

Nov. 9, 1943.

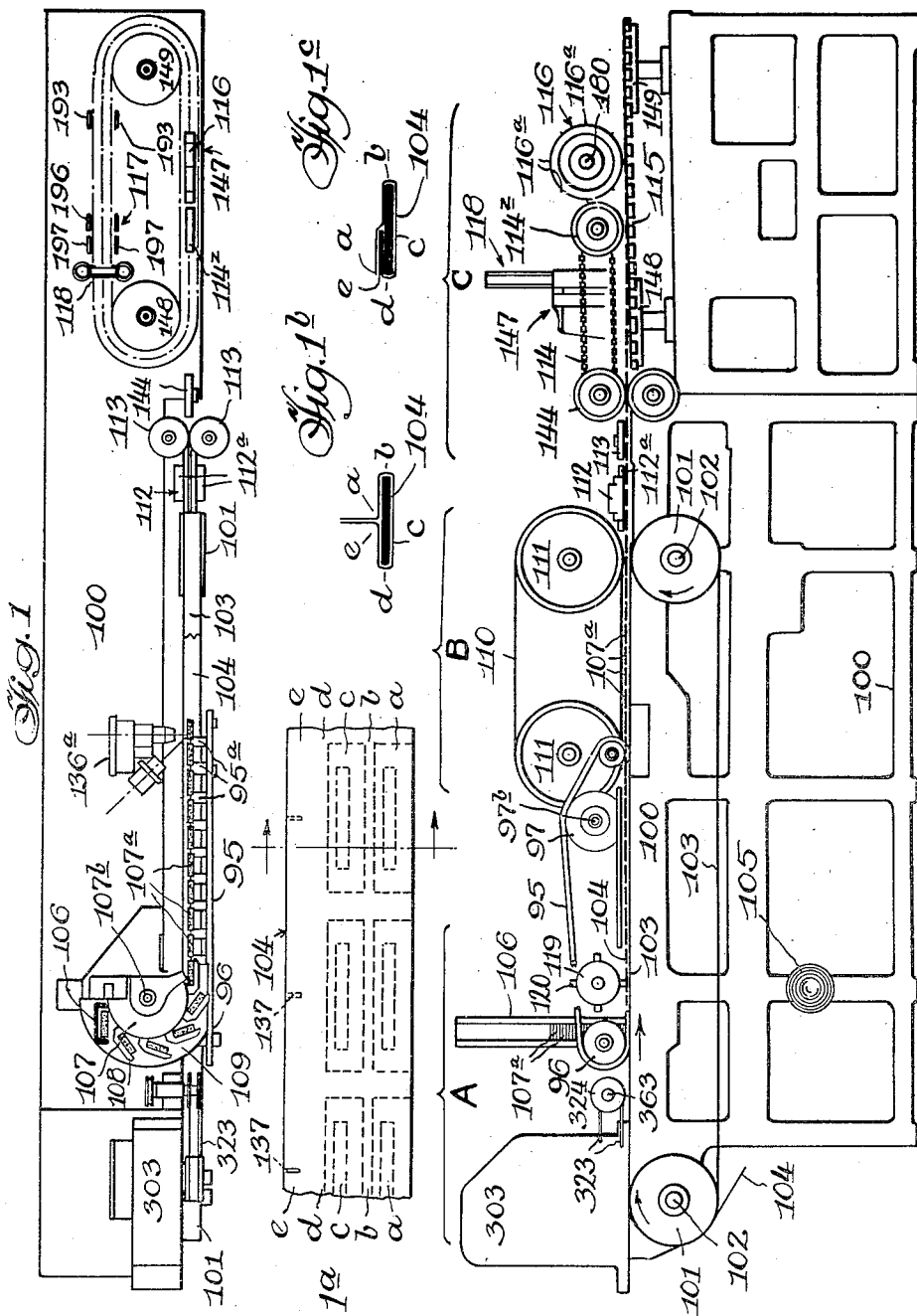
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 1



Witness:
Chas. H. Koush.

INVENTORS.
Willet B. Ranney
and Albert F. Ruhf
OFFICIAL TYPING SHOP
ATTORNEYS.

Nov. 9, 1943.

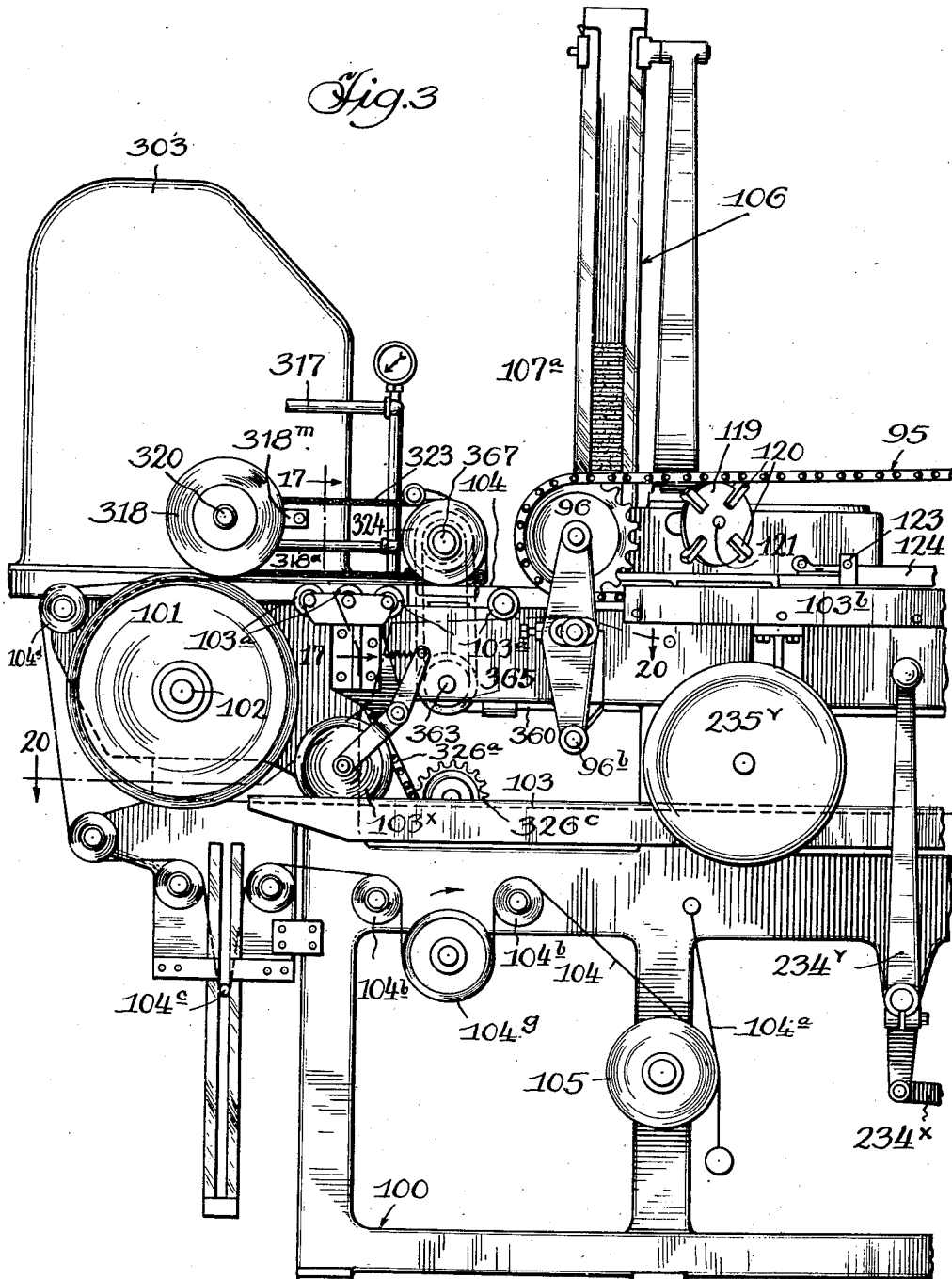
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 2



Witness:
Chas. R. Korsch.

INVENTORS.
Willet B. Ranney
and Albert H. Kuhf,
Attorneys.
Office: Hohlberg, Kott & Tarkenton

Nov. 9, 1943.

