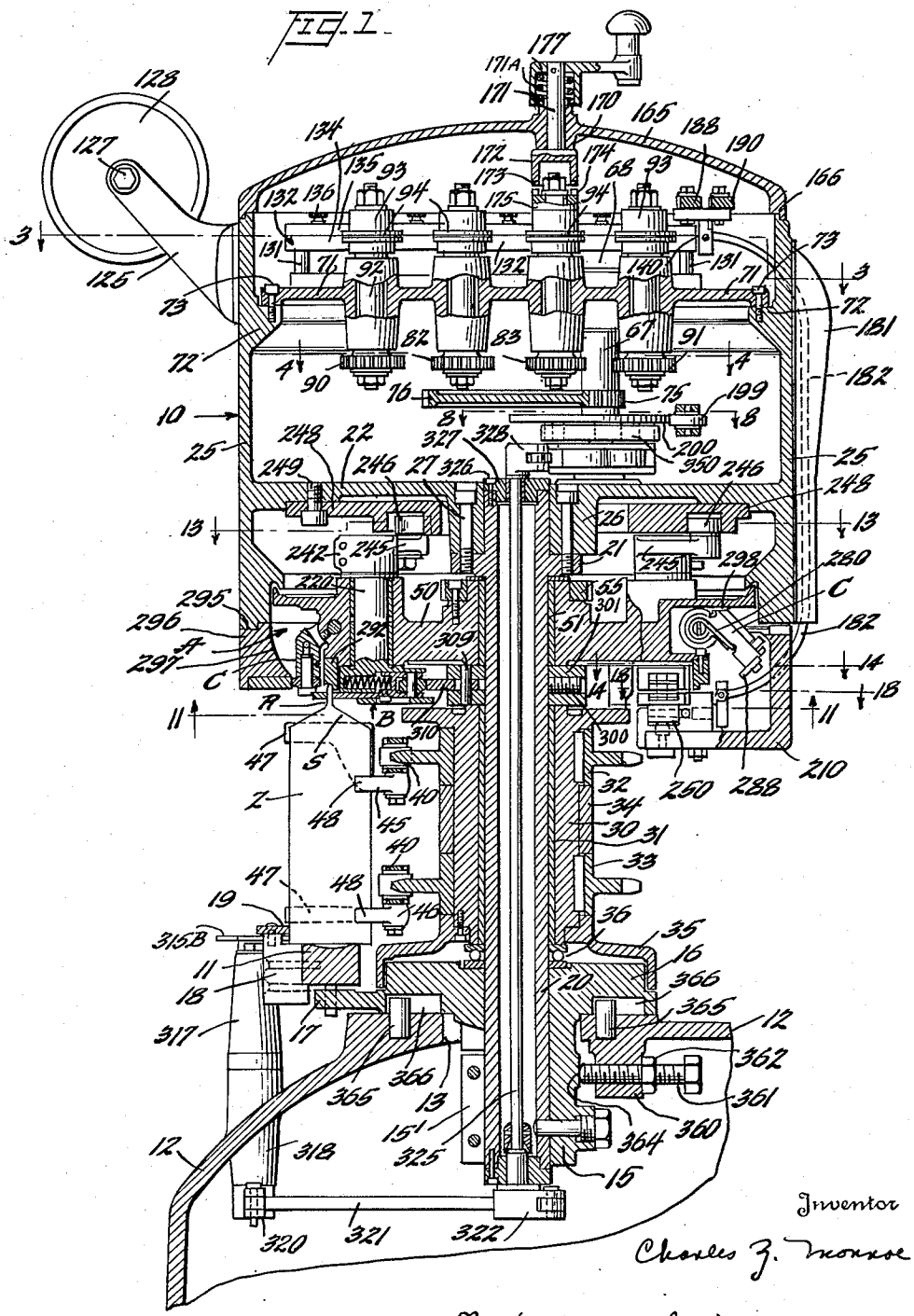
Sept. 12, 1950 C. Z. MONROE 2,521,935

STAPLING MACHINE

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FIG. 1.



Inventor
Charles Z. Monroe

By Watson, Cole, Grindle & Watson
Attorneys

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STAPLING MACHINE

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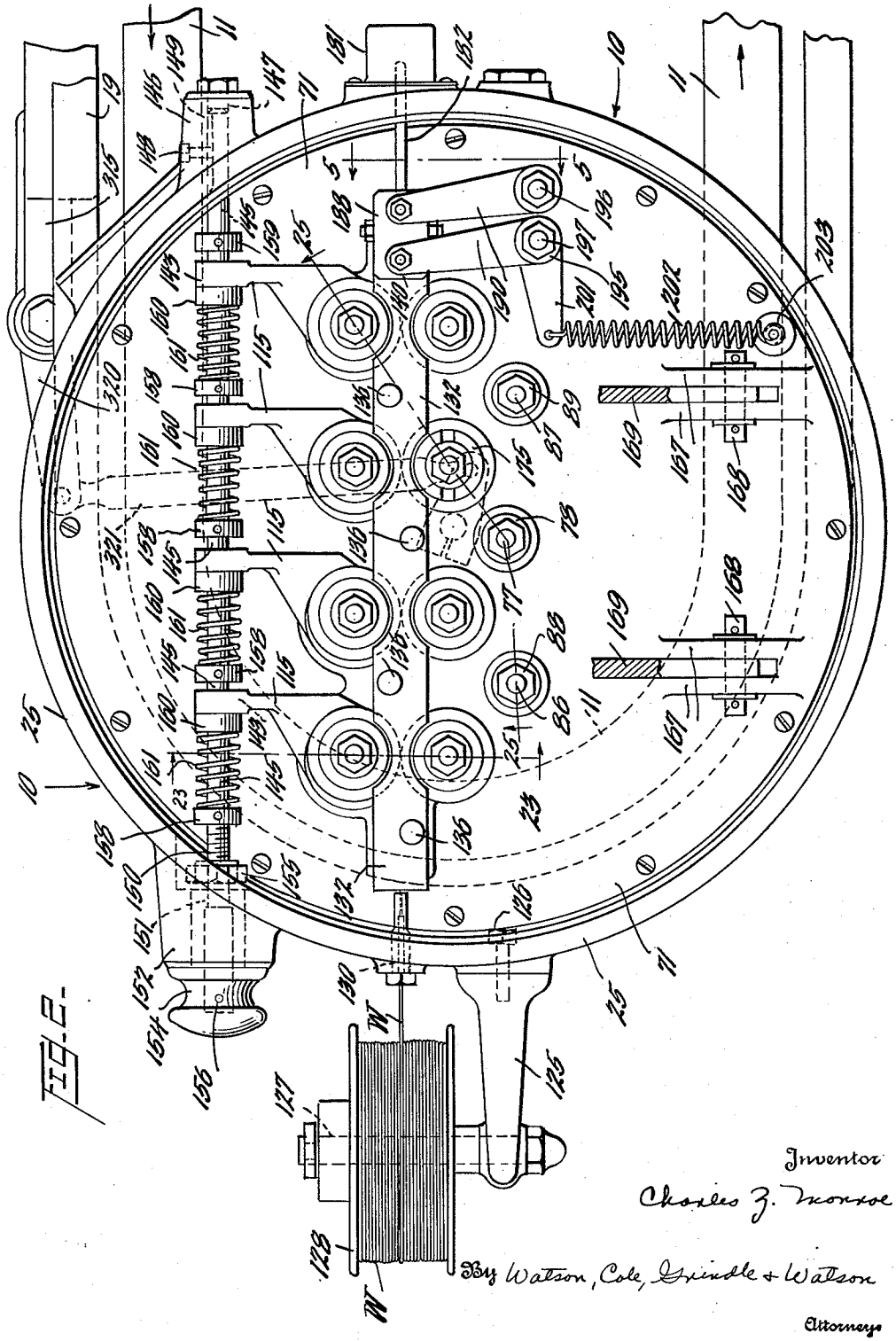


FIG. 2.

Inventor
Charles Z. Monroe

By Watson, Cole, Grindle & Watson
Attorneys

Sept. 12, 1950 C. Z. MONROE 2,521,935

STAPLING MACHINE

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FIG. 3.

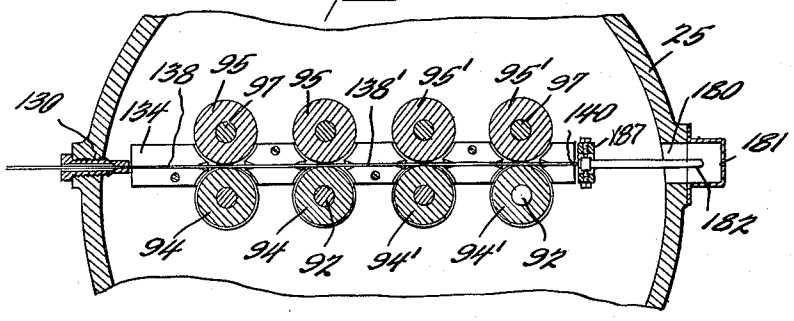


FIG. 4.

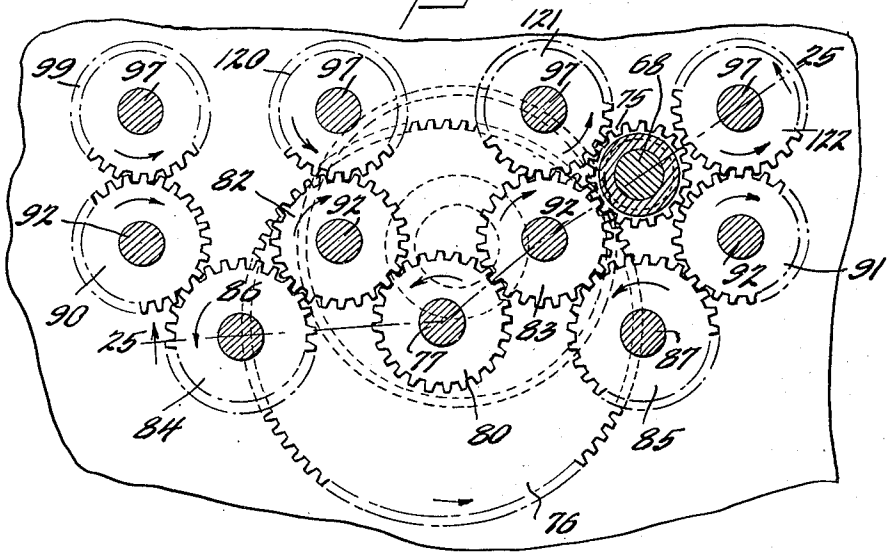
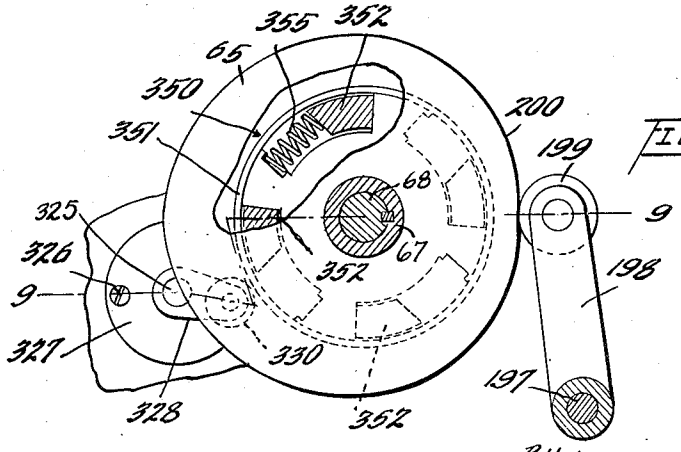


FIG. 8.



