393 that is connected to an angle block 394, hinged at 395 to the frame corner post 7. The upper leg of angle block 394 is connected by a link 396 (Fig. 21) to the top bar 138 of the movable frame that opens and closes the strap guideway. When the strap guideway is closed, the position of the swiping finger 388 is in the down position shown in Fig. 58, and as the strap guideway opens the finger 388 is raised to the position of Fig. 43A, Sheet 14, in the center of the sealing jaws, where it remains until the jaws seal finally the seal clip on the overlapped ends of the strap on the package. When this is completed the gripper cross bars 167 and 179 move as previously described, to the right to clear the strap on the package to permit the strap on the package to be cleared from the guideway. And the swiping finger must also be moved to the right and again returned to the left for a new cycle of operation. The endwise movement of swiping finger bar 389 is brought about by connecting bar 389 to rocker shaft arm 192, see Figs. 10 and 12, Sheet 7, by means of a block 397 hinged at 398 to said arm 192, and provided with a tip 399 engaged by block 400 on bar 389. The block 397 is connected to be moved by arm 192 toward the right of the machine in uncovering the strap guideway, which would be to the left of Fig. 12, by a clasp 401, which carries beneath it a spring 402, which permits the bar 389 to be held by a stop screw 403, see Fig. 2E, Sheet 2, to secure an exact register of the block T in the center of the sealing jaws and still permit a further movement to the left for the lower gripper bar 167 in gripping the strap, since the same rocker shaft arm 192 moves both bars 167 and 389.

On sealing and joining together the overlapped ends of strap it is necessary to hold the parts tightly together and in close contact with the jaws that act on them and to hold this position while the sealing is being performed and then remove the means for holding the parts together without damaging the sealed joint; the tapered ended block T does this work and is withdrawn crosswise from between the sealed joint and the strapped package without injury to either.

The movable carriage 117, see Fig. 13 and Fig. 13A, Sheet 8, is stopped to exact register at each end of its reciprocating movement by buffer blocks 404 on the carriage abutting against rubber faced abutment blocks 405 and 406 supported on rail 107.

The strap ordinarily used for strapping packages, has peculiarities that are more or less troublesome when it comes to handling the strap by automatic means. This sort of strap is usually very thin, perhaps the bulk of it that is used is not over fifteen to twenty thousandths of an inch thick, which creates sharp edges, particularly at the ends of the length cut off. The strap has various natural curves in it tending to bend in different directions at various portions of the coil. In addition, the strap has a general tendency to curve in one direction due to its initial coil shape. While the strap ordinarily looks as though it were straight on its edges, as a matter of fact there is a natural twist or camber illustrated by laying a long stretch of it on a flat floor flatwise and it will be seen that the body of the strap curves laterally with considerable irregularity.

The strap guideway as constructed and shown herein insures successful operation under high speed operation. This guideway being completely enclosed except adjacent the sealing position and the corners being suitably rounded the strap is forced to pass around the guideway under the action of the feed wheels. An important feature of this guideway is that the passage provided therein when the guideway is closed is relatively thin in the direction normal to the strap surface so that danger of the strap buckling under the endwise thrust is effectively obviated.

The operation of the machine in service is normally that the motor is running driving the wooden lagged pulley in idleness, the strap guideway being closed and a strap contained therein and with the end of the strap sticking out in a position of P, Fig. 59, Sheet 18, and the lower gripper gripping the end of the strap below P. The operator then places the package on the table, as indicated by dotted line in several figures with the portion upon which he desires a strap to be placed in the plane of the guide. Then he places his foot on the foot pedal which closes the clutch and causes the wooden lagged pulley to drive the main cam and gear wheel. The first action that takes place is that the sliding table surface plates and the angle guide bars move and clamp the package over to the frame side of the machine in sealing position. During this movement the strap guideway opens and the swiping finger moves up pressing the end of the strap over to a straight upright position. The feed wheel withdraws the strap back from the guideway to a tension on the package limited by the amount of friction as described and then the cross head which carries the sealing jaws and movable cutter blade moves forward, cuts off the strap in the passageway as described and pushes it over to contact with the end of the strap held in place by the swiping finger. The jaws have previously been loaded with a seal clip and they carry with