W. B. RANNEY ET AL

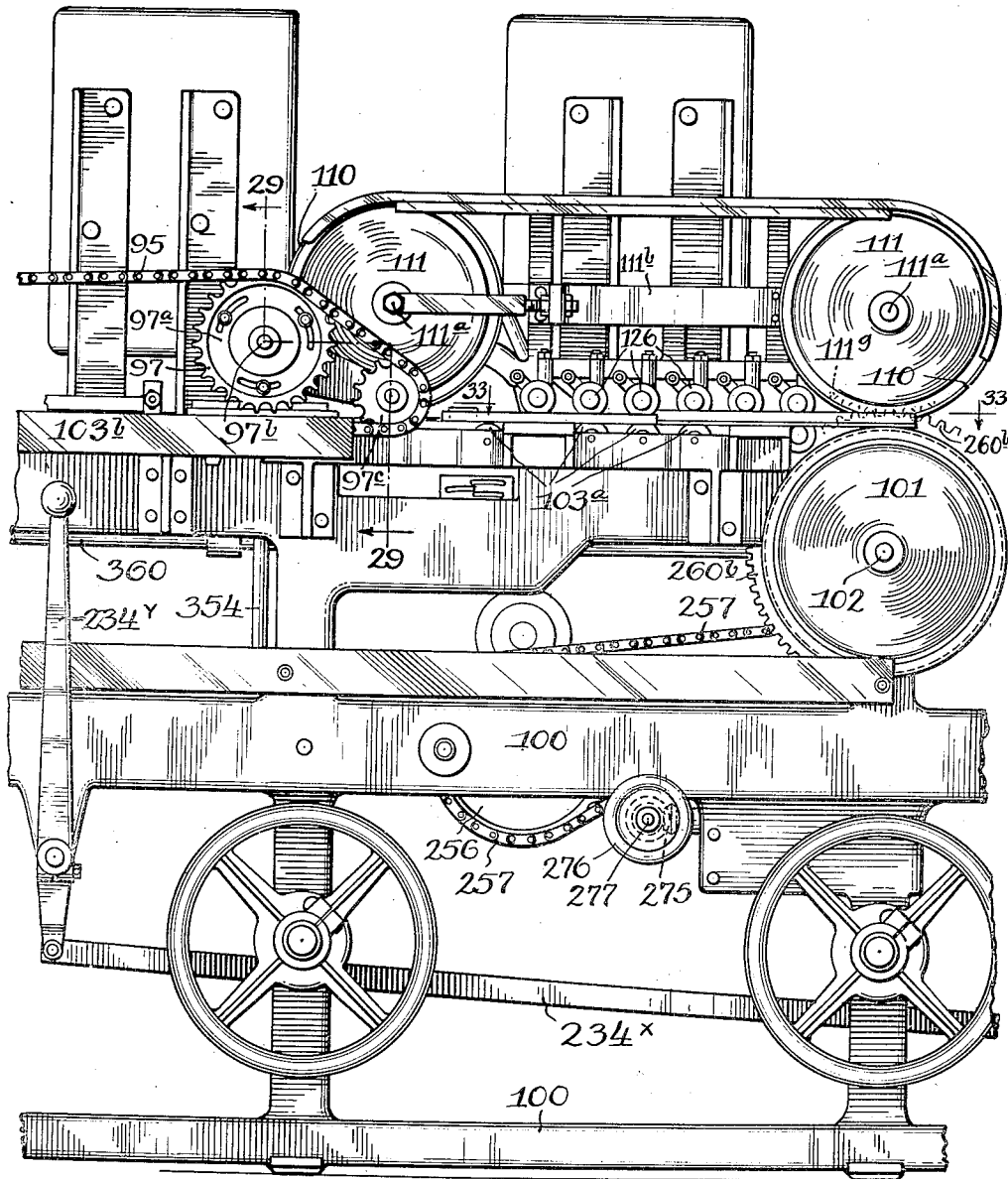
2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 3

Fig. 4



Witness:
Chas. H. Koush

INVENTORS.
Willet B. Ranney
and *Albert H. Ruhf*,
Offield, Webb, Scott & Cook,
ATTORNEYS.

Nov. 9, 1943.

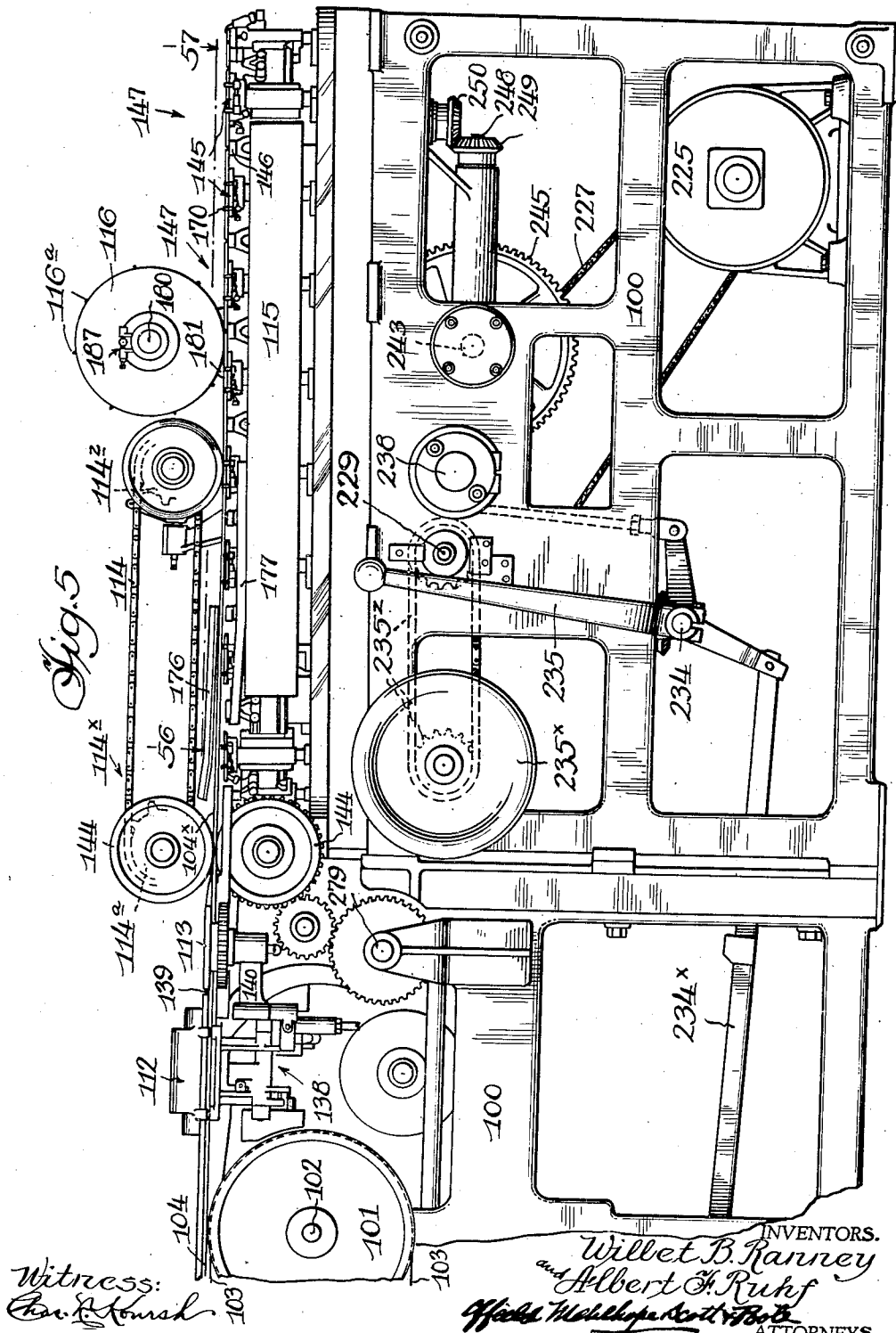
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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Nov. 9, 1943.

W. B. RANNEY ET AL

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GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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Nov. 9, 1943.

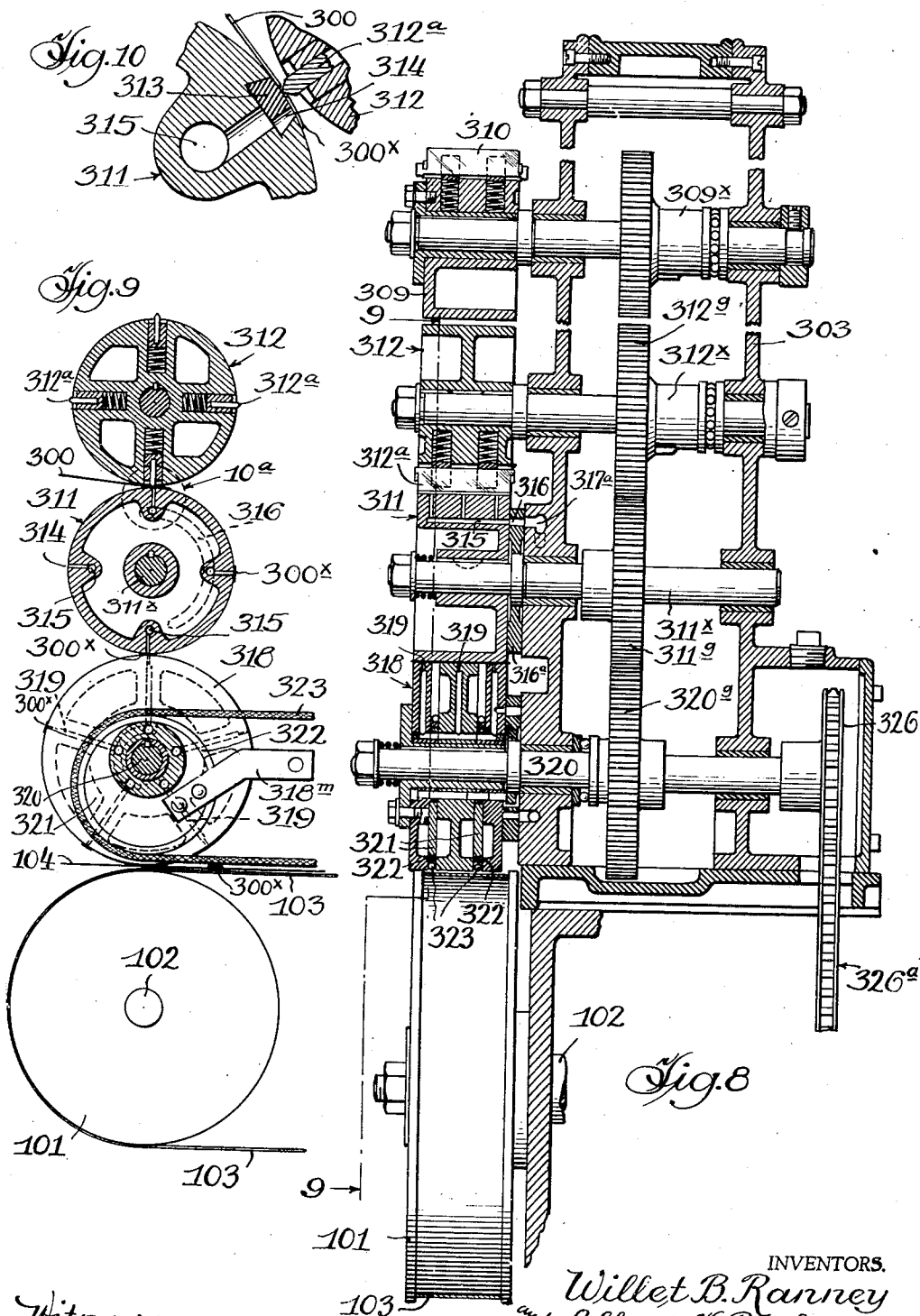
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 6



Witness:
Chas. R. Kirsch.