Inventor
Charles Z. Monroe

BY Watson, Cole, Grindle & Watson
Attorneys

Sept. 12, 1950 C. Z. MONROE 2,521,935

STAPLING MACHINE

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FIG. 5

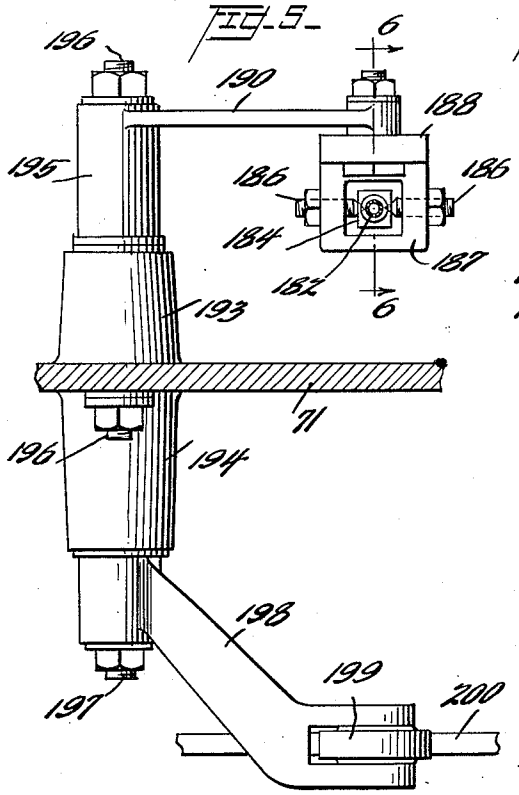


FIG. 6

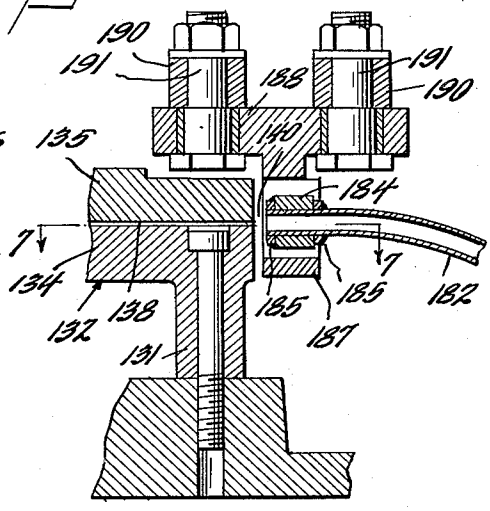


FIG. 7

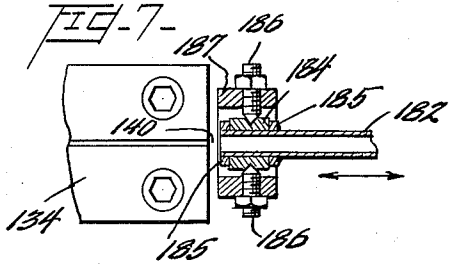


FIG. 17

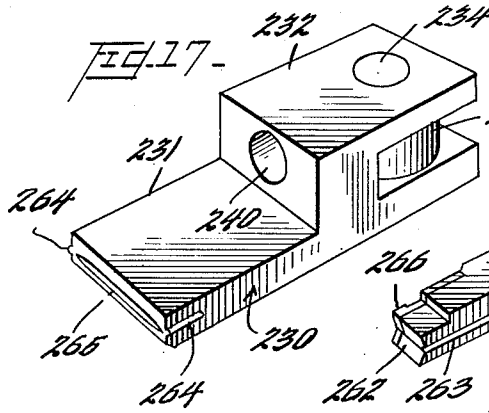
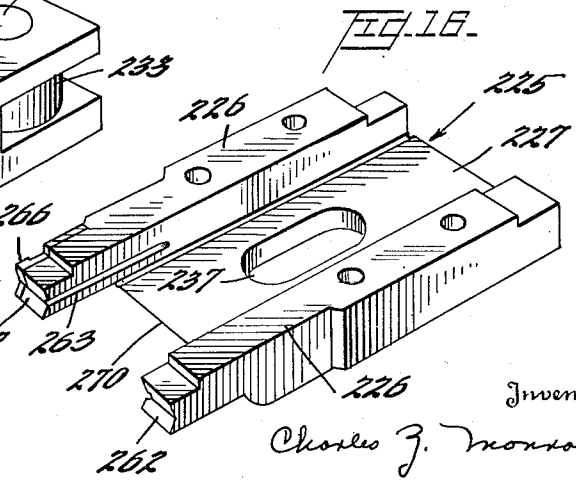


FIG. 16



Inventor

Charles Z. Monroe

By

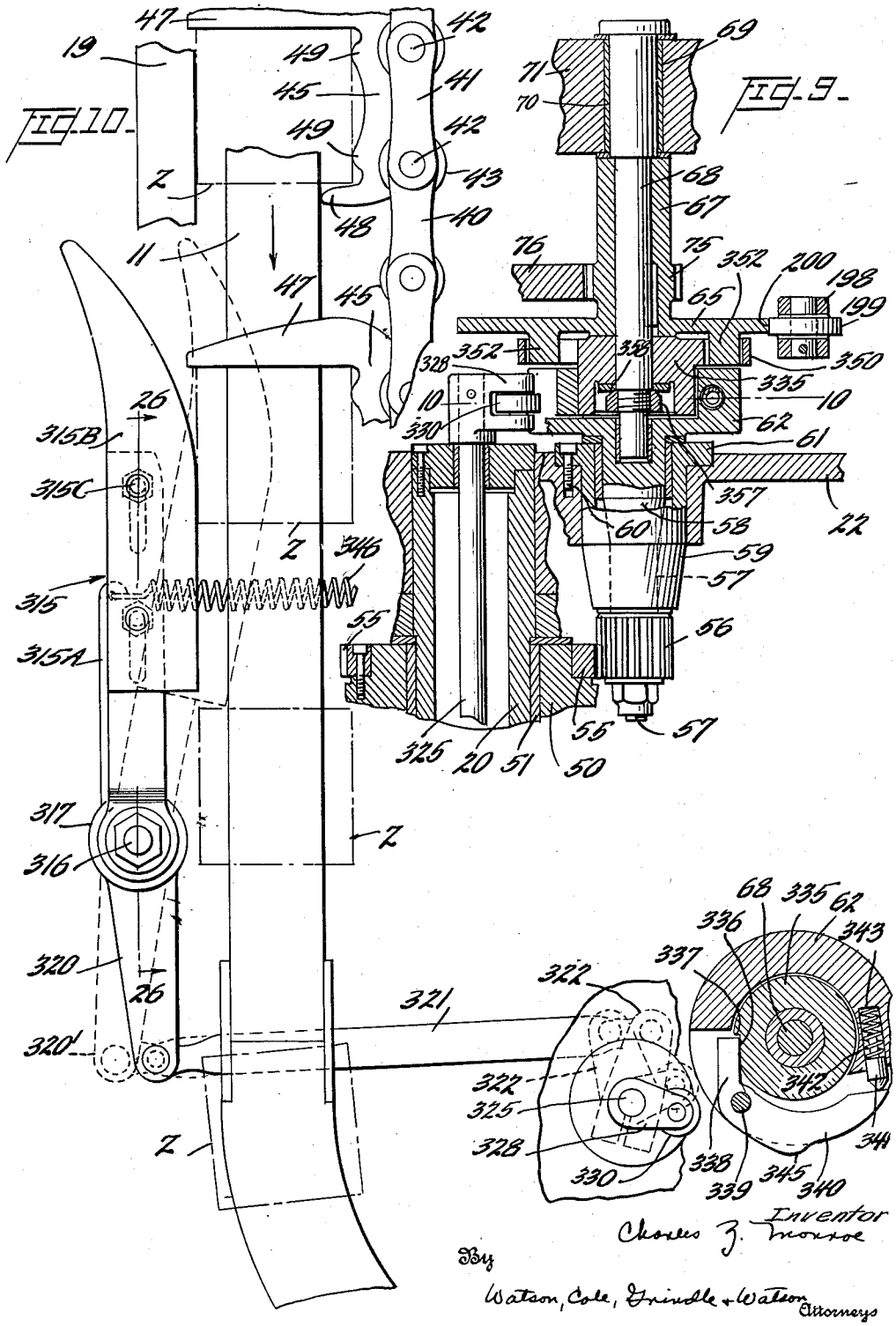
Watson, Cole, Grindle, & Watson

Attorneys

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FIG. 11.

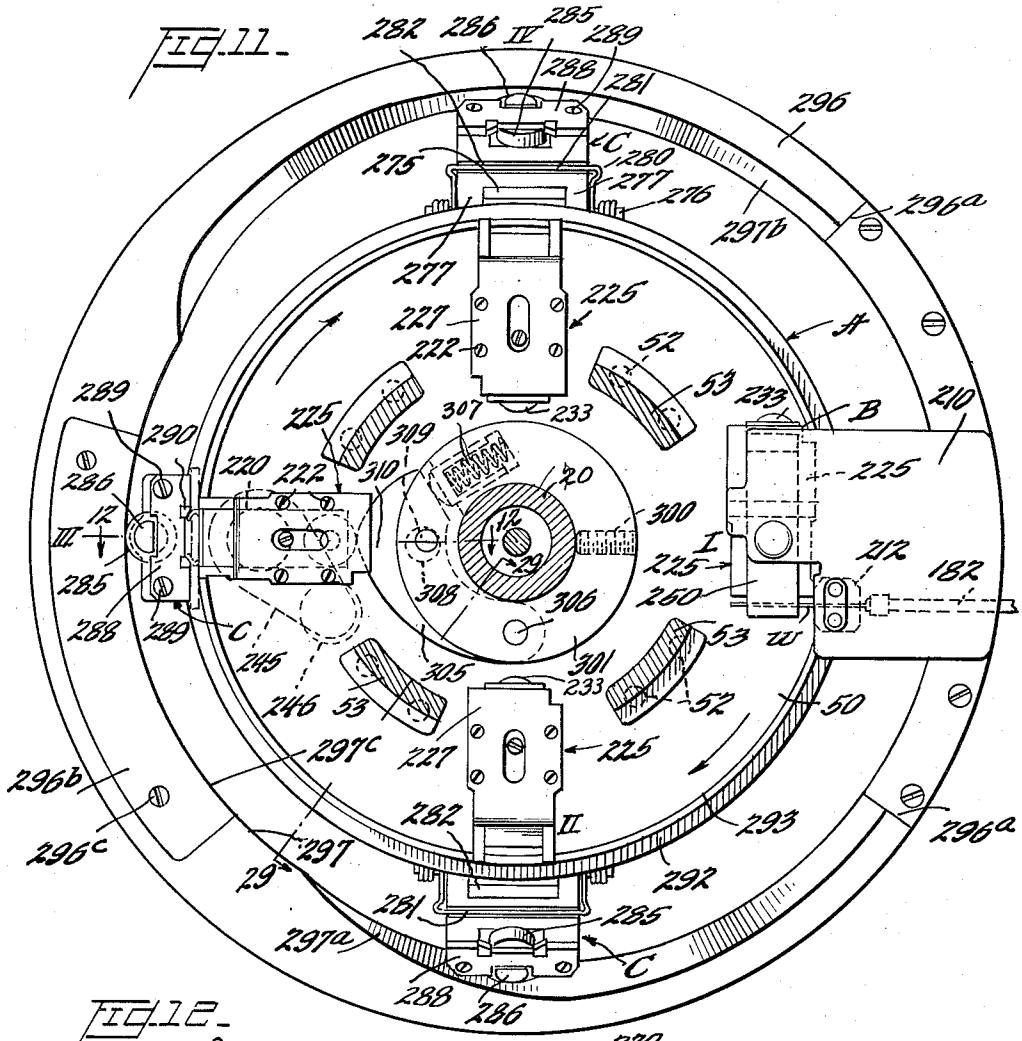
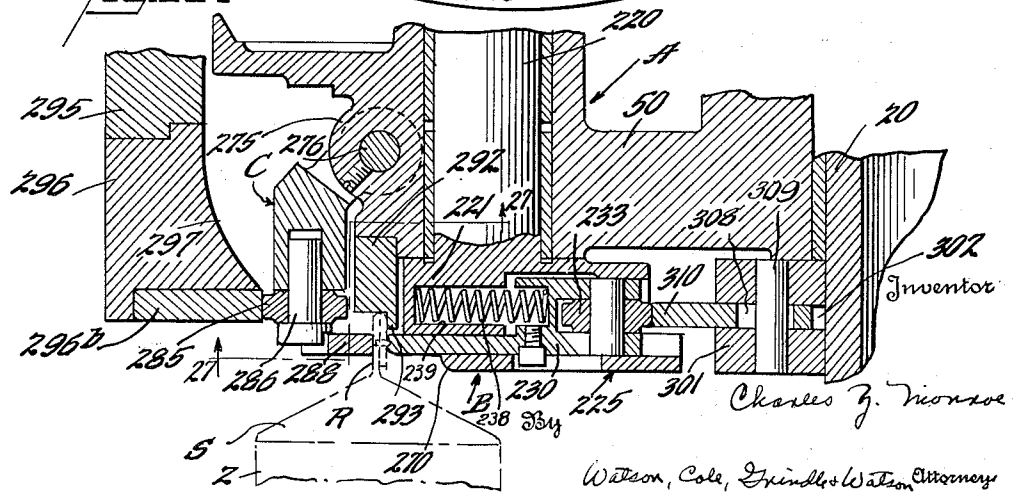


FIG. 12.