them the seal clip to a position around the overlapped ends of the strap. Immediately upon the arrival of the jaws with a clip to sealing position, a secondary tension is applied to the strap by the two sets of grippers moving toward each other as described. Upon the completion of this action the sealing jaws are closed on the strap completing the joining of the ends of the strap. The sealing jaws are immediately released and the cross head returned to its position of retreat. The grippers are released from the strap on the package and the package is pushed out to the position indicated by dotted lines in Figure 1. The angle guide bars being released from clamping the package, the package may be immediately removed and replaced by another one for another cycle of operation. Upon the pushing out of the package the strap guideway is again closed, a new seal clip is placed in the sealing jaws, a fresh length of strap is fed into the guideway and clamped by the lower gripper, and the drive of the wooden lagged pulley is declutched, bringing the main cam and gear wheel to rest awaiting the action of the operator to repeat the cycle of operation.

I claim:

1. In a machine for tying metal binders, the combination of means for supporting the object to be tied, guiding means for guiding the stock in passing the same around the object to be tied and having a gap adjacent the face of the object, means for feeding forward the stock in the guiding means to place the binder around the object with overlapping portions at said gap, means for gripping the binder, means for tensioning the binder, tie-forming mechanism including crimping jaws mounted to move in unison in and out of the gap, means for severing the binder from the stock at said gap, means for actuating the tie-forming mechanism to close the jaws in the gap and crimp the binder into a tie, and automatic means for controlling the tie-forming mechanism to form the tie after a predetermined tension has been developed in the binder.

2. In a machine for tying metal binders, the combination of means for supporting the object to be tied, means for feeding the stock around the object to form a binder with overlapping portions adjacent the side of the object, tying mechanism for forming a tie in the said overlapping portions, a driving member for driving the feeding mechanism to advance a predetermined amount of stock, and automatic means for normally detaining the driving member and for releasing the same to effect advance of the stock at the completion of the operation of the tie-forming mechanism.

3. In a machine for applying a metal binder around an object, the combination of a binder guide for guiding the binder stock around the object, a guide for the object enabling the object to be placed opposite the binder guide and advanced past the same, means for pulling the binder substantially taut on the object to form a binder, means for tying the binder, automatic means for advancing the stock into the guide while the object is moving away from the tying position, and means for stopping the cycle of movement of the machine after the stock has been advanced into the guide.

4. In a machine for tying metal binders, the combination of means for supporting the object to be tied, a frame disposed around the object, tie-forming mechanism for forming a tie in the band at a side of the object, feeding means for feeding a predetermined length of stock into the frame, with automatic means for starting the operation of the feeding means after the tie-forming mechanism has formed the tie, and means for stopping the mechanism of the machine after the feeding in of the stock has been completed.

5. In a machine for tying metal binders, the combination of means for supporting the object to be tied, guiding means for guiding the stock in passing the same around the object and having a gap adjacent the face of the object to be tied, a guide member for the stock located in the said gap when the stock is being advanced around the object, means for feeding forward the stock to place the binder around the object with an overlapping portion in said guide member at said gap, means for withdrawing the guide member, tie-forming mechanism, means for gripping the binder and for tensioning the binder, and means for actuating the tie-forming mechanism to form a tie in the binder at said gap when the guide member has been withdrawn.

6. In a machine for tying metal binders, the combination of means for supporting the object to be tied, guiding means for guiding the stock in passing the same around the object and having a gap adjacent the face of the object to be tied, means for feeding forward the stock in the guiding means to place the binder around the object with overlapping portions at said gap, a movable guide member located in the said gap and having a guide groove therein for guiding the stock across the gap when the stock is being fed into the guiding means, means for moving the guide member out of the gap, and means for forming a tie in the overlapping portions of the binder at said gap.

7. In a machine for tying metal bands, the combination of means for supporting the object to be tied, a guide frame disposed around the object, feeding means for feeding the stock into the guide frame to form a band extending around the object with portions of the stock overlapping, means for pulling the binder to place the same in tension, mechanism for forming a tie in the overlapping portions of the binder, and automatic means brought into action immediately after the removal of the tied object for controlling the feeding means to effect the feeding of the stock into the frame and means for automatically stopping the mechanism of the machine after the stock has been fed into the guide frame.

8. In a machine for tying metal binders, the combination of means for supporting the object to be tied, a frame disposed around the object, tie-forming mechanism for forming a tie in the band at the side of the object, and feeding means for feeding a predetermined length of stock into the frame, with automatic means for starting the operation of the feeding means after the tie-forming mechanism has formed the tie.

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