INVENTORS.
Willet B. Ranney
and Albert G. Ruhf
Attorneys.
Office: The Chicago Patent & Trademark Co.

Nov. 9, 1943.

W. B. RANNEY ET AL
GUM STICK WRAPPING MACHINE

2,334,029

Filed April 1, 1940

34 Sheets-Sheet 7

Fig. 11

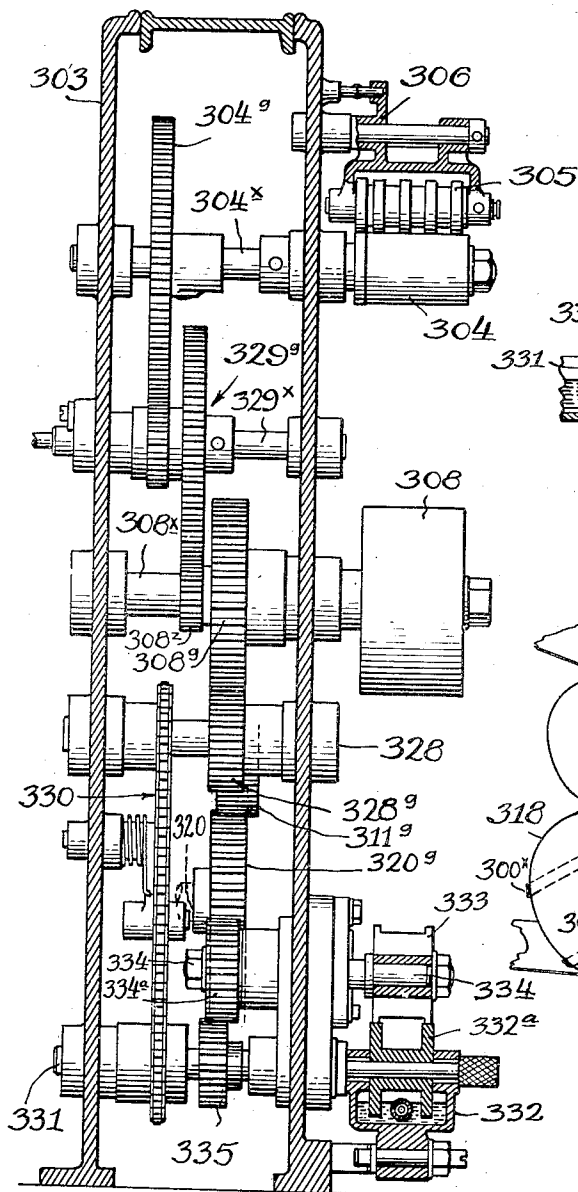


Fig. 12

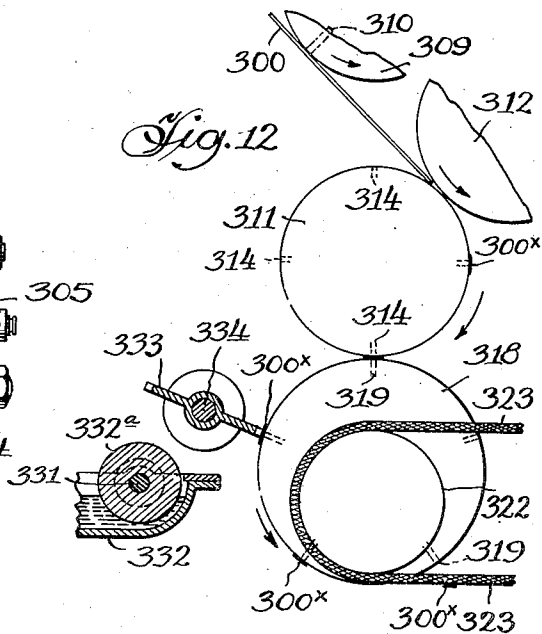


Fig. 13

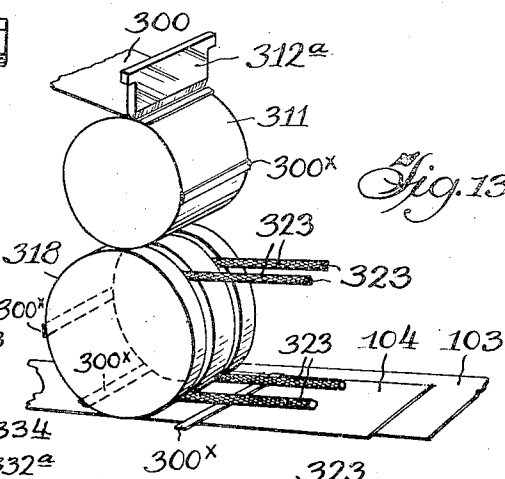
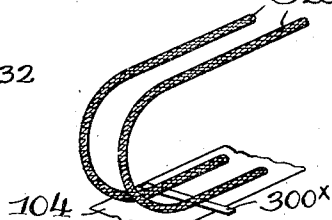


Fig. 14



Witness:
Chas. L. Korsch

INVENTORS.
Willet B. Ranney
and Albert A. Ruffy
ATTORNEYS.
Office: Washburn & Scott, Boston

Nov. 9, 1943.

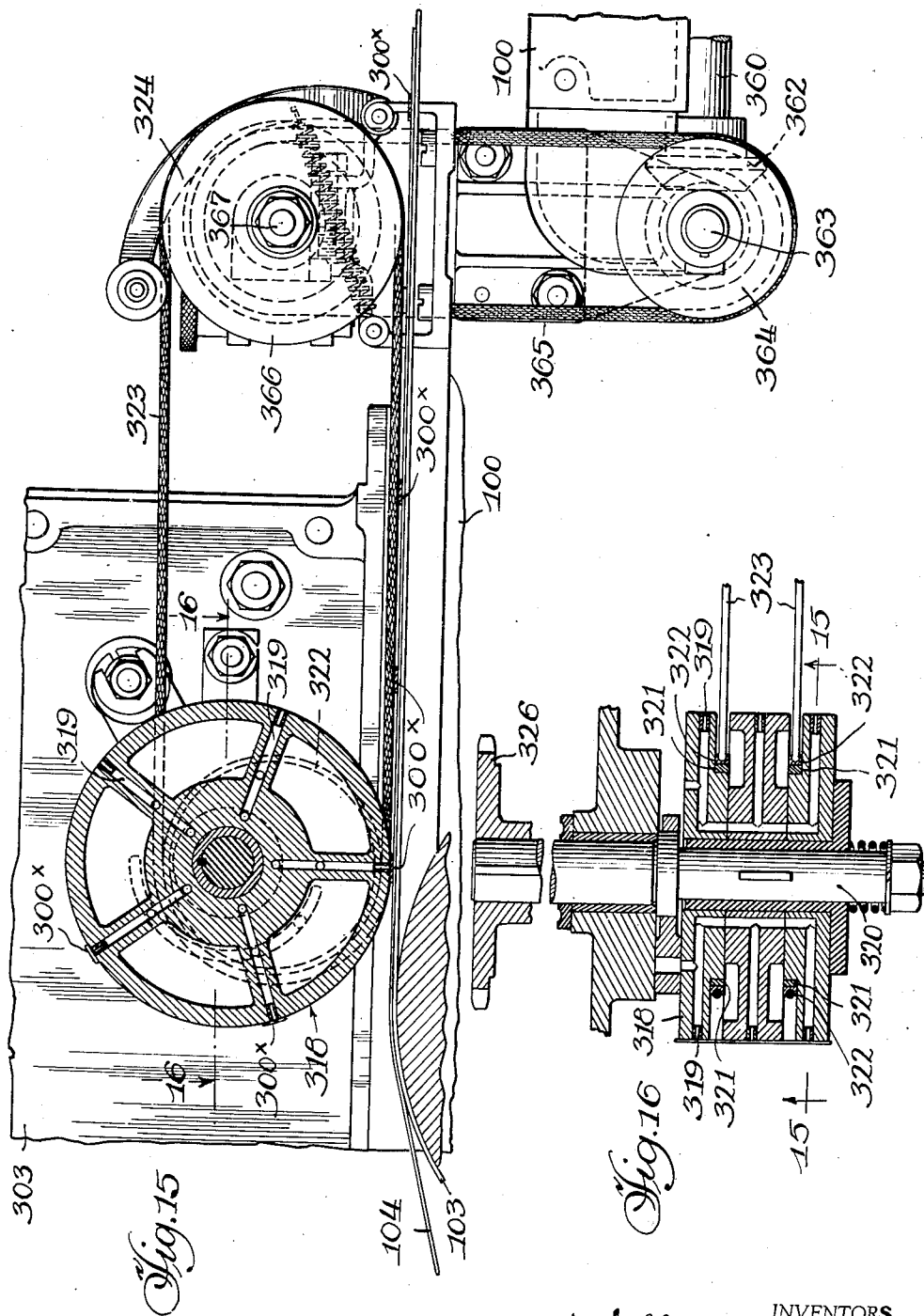
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 8



Witness:
Chas. L. Loush.