Inventor

Charles Z. Monroe

Watson, Cole, Grindle & Watson Attorneys

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STAPLING MACHINE

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FIG. 13.

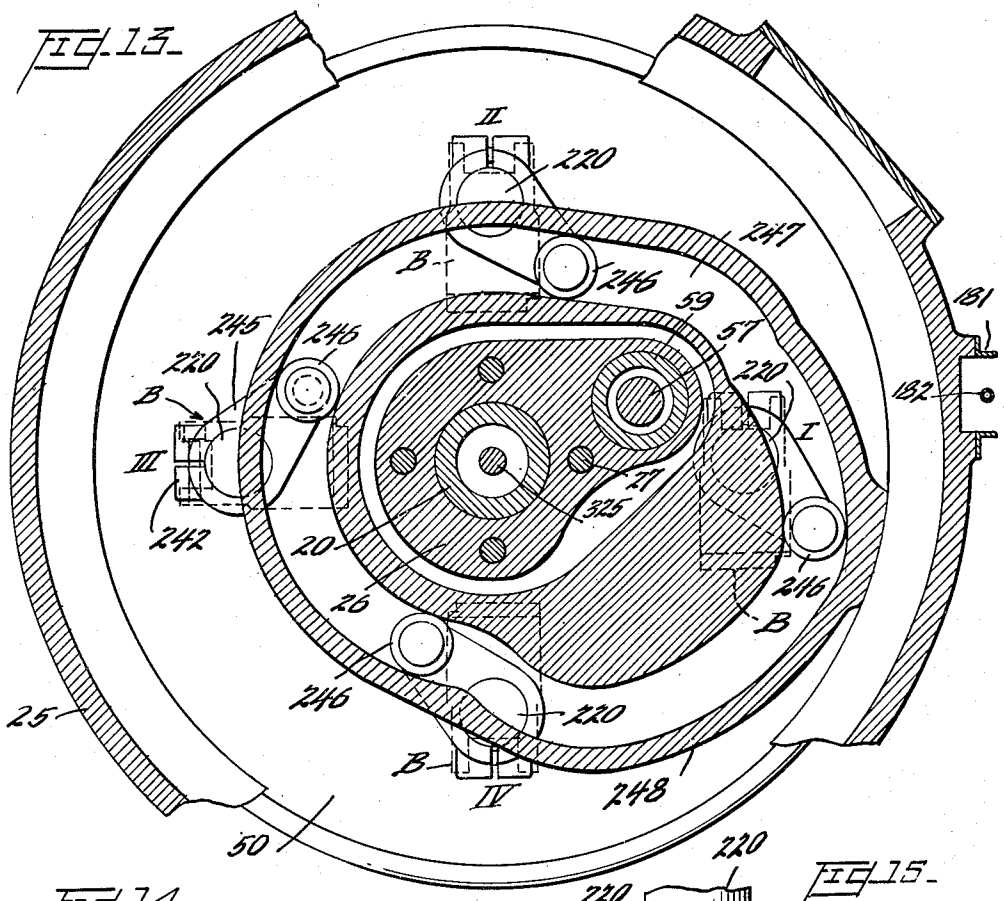


FIG. 14.

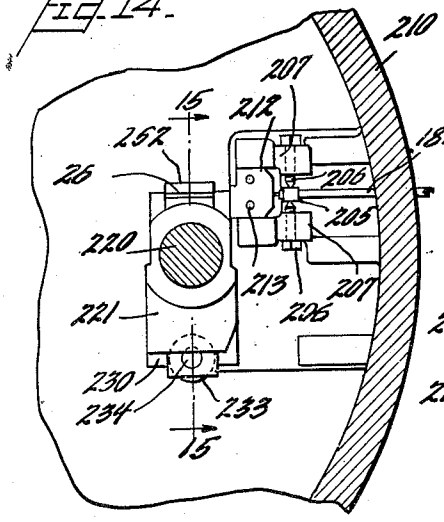
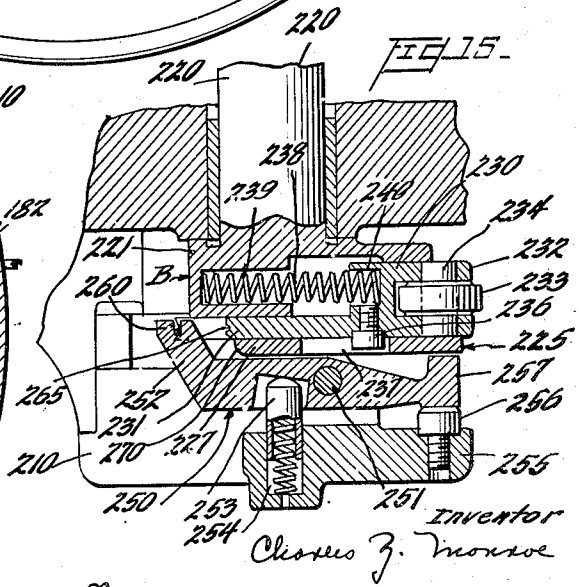


FIG. 15.



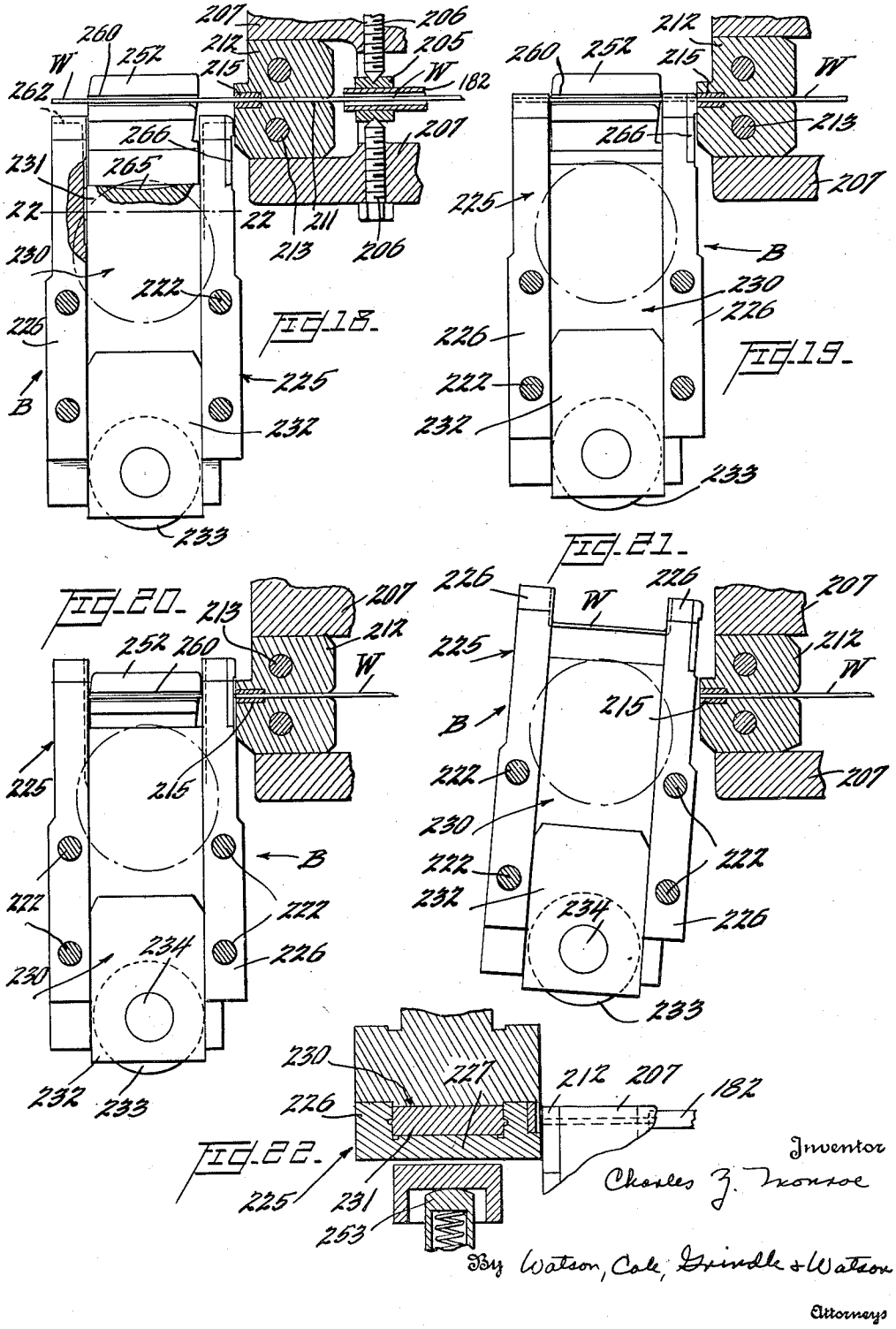
Inventor
Clarence Z. Monroe

By
Watson, Cole, Grindle + Watson
Attorneys

Sept. 12, 1950 C. Z. MONROE 2,521,935

STAPLING MACHINE

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Sept. 12, 1950 C. Z. MONROE 2,521,935

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FIG. 23.

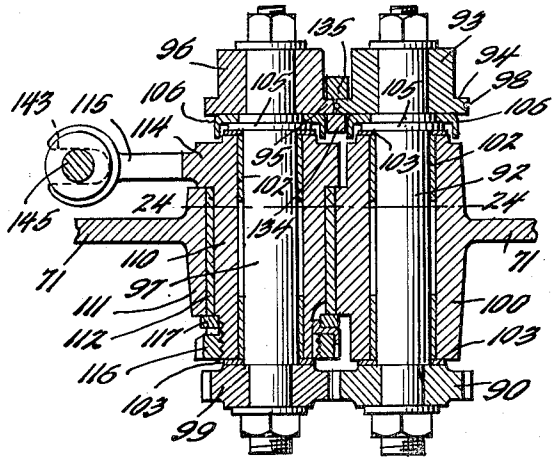


FIG. 24.

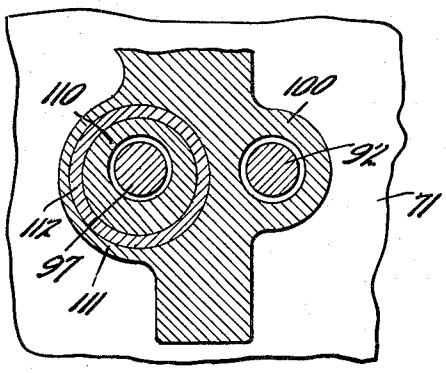
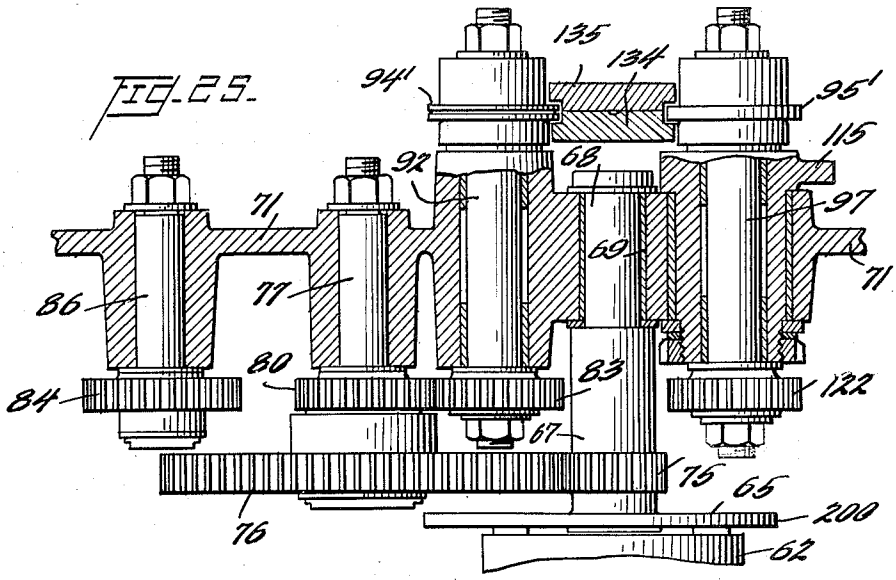


FIG. 25.



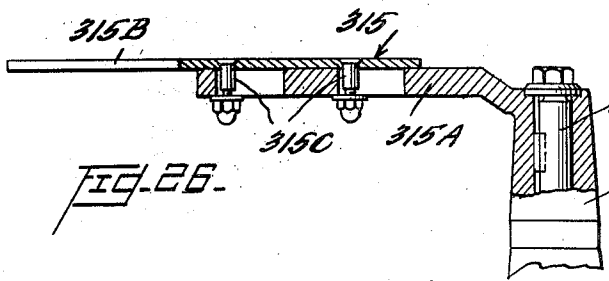


FIG. 26.