INVENTORS.
Willet B. Ranney
and Albert F. Ruhf
Offutt, Muller, Smith & Pool
 ATTORNEYS.

Nov. 9, 1943.

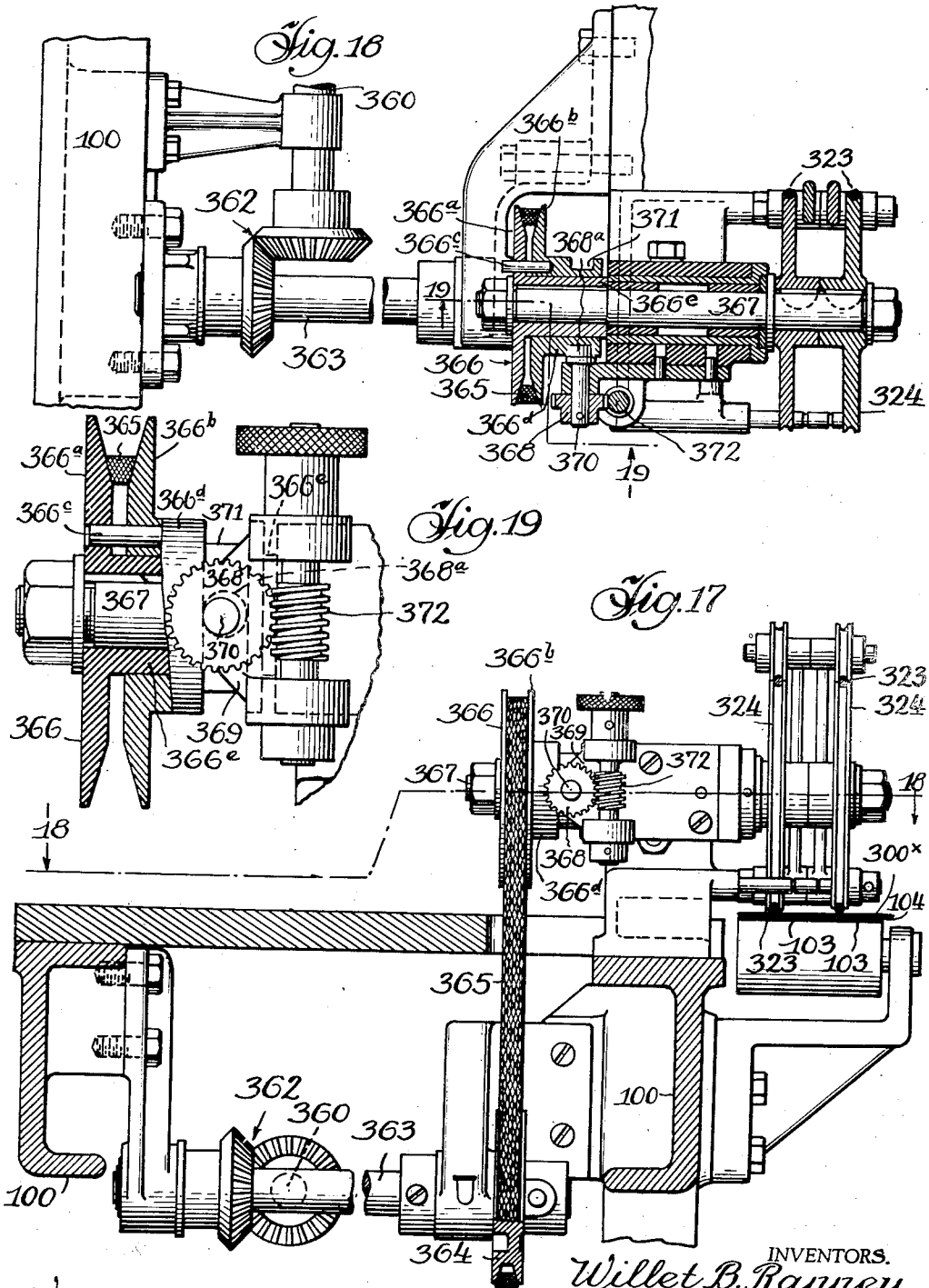
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 9



Witness:
Chas. L. Korsch.

INVENTORS.
Willet B. Ranney
and Albert F. Ruffy
Attorneys.
Office: 1111 1/2 Ave. N. E. Wash. D. C.

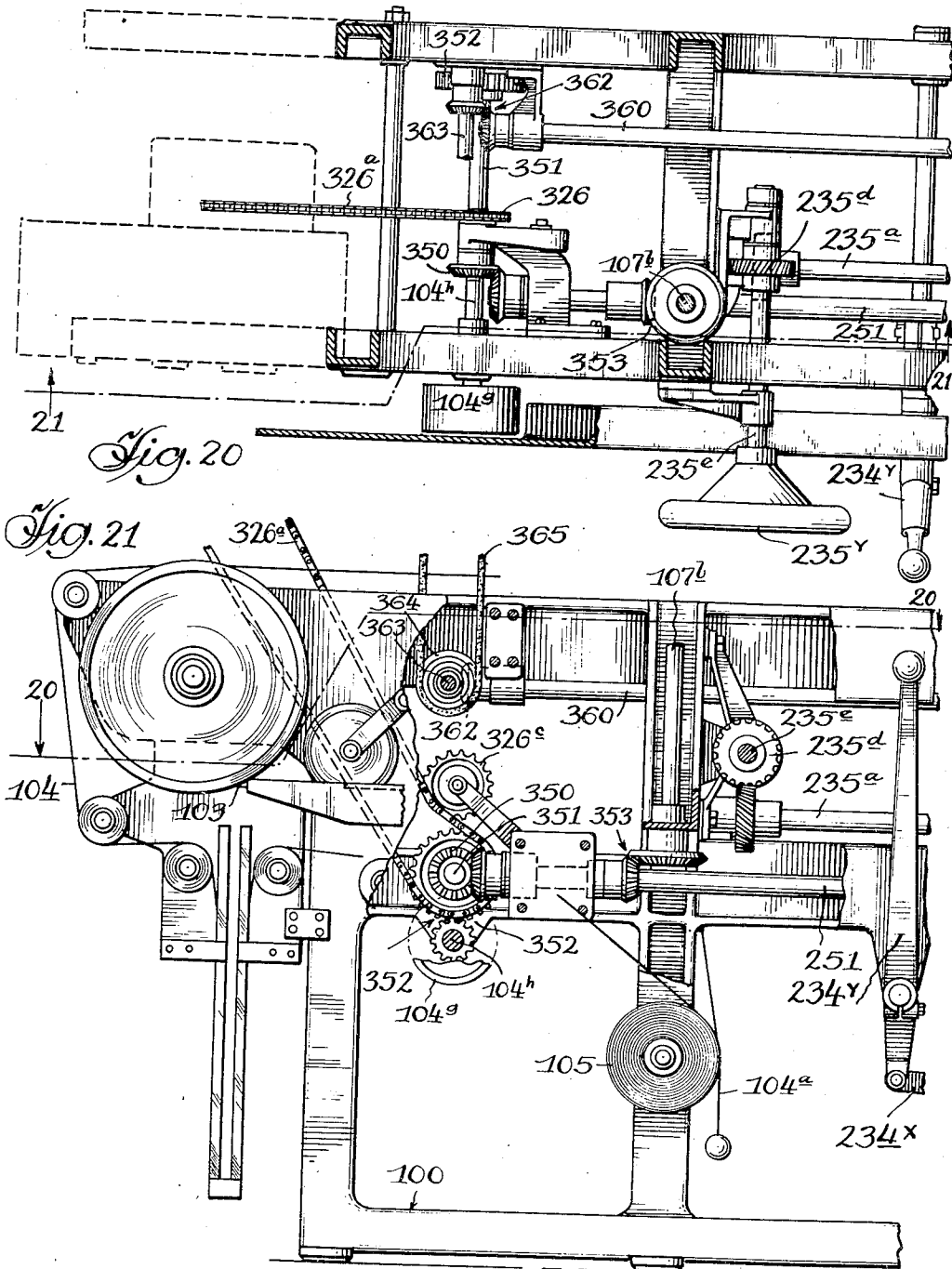
Nov. 9, 1943.

W. B. RANNEY ET AL
GUM STICK WRAPPING MACHINE

2,334,029

Filed April 1, 1940

34 Sheets-Sheet 10



Witness:
Chas. R. Korsch.

INVENTORS.
Willet B. Ranney
and Albert F. Ruffy
OFFICE: McLaughlin & Park
ATTORNEYS.

Nov. 9, 1943.

W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 13

Fig. 27

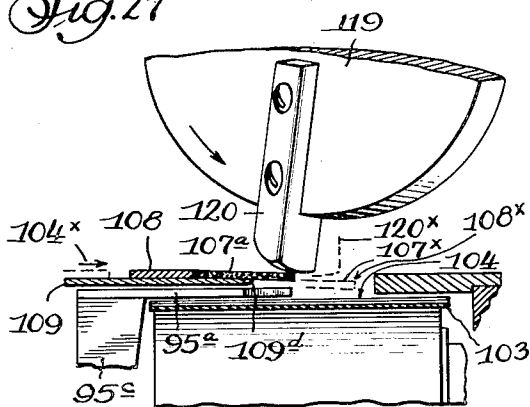


Fig. 28

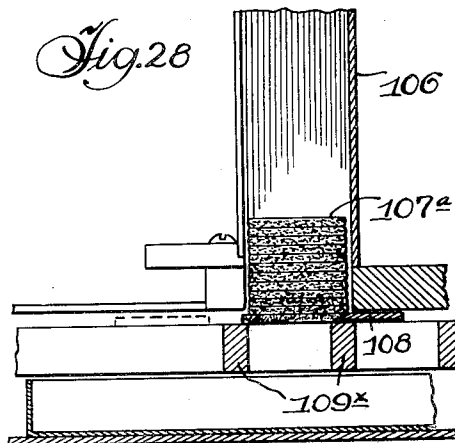
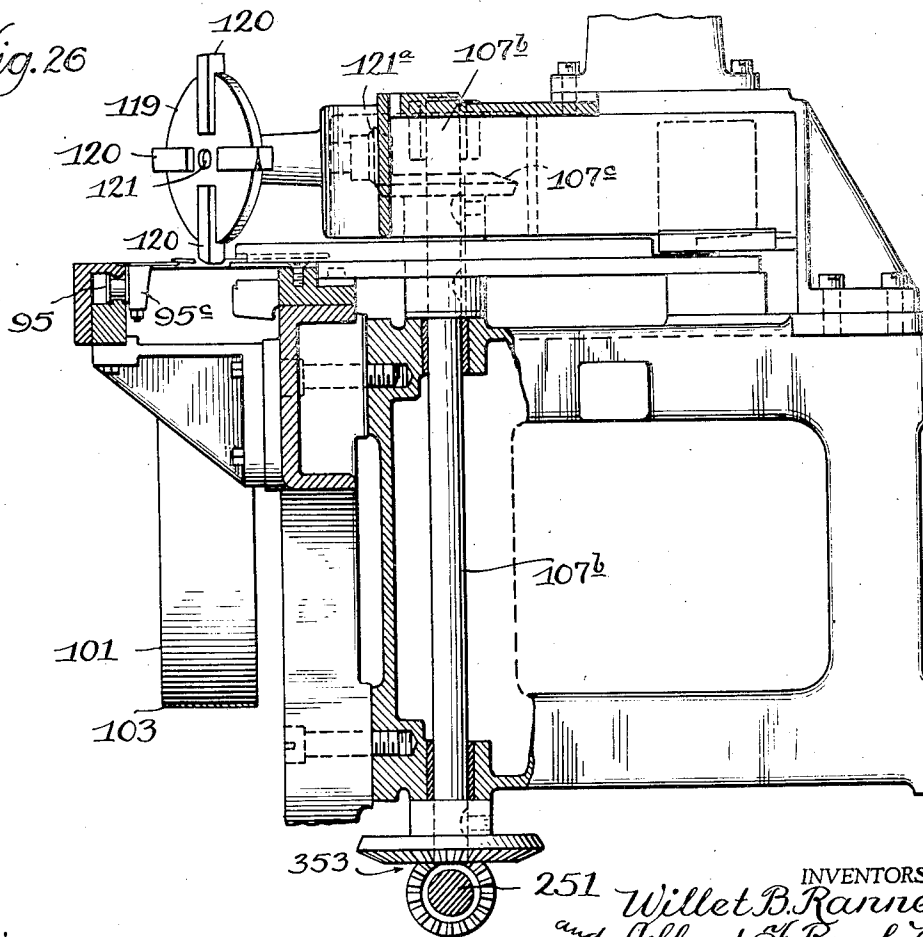


Fig. 26



Witness:
Chas. L. Korsch.

INVENTORS.
Willet B. Ranney
and Albert H. Ruff
OFFICE: HULL, SCOTT & POOL
ATTORNEYS.

Nov. 9, 1943.

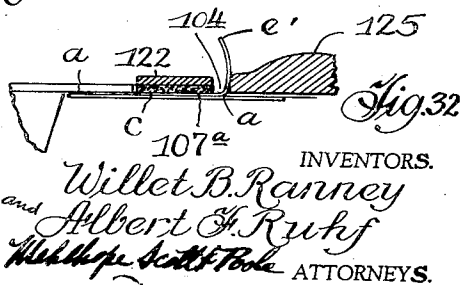
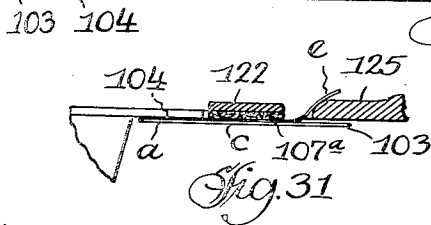
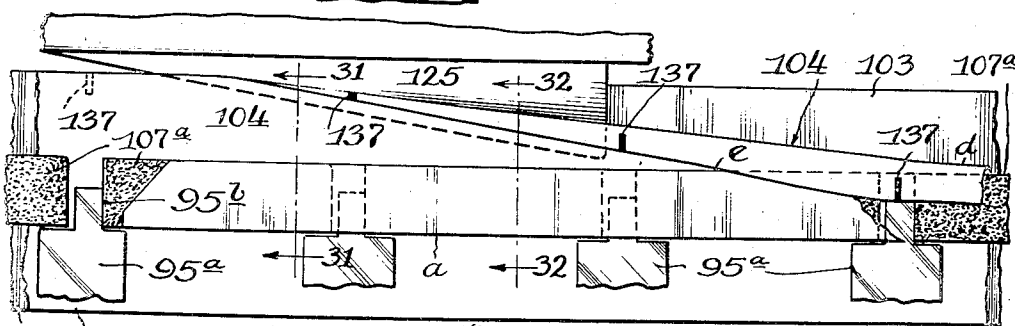
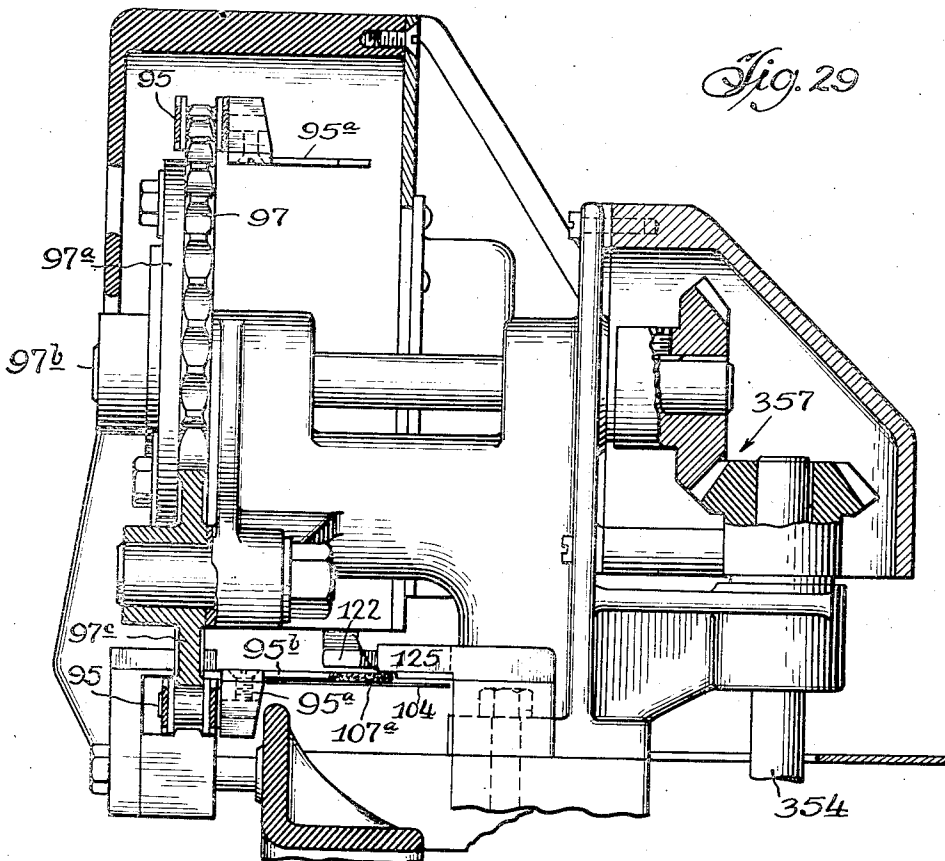
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 14



Witness:
Chas. R. Koursho

INVENTORS.
Willet B. Ranney
and Albert G. Rudy
OFFICE: HILL, HILL & SCOTT, P.O. BOX 100, ST. LOUIS, MO.
ATTORNEYS.

Nov. 9, 1943.