Inventor
Charles Z. Monroe

By Watson, Cole, Grindle & Watson

Attorneys

Sept. 12, 1950 C. Z. MONROE 2,521,935

STAPLING MACHINE

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FIG. 27.

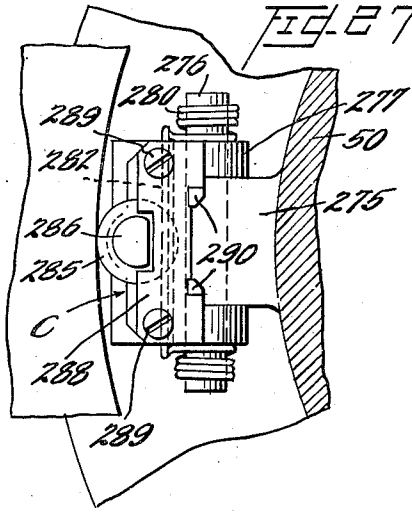


FIG. 28.

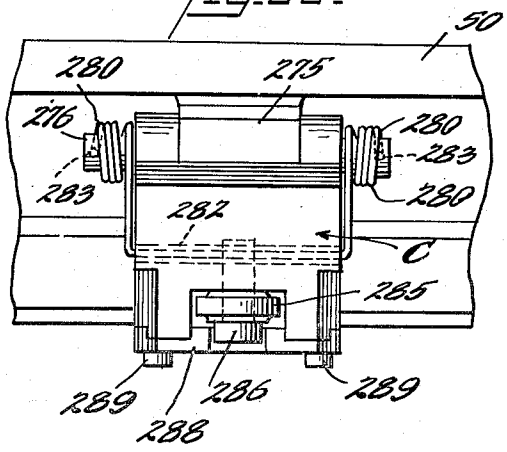
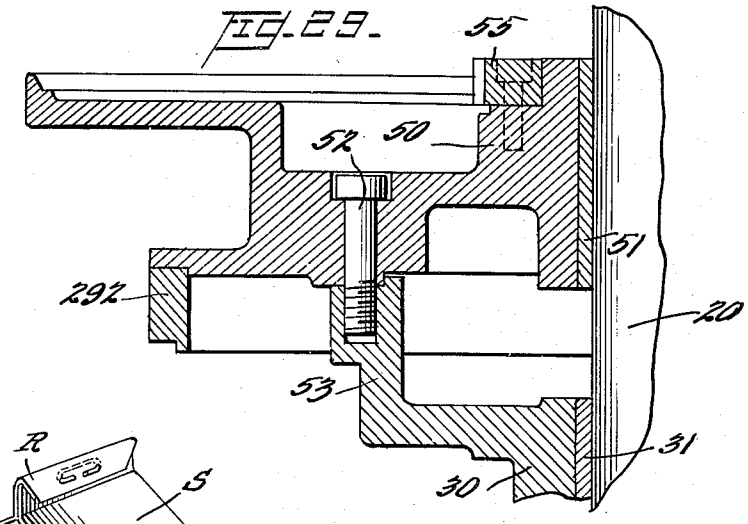


FIG. 29.



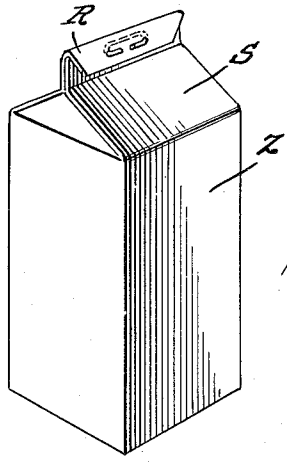


FIG. 30.

Inventor.

Charles Z. Monroe

By Watson, Cole, Grindle & Watson

Attorneys

Patented Sept. 12, 1950 2,521,935

UNITED STATES PATENT OFFICE

2,521,935

STAPLING MACHINE

Charles Z. Monroe, Detroit, Mich., assignor to The Ex-Cell-O Corporation, Detroit, Mich., a corporation of Michigan

Application December 17, 1946, Serial No. 716,761

26 Claims. (Cl. 1—2)

1

This invention relates to stapling machines and more particularly to machines for forming staples from wire and applying them to successive multi-ply units of sheet material, such as paper, in order to secure the layers together; as for example in fastening or securing the closure of a paper or paste-board container.

The novel and improved stapling machine which comprises the subject matter of the present invention, while applicable to a variety of uses in the mechanical arts, is intended primarily for the purpose of securing together the plies of folded material which comprise the top closure rib of a paraffin coated paper bottle, for example, one of the type disclosed in United States Patent No. 2,047,891, granted on July 14, 1936 to Henry T. Scott.

A stapling machine for use for similar purposes is disclosed in Patent No. 2,063,345 granted to Henry T. Scott on December 8, 1936, and it is the broad purpose and object of the present invention to provide a novel and improved mechanism of the general type disclosed in that patent, but which is adapted for operation on articles, such as paper bottles, fed to the machine continuously rather than in step-by-step fashion.

In its more particular aspects, the present invention contemplates the provision of a continuous stapling machine adapted to constitute an operative unit in the fully automatic container making and filling system disclosed in my copending application Serial No. 638,809, filed January 3, 1946, covering an apparatus for and method of fabricating paper containers. In this system, the containers, in the form of paper bottles, are delivered from the bottle forming machines to the charging device by which they are filled with milk or other fluent material, and thence to closing and sealing machines. The forming machines are arranged either singly or in tandem or multiple, whereby the capacity of the installation may be varied rather widely; and when running at maximum capacity the appropriate units must be such as to charge the fluid at a high rate without spillage, and to close, seal, and staple the filled containers properly at an equally high speed of operation.

The stapling machine illustrated and described in the present application is adapted to perform one of the last operations in the sequence of steps from the squaring out of the tubular paper blanks to the final delivery of the filled and sealed bottle, and it may contribute toward a fuller understanding of the invention if the units of the

2

installation which precede the stapler are briefly referred to. Certain of the machines for forming the containers are shown in the patent to Bennett et al., No. 2,217,784, and also in my Patent No. 2,399,934. Machines for coating the bottles with paraffin or the like and for cooling the coated bottles are disclosed respectively in the patents to James T. Earp, Nos. 2,289,763 and 2,382,619. After these operations, the upper portions of the containers are partially folded along previously formed score lines and machines for performing this operation are disclosed in the Bennett Patent No. 2,144,283 of January 17, 1939, and Patent No. 2,410,587, granted to the present applicant on November 5, 1946.

A continuously driven conveyor or, in case of the use of multiple forming units, a plurality of merging conveyors, serves to feed the bottles serially to a continuously operating charging or filling machine, which may well be one of the type disclosed in the Spurr Patent No. 2,353,519, of July 11, 1944. In passing from the charging machine, the line of filled bottles moves expeditiously along the conveyor through a closing device (which may be for example one such as disclosed in either of the patents to Wollenweber No. 2,156,037 or Scott No. 2,085,478) to the stapling machine comprising the subject of the present application.

It is therefore the primary object of the invention to provide an efficient stapling machine of the class described which is rapid in operation and of enlarged capacity being capable of acting upon articles fed through it with a continuous advancing movement.

In the pursuit of this object, the invention contemplates the provision of a number of novel features and combinations of elements which facilitate the stapling operation, the handling of the containers passing through the machine, the intermittent feeding of the wire to the cutoff and staple forming mechanism, and the interrupting of the wire feed at times when there are no containers on the conveyor at the entrance to the machine.

Not the least of these improvements is the novel arrangement whereby a plurality of serially disposed stapler units are revolved about an axis and each accompanies one of the articles to be stapled throughout its arcuate passage through the machine, performing the stapling operation during such continuous movement. Means are also provided for maintaining the stapler units in a radial position while accompanying the articles, and for shifting them to a tan-

gential or chordal position at that portion of their endless path where the staple-forming wire is received and cut off.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings,

Figure 1 is a vertical sectional view through a stapling machine embodying the principles of the invention;

Figure 2 is a top plan view of the machine with the cover removed;

Figure 3 is a view in horizontal section taken on line 3—3 of Figure 1 and showing the staple wire feeding rollers or disks;

Figure 4 is a similar view taken on line 4—4 of Figure 1 and showing the transmission gearing for the wire feed;

Figure 5 is a fragmentary view in vertical section taken on line 5—5 of Figure 2, and showing the intermittent feed for the staple wire supply;

Figure 6 is a vertical sectional view taken on line 6—6 of Figure 5;

Figure 7 is a fragmentary view in horizontal section taken on line 7—7 of Figure 6;

Figure 8 is a fragmentary horizontal sectional view on an enlarged scale, taken on line 8—8 of Figure 1, and showing the clutch device for interrupting the wire feed drive;

Figure 9 is a fragmentary view in vertical section taken on line 9—9 of Figure 8;

Figure 10 is a composite view illustrating the actuation of the wire feed interrupting clutch, the left-hand portion of the figure being in plan and showing the container actuated maintaining element adjacent the conveyor track, and the right-hand portion of the figure being a horizontal section taken on line 10—10 of Figure 9;

Figure 11 is a horizontal sectional view of the rotary stapling mechanism and the cam track for actuating the pivoted retractable clinching members, taken on line 11—11 of Figure 1 looking upwardly as indicated by the arrows;

Figure 12 is a fragmentary view in vertical section taken on line 12—12 of Figure 11;

Figure 13 is a horizontal sectional view on line 13—13 of Figure 1, showing the cam track and cam followers for swinging the stapling units into and out of their radial positions as they move from the cutting station to the container stapling station and back again;

Figure 14 is a fragmentary view in horizontal section of the device showing a stapler unit at the wire feeding and cut-off station, the section being taken substantially on line 14—14 of Figure 1;

Figure 15 is a fragmentary view in vertical section taken on line 15—15 of Figure 14;

Figure 16 is a view in perspective of an outside former element of a stapler unit, which is adapted to shear off a length of wire and to bend it into the U-shaped form of a staple;

Figure 17 is a similar view of a cooperating drive element forming a part of a stapler unit and serving to drive the staple through the folded rib of the container;

Figures 18, 19, 20, and 21 are horizontal sectional views taken substantially on line 18—18 of Figure 1, and showing successive positions of the parts of a stapler unit in the process of cutting off a length of wire and forming a staple;

Figure 22 is a view in transverse section across the stapler unit and taken on line 22—22 of Figure 18;

Figure 23 is a vertical sectional view taken on line 23—23 of Figure 2, through the mating gears and disks of the first wire feed unit;

Figure 24 is a fragmentary view in horizontal section taken on line 24—24 of Figure 23;

Figure 25 is a detail view in vertical section through certain others of the feed disks and driving gears therefor, and taken on line 25—25 of Figures 2 and 4;

Figure 26 is a detail view in vertical section through the detector arm controlling the clutching devices for feeding the wire, and the support for said arm, and taken on line 26—26 of Figure 10;

Figure 27 is a fragmentary view in horizontal section showing one of the staple clinching members in bottom plan as it appears in its operative position at the stapling station, said section being taken substantially on line 27—27 of Figure 12;

Figure 28 is a view in side elevation of a clincher member, as viewed from the left-hand side of Figure 27;

Figure 29 is a fragmentary vertical sectional view through a radius of the driving hub and the carrier for the stapler and clincher units, and taken substantially on line 29—29 of Figure 11; and

Figure 30 is a view in perspective of a paper container of the self-supporting type commonly used as milk bottles, and exemplifying the kind of container adapted to be handled by the stapling machine described herein.

For an understanding of the general arrangement of the machine, the relative positioning of the principal parts, and its interrelation with the conveyor installation, reference is made to Figures 1 and 2 of the drawings. The stapling machine as a whole is indicated generally by the reference numeral 10 and it is associated with the conveyor track 11 along which the containers Z move from the forming and filling units, through the stapler, and on toward the delivery point. Figure 2 shows that the stapling machine is located within a loop or bight of the conveyor track 11 and, as will be understood as the description proceeds, the stapling steps are accomplished upon each container while it is passing around the substantially semi-circular portion of the run of the conveyor within the confines of the stapling machine 10.

Referring now more particularly to Figure 1 of the drawings, it will be seen that the machine 10 is mounted upon a base casting 12 which comprises a hollow framework adapted to support the stapling machine and that portion of the conveyor which is associated therewith.

The upper wall of the base casing 12 is provided with an elongated opening 13 within which is received the downwardly extending axial portion 15 of the pedestal element 16. This pedestal is provided with a shelf-like extension 17 which provides support for the conveyor track 11 as it curves around the stapling unit. The track 11 is provided with a lateral extension 18 to a flange of which there is bolted a side guard member 19 along which the containers Z are guided around the arcuate path of the conveyor.

Through the center of the pedestal 16 there passes a hollow tubular stem or post 20 which is rigidly clamped to the supporting pedestal 16 by means of the bolted split tubular portion 15' thereof, this portion being disposed within the hollow base casting 12. The post 20 extends upwardly from the base and the supporting pedestal and provides means for supporting the stapling

machine or stapler head 10 and an axle for the sprockets about which the conveyor chains are trained. Thus the upward portion of the post 20 is provided with a flange 21 to which is bolted the horizontal web or partition 22 which is an integral part of the housing casting 25 of the stapler 10. The web 22 is provided with a downwardly extending hollow boss 26 through which the connecting bolts or screws 27 pass, these bolts serving to rigidly secure the stapler housing to the post 20.

A rotary hub member 30 is adapted to revolve around an intermediate portion of the post 20, a bearing bushing 31 being interposed between these members. Keyed to the hub 30 are the upper and lower sprockets 32 and 33 which are separated one from the other by means of the ring 34. Beneath the lower sprocket 33 there is disposed a skirt 35 which is secured to the hub 30 and serves to surround and protect the anti-friction thrust bearing 36 disposed between the hub 30 and the pedestal 16.

The conveyor proper consists of the pair of superposed chains 40 which are trained about the sprockets 32 and 33 and follow generally the path of the conveyor track 11. In this connection reference is made to Figures 1 and 10 of the drawings. The chain 40 comprises links 41 which are pivotally connected by means of pins 42 about which the sprocket engaging rollers 43 are disposed. Spaced pairs of pins 42 are extended downwardly to receive and support the conveyor flights 45 and 46. These flights are roughly L-shaped in configuration and comprise a rearwardly disposed projecting arm or blade 47 and a forwardly disposed projection or lip 48. The rear arm 47 of the upper flight 45 is displaced upwardly as clearly indicated in Figure 1 of the drawings, whereas the corresponding arms 47 and 48 of the lower flight 46 are substantially coplanar. The rear arms 47 of both flights serve to engage the rear wall of successive containers Z and push them along the track 11, the outer guard rail 19 serving to keep the containers in alignment. The forward lip 48 aids in preventing the displacement of the containers, especially when rounding the curve within the stapling area. Lateral protuberances 49 may be formed on the body portion of the flights 45 and 46 to give spaced point contact with the inside wall of the container.

Although the stapling machine may be driven from its own source of the power, independently of the drive of the complete container-sealing organization, in the illustrated embodiment the stapler takes its driving power from the conveyor itself. The conveyor chains 40 are driven from a remote source (not shown), and the chains 40 drive the sprockets 32 and 33 which are keyed to the hub 30 which is adapted to rotate about the axial post 20.

As the containers Z move around the substantially semi-circular orbit within the stapling zone, the crimped and folded top rib portions R formed at the peak of the roof-like closure section S of the container is moved about the stapler within the zone of operation of the stapler mechanism proper, which is given the general reference character A. The operative details of the stapler mechanism will be described hereinafter, but it is sufficient to state at this point that the mechanism comprises basically the turn-table 50 which carries a plurality of individual stapler members or units B adapted to move about the axis of the machine and to perform the stapling operation upon the successive containers Z as they pass at substantially uniform velocity around the track 11 within the machine. The turntable 50 is rotatably mounted upon the vertical hollow post 20 being separated therefrom by means of the cylindrical bearing bushing 51. The turn-table or stapler carrier 50 is spaced above the rotary hub 30 and is adapted to be driven thereby. For this purpose (see Figures 11 and 29) upwardly projecting lugs 53 are formed as vertical extensions on the upper portion of the drive hub 30, and these lugs are rigidly secured to the under part of the carrier 50 as by means of the screws or bolts 52.

A ring gear 55 is bolted to the central upper annular flange of the carrier 50 and serves to transmit driving force to the wire feeding mechanism disposed in the upper part of the casing or housing 25. The transmission of force from the ring gear 55 to the wire feeding elements will be but briefly described at this point, this transmission including a certain de-clutching mechanism which will be described at a later point. Referring now to Figure 9 of the drawings, it will be seen that drive gear 55 meshes with a pinion 56 rigidly carried by the lower countershaft section 57, this portion of the countershaft being provided with a frusto-conical part 58 seated in a similar part of the hollow suspension bearing 59, this bearing being seated within a flanged opening in the web 22 of the housing 25 and rigidly secured therein by means of the screws 60 which pass through the flange 61.

The upper end of the lower countershaft section 57 is formed into a cup-like clutch portion 62 which is adapted to be engaged with and disengaged from the mating clutch portion 65 of the upper tubular countershaft section 67 which is carried by the depending rod or shaft 68 having its upper end rotatably received within a bushing 69 provided in an opening 70 in the supporting plate 71. This plate casting 71 comprises a multiple bearing support for the various elements of the wire feed and is secured to the inwardly extending annular flange 72 of the housing 25 by means of the screws 73.

Formed on the upper countershaft section 67 is a drive pinion 75 which meshes with a gear 76 rotatably carried by the lower end of the stub shaft 77 which is secured at its upper end to the web or plate casting 71 by means of the nut 78 (see Figures 2 and 25). The gear 76 is keyed to a tubular extension of the smaller gear 80 which is of course also rotatably mounted on the depending shaft 77.

The gear 80 meshes with two gears 82 and 83 which in turn mesh respectively with the idler gears 84 and 85 which are in approximate alignment with the gear 80. The idlers 84 and 85 are rotatably carried by the depending shafts or axles 86 and 87 which are respectively secured by means of the nuts 88 and 89 to the plate 71. The idlers 84 and 85 mesh respectively with the gears 90 and 91 as indicated in Figure 4.

Reference to Figures 1, 2, 4, 23, and 24 will clearly establish the relationship of these several transmission gears and will also afford a clear understanding of the mounting thereof and their association with the wire feeding elements. Although Figure 23 is a section taken transversely through the mating gears and disks of the first wire feed unit, this figure may be taken as a generalized view of all four pairs of mating wire feeding members which comprise the constant speed feed. The gear 90 is fixed upon the lower end of the vertical stub shaft on axle 92 and rigid-

ly secured to the upper end of this shaft is the feed wheel 93, this wheel being provided with a feeding flange or disk portion 94 the periphery thereof being provided with a groove 98. This flange or wheel portion 94 is adapted to rotate in co-operation with the periphery of the smooth flange 95 of a mating wheel or disk element 96 fixed to the shaft 97 which is disposed in parallel relation with the shaft 92, to draw the wire forwardly from the supply.

Upon the lower end of the shaft 97 there is fixed the gear 99 which meshes with the gear 90 and is driven thereby. Adjacent the shaft 92 the supporting web plate or casting 71 is provided with a hollow boss portion 100 within which the shaft 92 is adapted to rotate. Bearing bushings such as indicated at 102 are provided between the shaft and the opening in the boss 100 and end washers 103 are also provided at the top and bottom of this boss section. The shaft 92 is flanged as at 105 to provide a shoulder to prevent longitudinal movement thereof. A washer 106 provided with a dust seal flange is disposed between the flange 105 and the feeding wheel 93.

The shaft 97 which carries the gear 99 and the feeding wheel 96 is rotatably mounted within the eccentric bushing 110, suitable bearing bushings and washers being employed and given the same reference numerals as the corresponding elements used in connection with the shaft 92.

The eccentric bushing 110 is mounted within the hollow boss 111 of the supporting plane 71 and a bearing bushing 112 intervenes therebetween. The upper portion of the member 110 is provided with a flange 114 upon which an angular arm 115 is formed. The bushing 110 is rotatably secured within the boss 111 by means of the nut or locking ring 116 and the washer and cotter arrangement 117. The eccentricity of the mounting is clearly apparent in Figure 24.

As already mentioned, the same mating gears and feed wheels are repeated at the four points across the upper portion of the stapler housing as clearly indicated in Figures 1 and 4 of the drawings, the additional driven gears associated with the grooved feed wheels being designated 120, 121 and 122, these gears mating respectively with the gears 82 and 83 and 91, in the same manner as the two gears 90 and 99. Similarly by reference to Figure 3 of the drawings it will be understood how the respective pairs of feed wheels and connecting shafts are arranged, these elements being given the same designations as those in the first pair already described.

As indicated in Figures 1 and 2 of the drawings a bracket 125 is bolted as at 126 to the housing 25 of the stapler 10 and this bracket carries an axle 127 upon which is rotatably mounted a reel 128 carrying a supply of wire W. The wire is threaded through a tubular eye 130 screwed into or otherwise fixed in an opening in the wall of the housing 25 and aligned with the bites of the feed wheels 94 and 95 of the wire feeding mechanism. Mounted upon posts 131 secured to bosses formed on the supporting plate 71 is the stationary wire supporting and guiding device 132 which bridges the gaps between the successive feeding rollers or disks. The guide plate assembly consists of a lower plate 134 and an upper plate 135 which is clamped thereto by means of the screws 136. The lower plate 134 is centrally grooved as at 138 as clearly shown in Figure 3 of the drawings and both plates are narrowed and cut away to accommodate the pairs of feeding rollers, this being indicated in Figure 23 of the drawings. The wire W is fed along the groove 138 by the successive pairs of feed rollers and it emerges from the feed plate assembly 132 at the point 140, at which point it comes within the control of an intermittent feed device which will be presently described.

The successive pairs of feed rollers and the guide plates 132 comprise the essential portions of the constant speed wire feed for pulling the wire supply from the reel 128 and feeding it to the intermittent forwarding device to be described. An important feature of this section of the machine resides in the fact that the two right-hand sets of pairs of feed rollers 94' and 95' are very slightly larger than the lefthand pairs of feed rollers 94 and 95. The difference in size, however, is too small to be apparent from the drawings. Since all four sets of rollers are driven at the same speed, it will be at once perceived that the wire will tend to be very slightly stretched or tautened between the two central pairs of said rollers within the portion of the groove 138 designated 138' in Figure 3. This arrangement serves to maintain the wire under tension and effectively removes even the slightest kinks or distortions which may be present in the wire, for example, such as it might have acquired from having been wound upon the reel 128.

Returning now to Figures 2 and 23 of the drawings it will be seen that each of the crank arms 115 is formed on one of the eccentric bushings 110 which support the shafts 97, upon the respective upper and lower ends of which are secured the feed disks or rollers 95 and the gears 99. It will be apparent that slight angular movements of the arms 115 will, by rotating the eccentric bushings 110, cause the smooth-periphery feed wheels 95 to release their grip upon the wire which is clamped between these wheels and the grooved mating wheels 94, and will release the frictional bite on the wire. Each of the arms 115 is bifurcated as at 143 and straddles the longitudinally adjustable rod or shaft 145. One end of this shaft 145 is received within the hollow boss 146 formed upon the casing 25. A stop abutment 147 is threaded into this boss and provides means for limiting the movement of the shaft 145 to the right in Figure 2. A set screw 148 threaded into the boss 136 projects into a groove or slot 149 in the rod 145 and prevents rotation of the rod 145.

The left-hand end of the rod 145 is threaded as at 150 and is screwed into the open threaded end of a rotatable cylindrical member 151. The member 151 is received in a boss 152 formed on the housing wall 25 and is held against longitudinal movement therein between the handle or knob 154 and the nut 155. It will thus be readily seen that rotation of the knob 154 which is pinned as at 156 to the bushing or sleeve 151, will cause the rod 145 to move in the direction of its length, by virtue of the threaded connection between the portion 150 of the rod and the internally threaded bushing 151.

At proper intervals along the rod 143 there are secured the stop sleeves 158, an additional stop 159 being provided beyond the right-hand crank arm 115. Slidably mounted on the rod 145 are the sleeves or collars 160 and these are adapted to contact the left-hand face of the bifurcated portion 143 of the crank arms 115. Between each of the fixed stop sleeves 158 and the slidable collars 160 there are disposed the coil springs 161. It will thus be seen that the springs 161 will tend to urge the crank arms 115 in a

clock-wise direction as viewed in Figure 2 and cause the eccentrically mounted wire feeding disks or wheels 95 to resiliently bear upon the wire W occupying the shallow grooves 98 in the feed wheels 94. This spring pressure may be applied, released, or adjusted by rotation of the knob 154 which will cause the fixed abutment sleeves 158 to advance or retract with relation to the crank arms 115. Thus the gripping pressure of the feed wheels may be released during the threading of the wire through the feed device or at any other desired or necessary time.