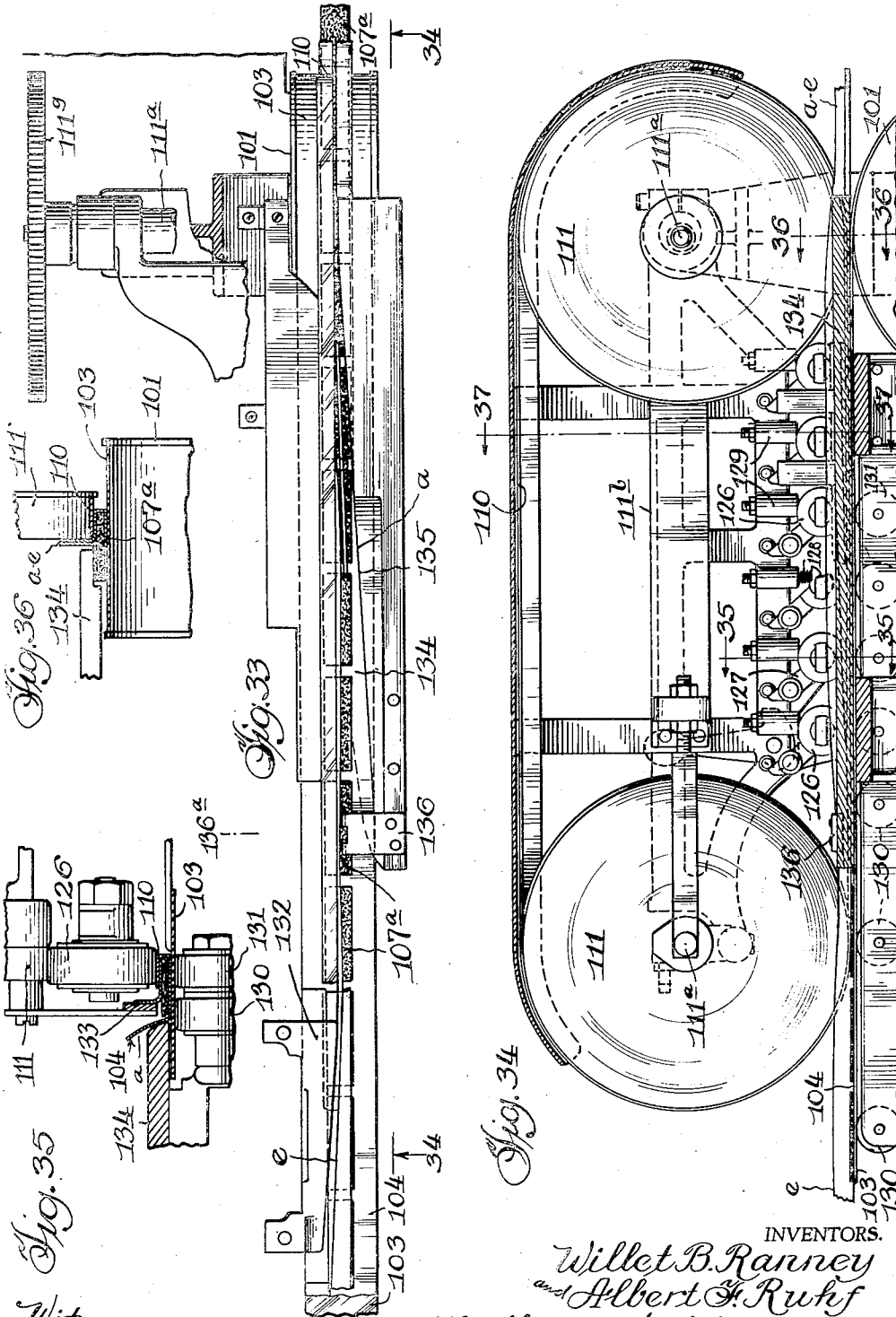
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 15



Witness:
Chas. R. Koush.

INVENTORS.
Willet B. Ranney
and Albert F. Ruffy
OFFICE: Weidner, Kott & Pool. ATTORNEYS.

Nov. 9, 1943.

W. B. RANNEY ET AL

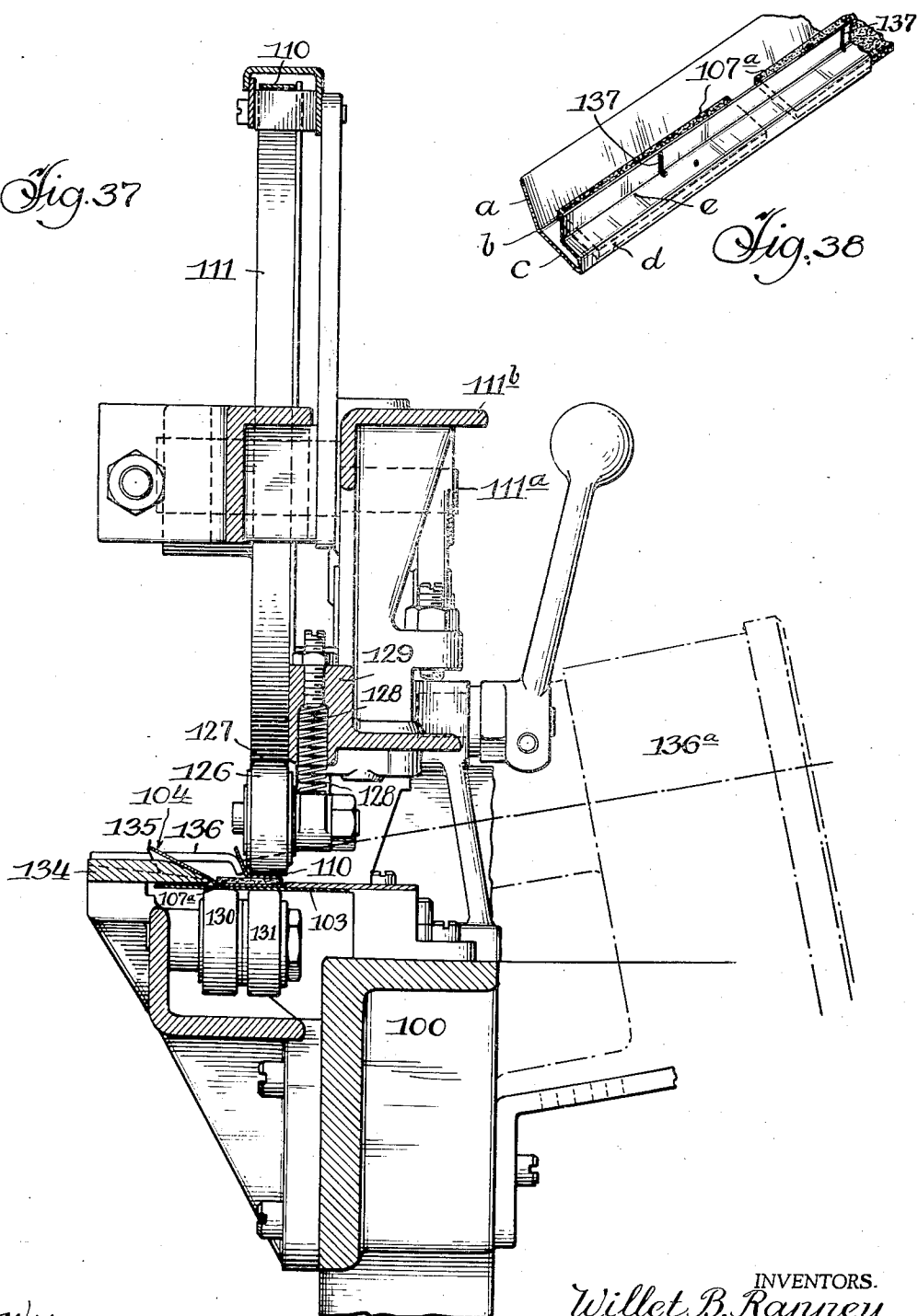
2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 16

Fig. 37



Witness:
Chas. E. Koush.

INVENTORS.
Willet B. Ranney
and Albert F. Rudy
Attorneys.
Offield, Webb, Keefe & Pohl

Nov. 9, 1943.

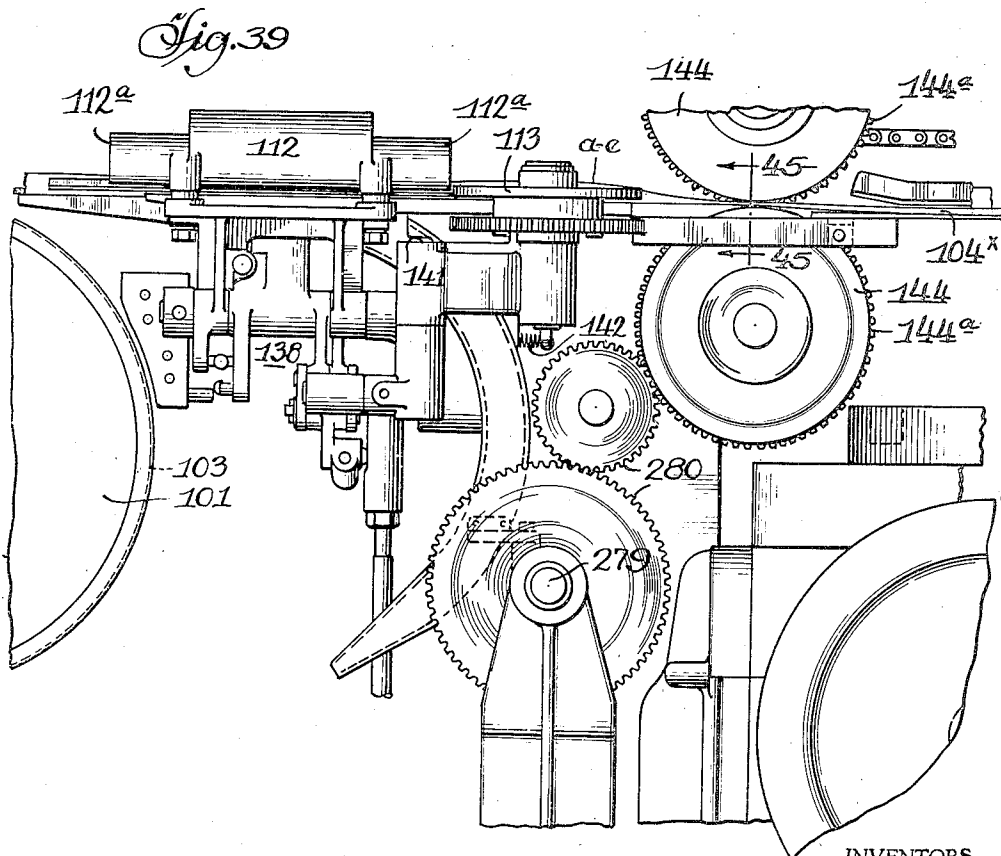
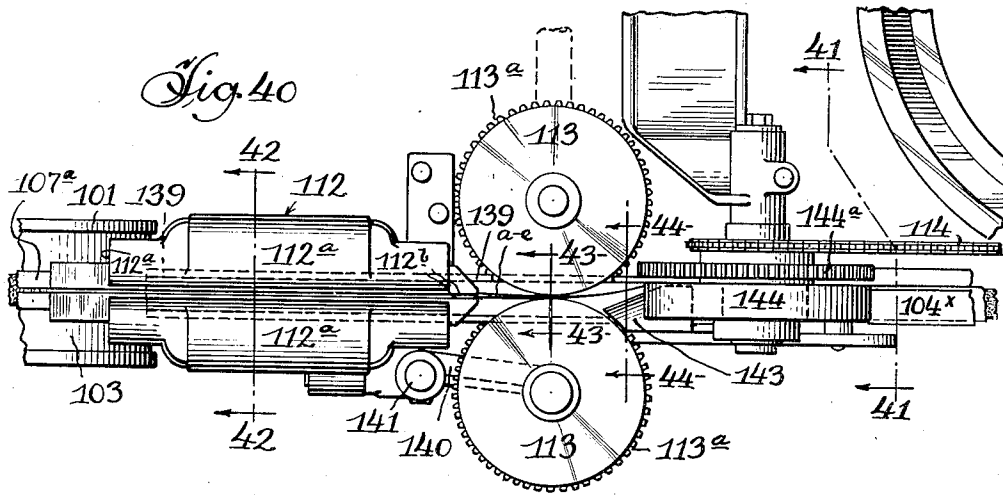
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 17



Witness:
Chas. E. Korsch

INVENTORS.
Willet B. Ranney
and *Albert F. Ruffy*
Offile Wohlhoff Scott & Pohl ATTORNEYS.

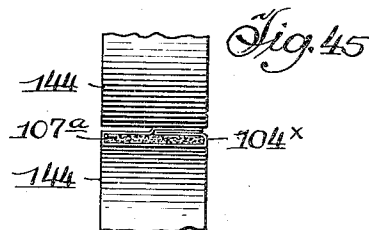
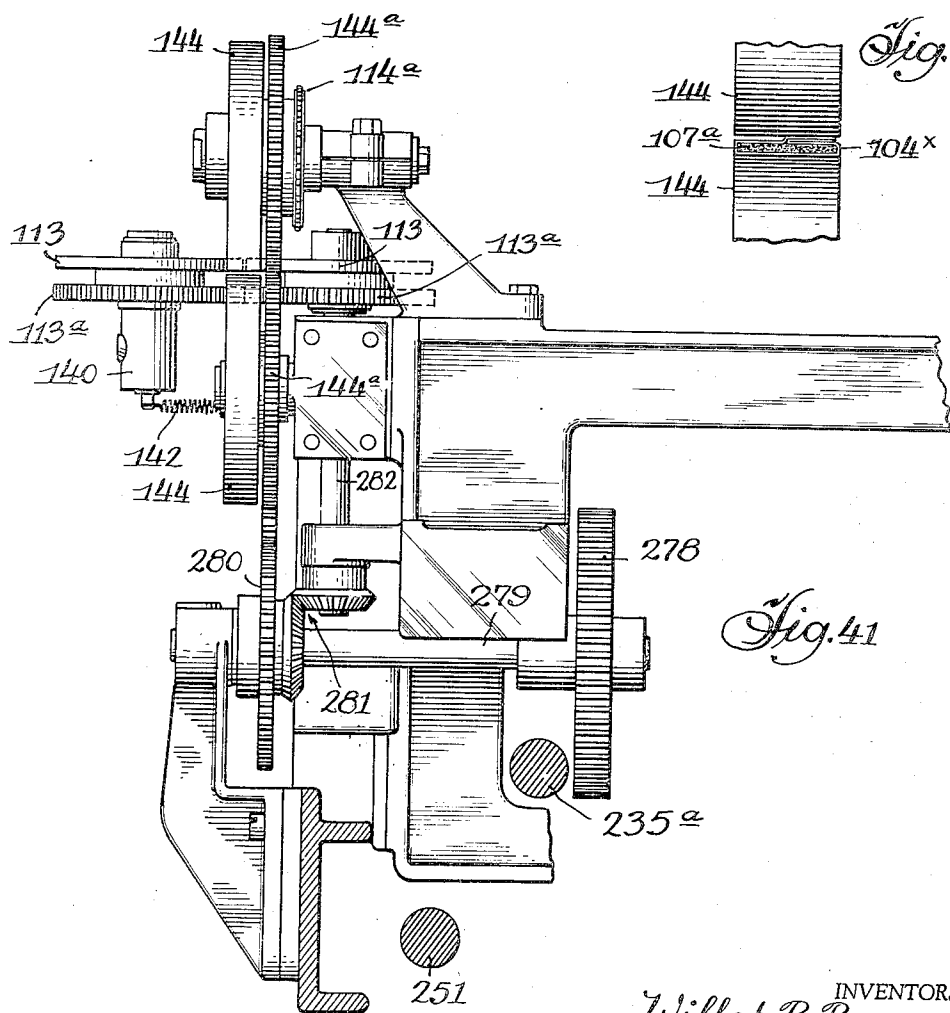
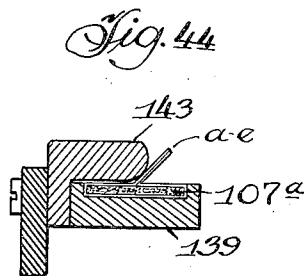
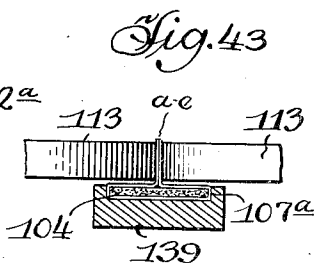
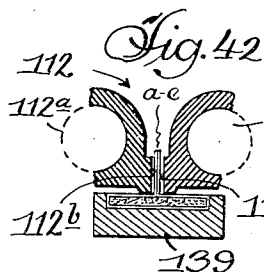
Nov. 9, 1943.

W. B. RANNEY ET AL
GUM STICK WRAPPING MACHINE

2,334,029

Filed April 1, 1940

34 Sheets-Sheet 18



Witness:
Chas. F. Korsch.

INVENTORS.
Willet B. Ranney
and Albert F. Ruff
Attorneys.

Nov. 9, 1943.

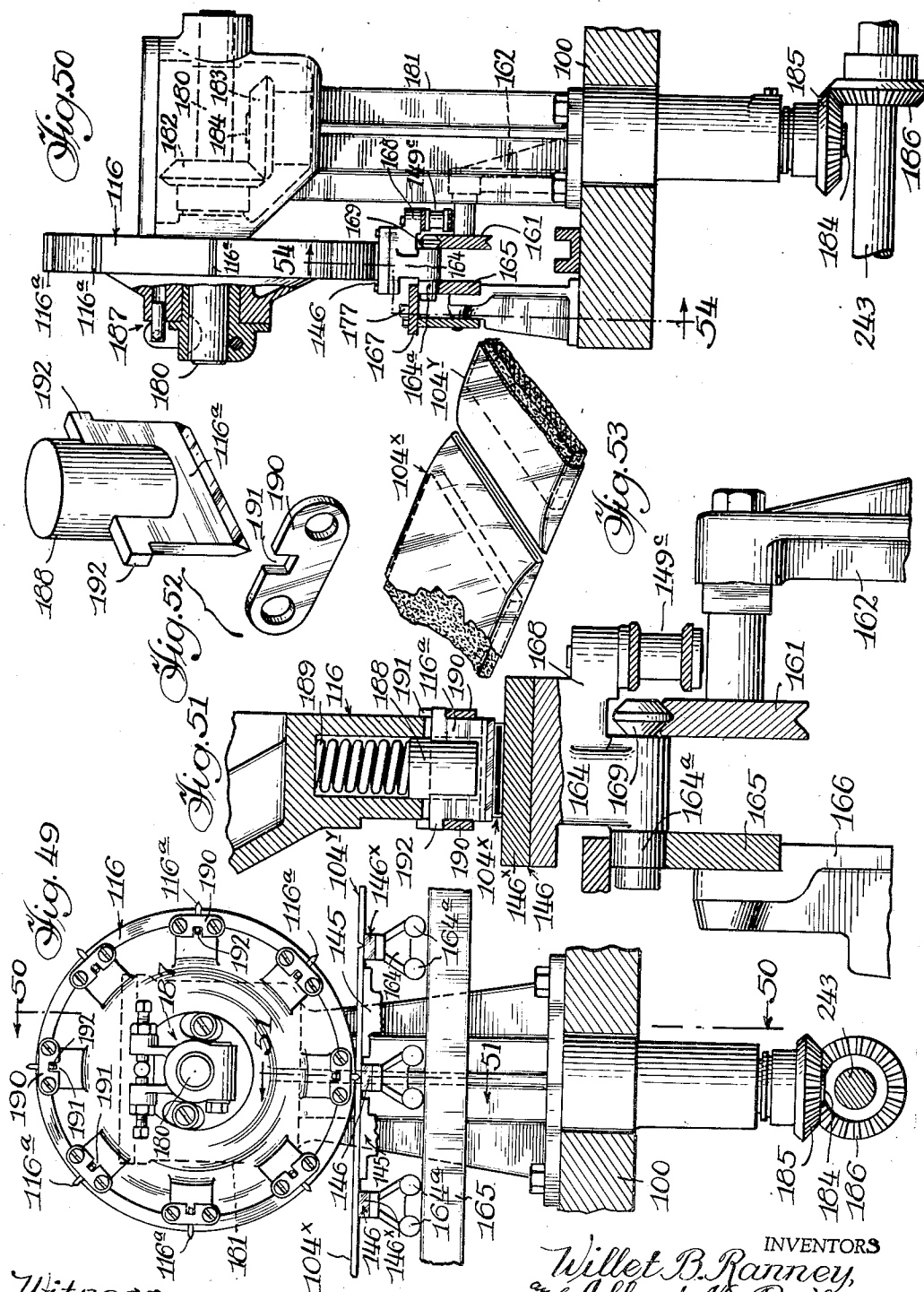
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 20



Witness:
Chas. R. Korsch.