Also, during threading of the wire into the feed device, or upon other occasions, it may be found necessary to operate the feed wheels slowly or intermittently through manual means. A device for accomplishing this purpose is associated with the top cover or lid which is applied to the stapler housing 25. This cover or closure comprises the dome-like element 165 shown in Figure 1 which has a flanged sealing contact as at 166 with the upper rim of the housing 25. The cover 165 is hinged to the housing as shown in Figure 2. Spaced ears or lugs 167 are formed in the top plate or partition 71 of the housing and between each pair of these lugs there are pivotally mounted upon the pintles 168 the hinge arms 169 formed on the under side of the cover 165.

At a point directly above one of the vertical shafts or axles 92, preferably the one which carries the gear 83 and one of the feed rollers 94', there is provided in the cover 165 a hollow boss 170 through which projects a pin 171 having a downwardly facing cup-like socket portion 172 having its walls notched as at 173 to interlock with the corresponding projections 174 in the nut 175 which is keyed to the upper end of the shaft 92. Fixed to the upper end of the pin or shaft 171 is the crank handle 177 by means of which, when the lid or cover 165 is lowered, the socket may be depressed and engaged with the nut 175 and the shaft 92 may be rotated manually to feed the wire between the four pairs of feed wheels, while the drive from the conveyor is idle. The hub of the crank handle 177 is hollow and may slide vertically with the shaft 171, against the resilient pressure of a spring 171A which normally serves to keep the crank and socket in raised inoperative position. This is possible by virtue of the one-way or over-running nature of the clutch 62 (Figure 9) interposed between the upper and lower sections 57 and 67 of the counter shaft which forms a part of the wire feed transmission.

As related earlier, the actual stapling mechanism A comprises the turn-table 50 which carries a plurality (in this case four) of individual stapling members B which move around the semi-circular path of the containers Z as they pass through the machine. Each of these stapler units is supplied with the proper length of wire to form one staple, this length being cut off from the wire supply W as each successive unit passes a wire receiving station. Now in order to insure that the proper length of wire is fed into the individual units quickly while they are momentarily at the wire receiving station, and to prevent projection or feeding of the wire toward the path of the units while a succeeding unit is coming into position, provision must be made for converting the steady constant speed feed of the wire W by means of the feed rollers just described, into an intermittent feed timed to project a length of wire into the stapler unit at the proper instant and to withhold the supply until the next unit is in receiving position. This intermittent feed is accomplished by the mechanism now to be described. In line with the direction of feed of the wire by the feed rollers 94, 95 there is provided an opening 180 (Figure 3) in the wall of the housing 25. Secured to the exterior face of the housing and covering this opening is a supplemental casing or sheath 181 (Figure 1) which may be made of sheet metal and is bulged slightly for a purpose to be described. The sheath extends downwardly along the outer surface of the housing and terminates in the vicinity of the stapling mechanism A. Within this sheath there is suspended a somewhat flexible tube 182 the lower end of which is substantially fixed adjacent the delivery point of the wire to the stapler units. The upper end of the tube is carried by an oscillating support which is adapted to be moved to and from the point 140 at which the continuous length of wire W passes from the control of the constant speed wire feed.

Referring to Figures 1, 2, 3, 5, 6, and 7 of the drawings it will be seen that the upper end of the tube 182 is fixedly secured within the block 184 as by means of the welded flanges 185. The block 184 is swiveled, to accommodate rotation in a vertical plane, upon the needle bearings 186 which are threaded through and locked to the side walls of the hollow depending portion 187 of the T-shaped bracket 188. The bracket 188 is suspended from a parallel motion which comprises the horizontal pair of arms 190. Each of these arms is pivotally connected with the bracket 188 by means of the pintle bolts 191.

Rising from the partition plate 71 is a double hollow boss 193 one portion of which is prolonged downwardly beneath the plate 71 as at 194. See Figures 2 and 5. One of the arms 190 has its cylindrical end 195 keyed to a shaft 196 which is rotatably received within one portion of the boss 193. A similar cylindrical portion is formed on the other arm 190 and is keyed to a longer shaft 197 which extends rotatably through the lower boss portion 194. Fixed upon the lower end of the shaft 197 is the angular crank arm 198, the free end of which is provided with a cam follower roller 199 which is adapted to follow the peripheral cam surface 200 formed on the element 65 of the counter shaft 57, 67. In order to maintain the cam follower in contact with the cam surface 200 the cylindrical hub portion 195 of one of the arms 190 (preferably the one which is carried by the elongated shaft 197), is provided with an arm 201 which is connected by a spring 202 with a fixed point 203 on the plate 71. By this means the tube carrying bracket 188 is urged toward the constant speed delivery point 140 to the position shown in Figures 1, 6, and 7 of the drawings.

Recalling that the lower end of the wire carrying tube 182 is relatively stationary, it will be readily understood that by the action of the cam 200 the bracket 188 which supports the upper end of the tube 182 is oscillated back and forth in the direction of the length of the wire supply W, the bulged part of the casing 181 accommodating this movement of the relatively flexible tube. Obviously this displacement toward the right in Figures 1, 2, and 3 of the drawings, will have the effect of elongating the total path of the wire from the receiving point 140 to the delivery point to the stapler unit and this elongation is of an amount equal to the length of wire needed for

forming a single staple. Thus, during the movement of the wire carrying tube 182 toward the right at a speed equivalent to the rate of movement of the wire due to the feed rollers 94', 95' will have the net effect of causing the lower end of the wire adjacent the stapler units to remain stationary. Then upon return movement of the upper end of the tube carried by the bracket 188 to the point 140, the wire will be quickly fed into the properly positioned stapler unit.

The lower end of the tube 182 (Figure 18) is fixedly secured within a block 205 which is pivotally supported upon the needle bearings 206 which are carried by the two side brackets 207 which may be cast integrally with the insertable housing section 210 which is attached in any suitable way to the main housing 25 at the lower right-hand corner thereof as viewed in Figure 1. From the mouth of the tube 182 in the lower end thereof the wire W passes through an opening 211 in the guide block 212 which is rigidly secured between the side frames 207, as for example by means of the bolts 213. Within the forward end of the opening 211 there is situated a hardened steel bushing 215 which cooperates with a part of each of the successive stapling units in shearing off the required length of wire to form a staple.

The stapling mechanism itself will now be described by reference to Figures 1 and 11 to 22 inclusive. The turn-table or carrier member 50 (Figure 1) is provided with four circumferentially spaced openings within which are rotatably secured the stub crank shafts 220 (Figure 12) upon the lower end of each of which is formed the body portion 221 of a stapler unit which is of the general top plan configuration shown in Figure 14 of the drawings. To the lower part of this body portion 221 there is secured, as by means of the screws or bolts 222, an outside former which comprises the combined shear and gripping member and is designated generally by the reference numeral 225. This member as best shown in Figure 16 of the drawings comprises two side portions 226 connected by a lower bridging web 227. Between these side bars 226 of the member 225 and within the space provided between the lower part of the body portion 221 and the web 227, there is disposed the sliding driver element 230. This element comprises a forwardly disposed plate-like portion 231 and a rearward bifurcated block portion 232 between the forks of which is rotatably disposed a cam following roller 233 rotatable upon the axle 234. The driver member 230 is adapted to slide between the side arms of the member 225 within the limits of movement permitted by the reciprocation of the head 236 of a stud threaded into the bottom of the member 230, which head is adapted to move within the slot 237 formed in the web 227 of the member 225. In order to urge the member 230 rearwardly toward its retracted position a coil spring 238 has one of its ends seated in a socket 239 in the forward part of the body portion 221 of the unit. The rear end of the spring sits in a socket 240 formed in the block 232 of the member 230.

To the upper end of each of the crank shafts 220 which rotatably support the stapler units there is clamped, as at 242, the crank arm 245, upon the outer end of which is carried a roller 246 which follows the cam groove 247 formed in the cam plate 248 bolted as at 249 to the under side of the partition 22, all of which is clearly shown in Figure 13 of the drawings. In this figure stapler units B are shown in each of the four quarter positions or stations I, II, III, and IV. Figure 13 is arranged in the same orientation as Figure 2 and it will be seen that station I is disposed between the straight portions of the container conveyor track 11 where no containers are presented to the stapling mechanism. At station II the stapler units B are brought into operative position with respect to a container Z which is at that point beginning its semi-circular path around the track 11 within the operative zone of the stapler. When the stapler unit B reaches station III the staple is driven into the rib R of the container Z, and when the unit reaches station IV the operation has been completed and the stapled container passes from the semi-circular portion of the track 11 onto the straight delivery portion.

It will be noted that the cam track 247 from station II to station IV is substantially semi-circular and there is no relative swinging movement of the stapler units B about the axis of their supporting crank shafts 220, the units maintaining their radial position with respect to the machine. However, from station IV through station I to station II, the cam track 247 departs from its semi-circular shape and provides a path for the cam following rollers 246 of the units B which will swing each unit upon its cranks 220 so that the long axes of the successive units are disposed transversely of a radius of the machine instead of in alignment therewith. The purpose of this arrangement will appear as the description proceeds.

When a stapler unit B is disposed at station I in Figure 13, it is in the position to have the wire W fed to it from the tube 182 through the mouth of the opening 211 in the feed block 212, the general position being shown in Figure 14 of the drawings and successive movements past the station I being clearly shown in Figures 18, 19, 20, and 21.

Referring now more particularly to Figures 15 and 18, it will be seen that there is provided, beneath the path of the stapler unit B, an inside former which comprises a swinging anvil or holding lever and is designated generally by the numeral 250. This lever is pivotally mounted upon a pintle 251 secured in the housing insert casting 210 and has its angled forward portion 252 urged upwardly by the spring pressed plug 253 seated in a socket 254 formed in the portion 255 of the housing. An abutment lug 256 is threaded in the rear portion of this member 255 and serves as a stop which limits the downward portion of the tail 257 of the inside former 250.

The upwardly directed forward end 252 of the inside former 250 is slotted as at 260 to receive the end portion of the wire W when it is fed through the feed block 212, as most clearly shown in Figure 18 of the drawings.

Referring again to Figures 16 and 17 of the drawings it will be seen that the forward ends of the side blocks 226 of the outside former 225 of the stapler unit are provided with the V-shaped notches 262, and the inner walls of the forward parts of the portions 226 are also provided with the grooves 263 of the gauge of the wire W. The side walls of the plate portion 231 of the sliding driving member 230 are also grooved as at 264 adjacent the grooves 263 of the member 225. The forward edge of the plate 231 of the driver is provided with a groove or notch 265 of a peculiar configuration, the central portion of the notch 265 being somewhat wider and deeper

than the end portions thereof. Also a hardened steel shear-plate insert 266 is secured to the side wall of the side bar 226 of the former 225 to cooperate with the hardened tubular insert 215 set in the feed block 212, in severing the wire.

In Figure 19, the unit B is shown at the point where the cooperating shearing portions 215 and 266 are cutting off the length of wire from the supply W as the unit passes the feed block 212. At this instant the groove 260 in the forward end 252 of the inside former 250 is in substantial alignment with the notches 262 in the forward ends of the side bars 226 of the outside former 225. As the unit B continues to advance past the cut-off station, the laterally spaced side bars 226 move forwardly with relation to the inside former 250 and serve to bend the ends of the staple *w* forwardly, the intermediate portion being held within the notch 260 of the anvil lever. The legs of the staple *w* then occupy the forward portions of the groove 263 in the inner side walls of the stapler unit outside former 225. Thus the staple is formed, as clearly shown in Figure 20 of the drawings.

From this point onward, the sloping cam-like forward edge 270 of the web portion 227 of the member 225 engages the inclined inner edge of the forward portion 252 of the inside former 250 and cams it downwardly against the pressure of the spring pressed plunger 253 and removes the anvil from engagement with the formed staple. This is most clearly shown in Figure 15 of the drawings.

By appropriate shaping of the cam 247 the stapler unit B is swung or tilted somewhat as shown in Figure 21 so that it will readily clear the cut-off or feed block 212 wherein the wire supply W is held stationary by the outward movement of the intake end of the intermittent feed tube 182 in the upper part of the machine. Thus the staple *w* is carried between the arms 226 of the unit to position II where the unit B has been swung around to its radial position and the staple *w* brought into juxtaposition with the rib R of a container Z to which it is to be applied.

Associated with each of the stapling units B and likewise carried by the turn-table or carrier 50 are individual clincher devices C which cooperate with the staple driver element on the units B by backing up the staple on the remote or outer side of the rib B of the container, and these devices C are adapted to be brought into and released from their operative positions as the stapler members B are respectively moved to stations III and I, shown in Figure 13. Referring also to Figures 27 and 28, it will be seen that, at points on the periphery of the carrier 50 adjacent the stapler units there are provided lugs or ears 275 through which a hinge pintle 276 extends and is held against rotation. The pintle carries upon its ends the ears 277 of the clincher element C which straddle the projecting ear 275 of the carrier member. A spring element 280 is coiled about each end of the pintle 276 and the intermediate portion of the spring 281 is received within a groove or slot 282 in the inner side of the member C. The ends of the spring 280 are received within the notches 283 in the ends of the pintle 276 and the spring is initially tensioned to urge the member C outwardly and upwardly toward the position shown at the right-hand side of Figure 1 of the drawings and approximately to the position shown at the top of Figure 11.

Each of the clincher elements C is provided with a cam follower roller 285 carried upon the bolt or pin 286 seated in the member C. Secured to the end of the member C is the clincher plate 288, as by means of the screws 289. The forward inwardly directed operative edge of the clincher plate 288 is notched to receive the hard metal inserts 290 and this forward edge of the plate is adapted, at station III to contact the outer face of the rib R of the container Z upon which the stapler is to operate. This is shown clearly in Figure 12 of the drawings. There is carried by the turn-table 50 an annular ring 292 which has a downwardly projecting flange 293, providing shoulders against which the rib R of the containers is guided during the semi-circular path of the containers through the operating zone of the machine.

Carried upon the bottom edge 295 of the housing 25 is a generally circular cam member 296 which has its inwardly facing surface 297 formed with camming areas indicated at 297*a*, 297*b* and 297*c* (see Figure 11). The cam element 296 may be broken away in the vicinity of station I as at 296*a* since the clincher elements C are in their raised idle positions at this point and their outwardly and upwardly swinging movement is limited by the abutment indicated at 298 in Figure 1. The operative cam edge 297*c* against which the roller 285 bears during the actual clinching operation, may be supplied by a hardened wear resisting insert 296*b* which may be secured to the main cam member 296 as by means of the screws 296*c*.

Surrounding the central vertical hollow post 20 of the stapler (Figures 1, 11, and 12) and disposed between the upper end of the rotary hub 30 and the turn-table 50 there is fixed, as by means of a set screw 300, a ring or collar 301, this collar being horizontally slotted upon one segment thereof as at 302, in order to receive the cam lever 305 which is pivoted to a collar by means of the pin 306. The free end of the cam lever is urged outwardly by means of the coil spring 307 seated in a socket in the collar. The cam arm or lever 305 is provided with an opening 308 which receives a pin 309 set in the collar 301, the pin and opening serving to limit the movement of the cam arm in both directions. The surface 310 of the cam lever 305 is curved or rounded to provide an approach and departure surface and an intermediate node which is adapted to be contacted by the roller 233 of the staple driving member 230, as clearly shown in Figures 11 and 12 of the drawings.

The operation of the stapler mechanism will now be clearly understood from the elements which have been described. At station II the rib R of the bottle or container Z is brought into contact with the annular guide ring 292 and remains in contact therewith throughout the semi-circular path through the machine. This ring provides inward and upward limiting surfaces for the top of the container. Then as the roller 285 of the clincher C advances along the cam surface 297*a* in leaving station II the clincher C is swung downwardly toward a vertical position and the inner face of the clincher plate 288 is brought into contact with the outer side of the container rib R, the hardened inserts 290 being disposed at points where the staple will come through the rib. As station III is approached by the stapler unit B, the cam roller 233 of the driver member 230 rides along the cam surface 310 of the lever 305 and the driver is moved outwardly until the groove 265 engages the cross bar of the staple which has been thus far held in the grooves 293 between

the side bars 266 of the element 225 of the unit B. The configuration of slot or groove 265 in the face of the driver is such that the cross bar is very slightly bowed so as to cause the legs of the stapler *w* to toe inwardly to a slight degree to prevent any accidental outward splaying of the staple in passing through the rib. The resilient cam 305, 310, causes the driver 230 to give a resilient blow which drives the staple through the rib R and at the same time the points of the staple striking the inserts 290 on the clincher plate 288 are caused to be clinched inwardly against the outer face of the rib R. As the clincher C passes along the cam surface 297b in approaching station IV, it is allowed to swing outwardly and upwardly away from the container rib, and the container is thus freed for passage out of the machine along the straight delivery run of the conveyor track 11. At this point the stapler unit B begins to swing to its transverse tangential or chordal position which it assumes at station I in order to receive another length of wire and form a staple.

Another feature of the novel stapling machine comprises interrupter means whereby no wire will be fed to a stapler unit B passing station I if there is no container Z to occupy this position on the conveyor. To accomplish this purpose there is provided alongside of the straight approach section of the conveyor track 11 a pivoted arm 315, the pivoted pin of this arm being indicated at 316 and passing through the tubular bearing bosses 317 and 318 provided on the base casting 12. (See Figures 1, 2, 10, and 26.) The arm 315 comprises a slotted stub portion 315A to which a contact blade 315B is adjustably secured as by means of the bolts 315C. The end of the rod or shaft 316 within the base casting is provided with a crank arm 320 the free end of which is connected by means of a rod 321 to a crank 322 secured to the lower end of the vertical axial rock shaft 325 which passes through the hollow interior of the central post 20 of the machine. Secured by means of the screws 326 to the upper end of the post 20 is the bearing plate 327 through which the upper end of the rod or shaft 325 passes (see Figures 8, 9, and 10). To this upper end of the shaft 325 there is fixed a crank 328 which carries a roller 330 at its free end. This crank 328 with its roller 330 is directed toward the clutch assembly which connects the two parts 57 and 67 of the countershaft which drives the wire feed. The cupped upper portion 62 of the lower shaft portion 57 surrounds an inner member 335 which is rotatably disposed upon the depending rod 68. The outer peripheral wall of the member 335 is provided with a notch 336 which provides a shoulder 337 which functions as a ratchet tooth within which the pawl 338 is normally disposed. The pawl is pivotally carried by the member 62 by means of the pin 339. The tail 340 of the pawl is urged outwardly by means of the plunger 341 which is resiliently pressed by means of the spring 342 seated in a socket 343 in the member 62. The tail 340 of the pawl is also provided with a rounded protuberance 345 which normally, during the rotation of the part 62, clears the roller 330.

However, when a container Z is missing from the approach portion of the track 11 and the detector arm 315 is allowed to move inwardly across the track under the urging of the spring 346, the crank 320 moves outwardly to the dotted line position 320' in Figure 10 and the other transmission elements 321, 322, 325, and 328 are also rotated to their dotted line positions whereupon the roller 330 is brought into the path of the protuberance 345 on the pawl 338 and the pawl is tripped, withdrawing its operative end from the ratchet shoulder 337 of the inner member 335. Thus the drive from the lower portion 57, 62 of the countershaft and the driven member 335 is broken and the driven end of the countershaft 65, 67 is idle. Thus both the constant and intermittent feed mechanism for the wire W is interrupted until a container again moves the detector on 315 outwardly to its full line position shown in Figure 10.

In order to eliminate the possibility of shock of starting, stopping, operating, or interrupting the wire feed drive, a resilient transmission section is introduced in the countershaft assembly. The inner element 335 of the interrupter clutch is provided with a widened upper flange portion 350 which is provided in its overhanging portion with a series of spaced slots 351. Projecting downwardly from the clutch member 65, which also provides the cam element 200, are a series of arcuate lugs 352 which conform substantially to one end portion of the slots 351 in the flange 350, but are of considerably less arcuate extent to provide space for the coil springs 355 which urge the lugs 352 toward the forward ends of the slots. Thus the drive is through the flange 350, the spring 355, and the lug 352 in transmitting the driving force from the member 335 to the member 65.

The member 335 is carried rotatably upon the lower portion of the vertical shaft or axle 68, a nut 357 being threaded upon the shaft and a bearing washer 358 being interposed between the nut and the member 335, both of these elements being received within a central recess in the element 335.

In order to dispose the stapler device adjustably within the bight of the chain conveyor 40, and to take up any minor slackness in the chains, the pedestal member 16 is adjustably mounted upon the base casting 12. Reference to Figure 1 of the drawings will disclose that there is provided a depending projection 360 on the inner side of the base casting at the right-hand side of the pedestal block 16. Threaded through this projection is an adjusting bolt 361 provided with a lock nut 362 and adapted to abut the flat surface 364 on the vertical stem portion 15 of the pedestal. It will be readily seen that adjustment of the bolt 361 will move the pedestal and thus the whole stapler assembly in the plane of the figure and this will result in tautening or slackening the conveyor mechanism. The pedestal 16 is guided in its adjusting movement by means of the pins 365 which are set in the base casting 12 upon opposite sides of the opening 13 which receives the pedestal 16. Elongated slots 366 are formed in the underside of the pedestal flange to receive the pins 365 and thus guide the pedestal.

Various changes and modifications may be made in the embodiment illustrated and described herein without departing from the scope of the invention as defined by the sub-joined claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, stapling mechanism movably carried by the machine and arranged to follow the movement of an article through the machine while operating

upon it, means for moving said mechanisms, and a drlying connection between said last named means and said conveyor; whereby the power for operating the stapling mechanism is derived from the conveyor itself.

2. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, staple forming and applying mechanism movably carried by the machine and arranged to follow the movement of an article through the machine while operating upon it, means for moving said mechanisms, means for supplying wire to said staple forming and applying mechanism, and driving connections between said two last named means and said conveyor, whereby the power for operating the machine is derived from the conveyor itself.

3. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, means for driving said conveyor at a uniform speed, a plurality of staple forming and applying mechanisms movably carried by the machine and each arranged to follow the movement of an article through the machine while operating upon it, means for moving said mechanisms, means on the machine for feeding wire to said staple forming and applying mechanisms, driving transmission means from said conveyor to both of said two last named means, and means in the transmission to said wire feeding means for interrupting the drive of the latter in the event of the absence of an article to be stapled at the appropriate point on said conveyor.

4. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, the path of the articles while in the zone of operation of the machine being an arc of a circle, a plurality of stapler units carried by said machine and mounted to revolve in a substantially circular path part of which coincides with the arc of movement of said articles, the respective units adapted to meet and accompany the successive articles upon the conveyor as they enter the machine and to drive their staples while the paths of the units and articles coincide, means for supplying wire to the units at a portion of their endless path remote from the path of the conveyor, and means for causing each stapler unit to sever the required length of wire and form an open staple before again approaching the arcuate path of the articles.

5. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, the path of the articles while in the zone of operation of the machine being a circular arc of approximately 180°, a plurality of stapler units carried by said machine and mounted to revolve in a substantially circular path part of which coincides with the arc of movement of said articles, the respective units adapted to meet and accompany the successive articles upon the conveyor as they enter the machine and to drive their staples at about the mid-point of 180° arc, means for supplying wire to the units at about the mid-point of the remaining 180° arc of the generally circular path of the units, and means for causing each stapler unit to sever the required length of wire and form an open staple before again approaching the arcuate path of the articles.

6. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, the path of the articles while in the zone of operation of the machine being a circular arc of approximately 180°, a plurality of stapler units carried by said machine and mounted to revolve in a substantially circular path part of which coincides with the arc of movement of said articles, the respective units adapted to meet and accompany the successive articles upon the conveyor as they enter the machine and to drive their staples at about the midpoint of said 180° arc, means for supplying wire to the units at about the mid-point of the remaining 180° arc of the generally circular path of the units, means for causing each stapler unit to sever the required length of wire and form an open staple before again approaching the arcuate path of the articles, means for causing the stapler units to drive the staples into said articles in a direction radially of their arcuate path, means for feeding the wire to the units also in a radial direction, and means for swinging said units through an angle of 90° in passing from the stapling point to a wire receiving point and vice versa.

7. A stapling machine of the class described comprising, in combination, a carrier mounted for rotation about a vertical axis, a plurality of stapler units swivelled on the carrier for horizontal revolution about said axis in a substantially circular orbit, an arcuate path through the machine substantially following the orbit of said stapler units but of less than a complete circle means for moving said articles successively along said path, each of said stapler units comprising a driver element adapted to drive a staple through one of said articles and against said clincher unit at a point on the coincident portions of said path and orbit, said stapler units and said driving elements each having a cam follower thereon, a cam track for causing the said units to swivel from a radial stapling position to a transverse wire receiving position, a cam track for causing the driver elements to drive a staple through an article, and means for driving said wire and said article moving means in synchronism.

8. A stapling machine of the class described, comprising, in combination, a carrier mounted for rotation about a vertical axis, a plurality of stapler units swivelled on the carrier for horizontal revolution about said axis in a substantially circular orbit, an equal number of clincher units each hinged on said carrier for swinging movement to and from clinching position with respect to one of said stapler units, an arcuate path through the machine substantially following the orbit of said stapler units but of less than a complete circle, means for moving said articles successively along said path, each of said stapler units comprising a driver element adapted to drive a staple through one of said articles and against said clincher unit at a point on the coincident portions of said path and orbit; said stapler unit, said clincher units, and said driving elements each having a cam follower thereon, a cam track for causing the said units to swivel from a radial stapling position to a transverse wire receiving position, a cam for causing the clincher units to swing to and away from clinching position and a cam track for causing the driver elements to drive a staple while one of said clincher units is in operative position, and means for driving said carrier and said article moving means in synchronism.

9. A stapling machine of the class described

comprising, in combination, a frame, a carrier rotatably mounted on said frame, a staple forming and driving member on said carrier and adapted to be moved through an endless path which includes a stapling station and a wire receiving and cut-off station, a wire feeding element at said latter station having a shearing edge past which the wire supply is fed, a cooperating shearing edge on said member which is adapted to be brought into shearing relation with said first named shearing edge to sever a length of wire to form a staple as the member is moved past said wire feeding element.

10. A stapling machine of the class described comprising, in combination, a frame, a carrier rotatably mounted on said frame, a plurality of staple forming and driving units swivelled on said carrier and adapted to be moved successively through an endless path which includes a stapling station and a wire receiving and cut-off station, a wire feeding element at said latter station having a shearing edge past which the wire supply is fed, a cooperating shearing edge on each of said units which is adapted to be brought into shearing relation with said first named shearing edge to sever a length of wire to form a staple as the unit is moved past said wire feeding element, the units adapted to drive the staples transversely to their path of movement and the wire feeding element adapted to feed wire transversely to said path and also transversely of the driving axis of the units, and means for swivelling the units between the stapling and wire receiving stations to appropriately orient the units.

11. A stapling machine of the class described comprising, in combination, a frame, a carrier rotatably mounted on said frame, a plurality of staple forming and driving units on said carrier and adapted to be moved successively through an endless path which includes a stapling station and a wire receiving and cut-off station, a wire feeding element at said latter station having a shearing edge past which the wire supply is fed, a cooperating shearing edge on each of said units which is adapted to be brought into shearing relation with said first named shearing edge to sever a length of wire forming a staple as the unit is moved past said wire feeding element, a retractable wire holding anvil element movable into the path of the units adjacent said wire feeding station and bracing the intermediate portion of the severed wire, means on the unit for bending the wire to form leg portions on the wire while so held, and means on said unit for displacing the anvil element from the path upon passage of the unit away from said wire feeding station.

12. In a stapling machine of the class described, a staple supporting and driving member, a reciprocable driver element on said member, means for moving an article to be stapled adjacent the machine, means for moving said member along in contact with an article for a limited distance, a resiliently yieldable cam surface on said machine adjacent the path of coincident movement of said article and member, and a cam follower portion on said driver element adapted to yieldably effect the driving movement of said element.

13. A stapling machine of the class described comprising, in combination, a conveyor for carrying articles to be stapled through the machine, the path of the articles while in the zone of operation of the machine being an arc of a circle, a plurality of stapler units carried by said machine and mounted to revolve in a substantially circular path part of which coincides with the arm of movement of said articles, the respective units adapted to meet and accompany the successive articles upon the conveyor as they enter the machine and drive their staples while the paths of the units and articles coincide, said units each comprising staple holding means and a reciprocable staple driving element having a cam following portion, a centrally disposed spring pressed cam member carried by the machine and adapted to be contacted by the drive elements of the successively revolving staple units, whereby the staples are resiliently driven through the articles.

14. A stapling machine of the class described, comprising, in combination a frame, a conveyor for moving through the machine articles certain portions of which are to be stapled, the path of said articles being in the form of an arc of a circle, a substantially circular rotary carrier mounted on said frame concentrically with said arc, a skirt-like portion of said frame embracing the margins of said carrier, a plurality of stapling units carried by the carrier at points about its periphery so as to move alongside and at the same speed as one of said articles, and adapted to be positioned during the portion of their revolution when they are adjacent an article to drive a staple radially outwardly of the carrier through said portion of the article, a plurality of clincher members hinged to said carrier for outward-and-upward and inward-and-downward movements upon the outer side of the staple receiving portion of said articles, each clincher member being disposed opposite one of said stapler members and adapted to cooperate therewith, means continually urging said clincher member outwardly and upwardly toward idle position, and a cam track on the inner side of said skirt-like portion of the frame for guiding said clincher member inwardly and downwardly to operative position adjacent the stapling point on the orbit thereof.

15. A stapling machine of the class described, comprising, in combination, a frame, a conveyor for moving through the machine articles certain portions of which are to be stapled, the path of said articles being in the form of an arc of a circle, a substantially circular rotary carrier mounted on said frame concentrically with said arc, a skirt-like portion of said frame embracing the margins of said carrier, a flanged marginal ring on said carrier against which the staple receiving portions of successive articles abut to be guided accurately through the machine, a plurality of stapling units carried by the carrier at points about its periphery so as to move alongside and at the same speed as one of said articles, and adapted to be positioned during the portion of the revolution when they are adjacent an article to drive a staple radially outwardly of the carrier through certain portions of the article, a plurality of clincher members hinged to said carrier for outward-and-upward and inward-and-downward movements upon the outer side of the staple receiving portion of said articles, each clincher member being disposed opposite one of said stapler members and adapted to cooperate therewith, spring means continually urging said clincher member outwardly and upwardly toward idle position against a stop abutment on the carrier, and a cam track on the inner side of said skirt-like portion of the frame for guiding said clincher member inwardly and down-

wardly to operative position adjacent the stapling point on the orbit thereof.

16. A stapling machine of the class described comprising, in combination, a frame, a conveyor for moving through the machine articles certain portions of which are to be stapled, the path of said articles having relatively straight approach and departure portions but being in the form of an arc of a circle as it passes through the machine, a substantially circular rotary carrier mounted on said frame concentrically with said arc, a skirt-like portion of said frame embracing the margins of said carrier, a plurality of stapling units carried by the carrier at points about its periphery so as to move alongside and at the same speed as one of said articles, and adapted to be positioned during the portion of their revolution when they are adjacent an article to drive a staple radially outwardly of the carrier through certain portions of the article, a plurality of clincher members hinged to said carrier for outward-and-upward and inward-and-downward movements upon the outer side of the staple receiving portion of said articles, each clincher member being disposed opposite one of said stapler members and adapted to cooperate therewith, means continually urging said clincher member outwardly and upwardly toward idle position, a cam track on the inner side of said skirt-like portion of the frame for guiding said clincher member inwardly and downwardly to operative position adjacent the stapling point on the orbit thereof, and means for swinging said stapler units to a non-radial loading position at a point on its orbit away from the stapling point on the arc of movement of the articles, said cam track also being shaped to permit the clincher members to swing away from the vicinity of the articles as the path of the articles diverges from the orbit of the stapler members.

17. In a stapler machine of the class described, means for moving a series of articles to be stapled through the machine, a rotary carrier, a stapling member mounted on said carrier for movement for a portion of its cycle in operative relation to one of said articles, a clincher member hinged on said carrier for movement to and from cooperative position with respect to said stapler member, an abutment face on said clincher member directed toward said stapler member, and a pair of wear resisting inserts in said face to be contacted by the staple points during the clinching operation.

18. In a stapler machine of the class described, means for moving a series of articles to be stapled through the machine, a rotary carrier, a stapling member mounted on said carrier for movement for a portion of its cycle in operative relation to one of said articles, a clincher member hinged on a pintle on said carrier for movement to and from cooperative position with respect to said stapler member, an abutment face on said clincher member directed toward said stapler member, a pair of wear resisting inserts in said face to be contacted by the staple points during the clinching operation, a cam follower roller on the back of said clincher member, a spring coiled about said pintle and having a portion fixed and another portion bearing against the clincher member, and a cam track surrounding said rotary carrier for guiding the clincher members to operative position from idle position against the tension of the spring.

19. A stapling machine of the class described, comprising, in combination, a supporting base, a vertical post extending upwardly from said base, a conveyor track looped about said post, and a stapler head supported at the upper end of said post and overlying the bight of said track.

20. A stapling machine of the class described, comprising, in combination, a supporting base, a vertical post extending upwardly from said base, a conveyor looped about said post, a housing supported upon the top of said post and overlying the bight of said conveyor, a rotary stapler mechanism in the lower portion of said housing adapted to operate upon successive articles passing along said conveyor, a wire feeding mechanism in the upper portion of said housing, means for driving said stapler mechanism, and transmission mechanism from said rotary stapler mechanism to said wire feeding mechanism.

21. A stapling machine of the class described, comprising, in combination, a supporting base, a vertical post extending upwardly from said base, a conveyor looped about said post, a substantially cylindrical drum-like housing supported upon the top of said post and overlying the bight of said conveyor, a horizontal partition in said housing, a rotary stapler mechanism in the lower portion of said housing adapted to operate upon successive articles passing along said conveyor, a wire feeding mechanism in the upper portion of said housing, means for driving said stapler mechanism, and transmission mechanism extending through said partition from said rotary stapler mechanism to said wire feeding mechanism.

22. A stapling machine of the class described, comprising, in combination, a supporting base, a vertical post extending upwardly from said base, a conveyor looped about said post, a substantially cylindrical drum-like housing supported upon the top of said post and overlying the bight of said conveyor, a horizontal partition in said housing, a rotary stapler mechanism in the lower portion of said housing adapted to operate upon successive articles passing along said conveyor, a wire feeding mechanism in the upper portion of said housing, means for driving said stapler mechanism from the conveyor, transmission mechanism extending through said partition from said rotary stapler mechanism to said wire feeding mechanism, and means extending outside of the housing proper for conducting the wire from the feeding mechanism to the stapler mechanism.

23. A stapling machine of the class described, comprising, in combination, a supporting base, a vertical post extending upwardly from said base, a conveyor looped about said post, a substantially cylindrical drum-like housing supported upon the top of said post and overlying the bight of said conveyor, a rotary stapler mechanism in the lower portion of said housing adapted to operate upon successive articles passing along said conveyor, a wire feeding mechanism in the upper portion of said housing, means for driving said stapler mechanism, disconnectable transmission mechanism from said rotary stapler mechanism to said wire feeding mechanism, a hinged cover plate on the top of said housing, and a rotatable manually operable member extending through said cover plate, and means for detachably connecting said member to the said wire feed mechanism as an alternative driving means.

24. A stapling machine of the class described comprising, in combination, a supporting base,

a vertical tubular post extending upwardly from said base, a conveyor looped about said post and adapted to move in the direction of its own configuration, a housing supported upon the top of said post and overlying the bight of said conveyor, a rotary hub on said post sprocketed to said conveyor and adapted to be driven thereby, a rotary stapler mechanism in said housing, and means operatively connecting said hub with said mechanism for transmitting driving force to the latter.

25. A stapling machine of the class described comprising, in combination, a supporting base, a vertical tubular post extending upwardly from said base, a conveyor looped about said post and adapted to move in the direction of its own configuration, a housing supported upon the top of said post and overlying the bight of said conveyor, a rotary hub on said post sprocketed to said conveyor and adapted to be driven thereby, a rotary stapler mechanism in said housing, means operatively connecting said hub with said mechanism for transmitting driving force to the latter, wire feed mechanism in the upper portion of said housing and transmission means extending from said hub to said wire feed mechanism, a clutch in said transmission, an article detector adjacent said conveyor, and means extending through said hollow post from said detector to said clutch for actuating the latter to interrupt said transmission upon the omission of an article from the conveyor adjacent said detector.

26. A stapling mechanism of the class described, comprising, in combination, a supporting base, a frame extending from said base, a stapler head carried by said frame, a substantially U-shaped chain conveyor partially surrounding and movably carried by said frame, cooperating means on said frame and said base for adjusting said frame and stapler head toward and from the bight of said conveyor in order to adjust the tension of the latter and to take up any slack therein.

CHARLES Z. MONROE.

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