INVENTORS
Willet B. Ranney,
and Albert F. Ruffy
OFFICE: 1111 1/2 1st St. N. E. S. P. O. Box 100
ATTORNEYS.

Nov. 9, 1943.

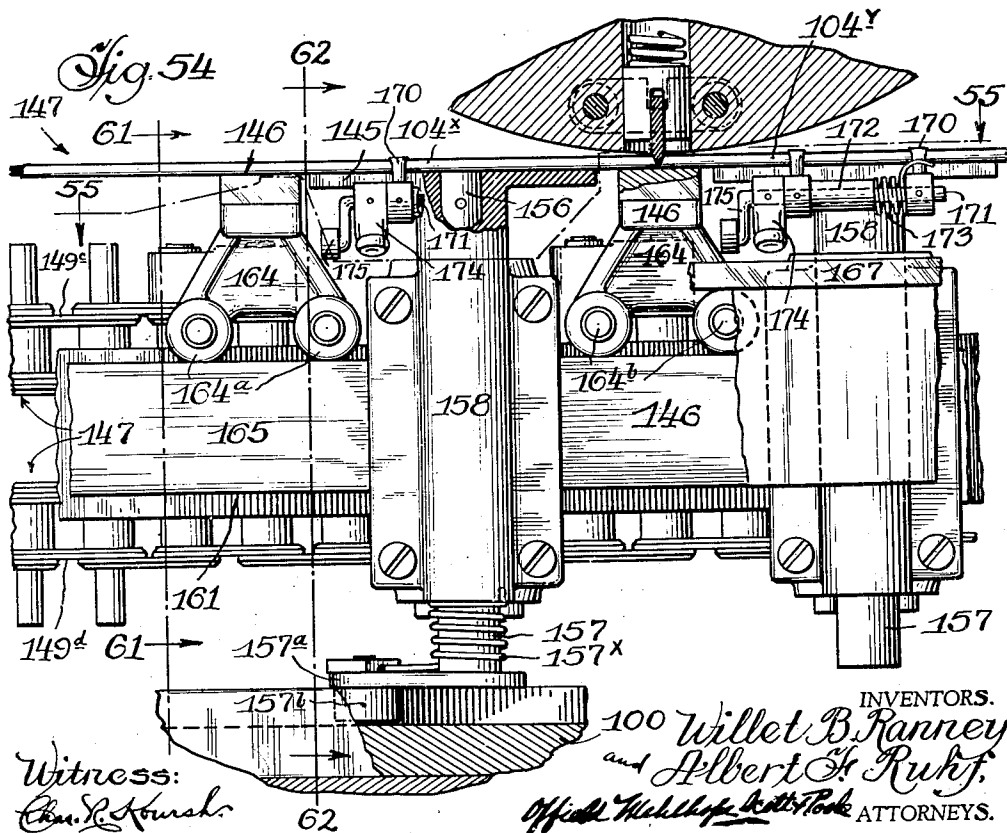
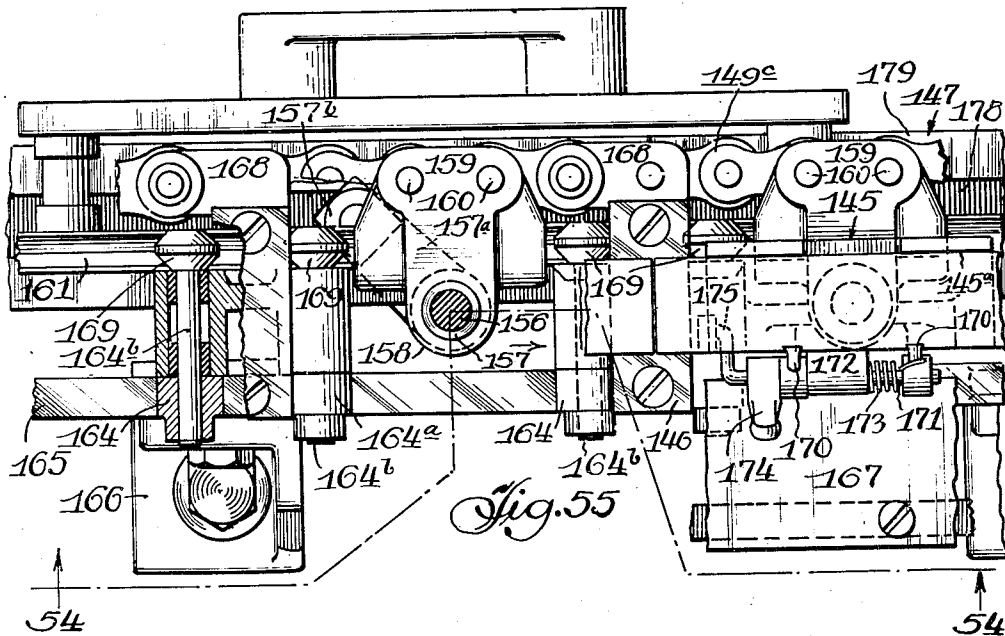
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 21



Witness:
Chas. L. Koush.

100 Willet B. Ranney
and Albert H. Rusk.
Official Makers of Better Tools

Nov. 9, 1943.

W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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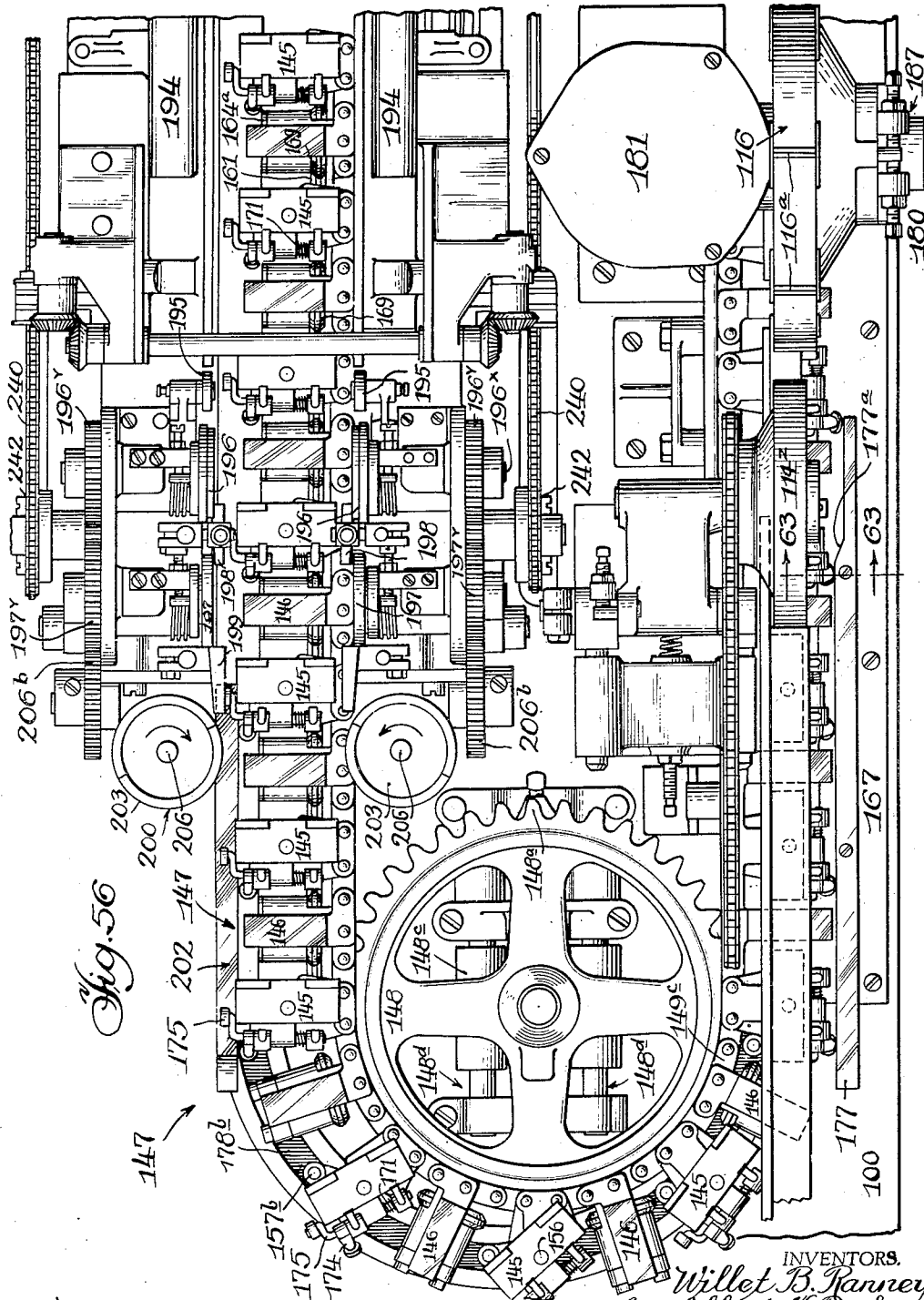


Fig. 56

Witness:
Chas. F. Korsch.

INVENTORS.
Willet B. Ranney
and Albert H. Kuch,
Attorneys.

Nov. 9, 1943.

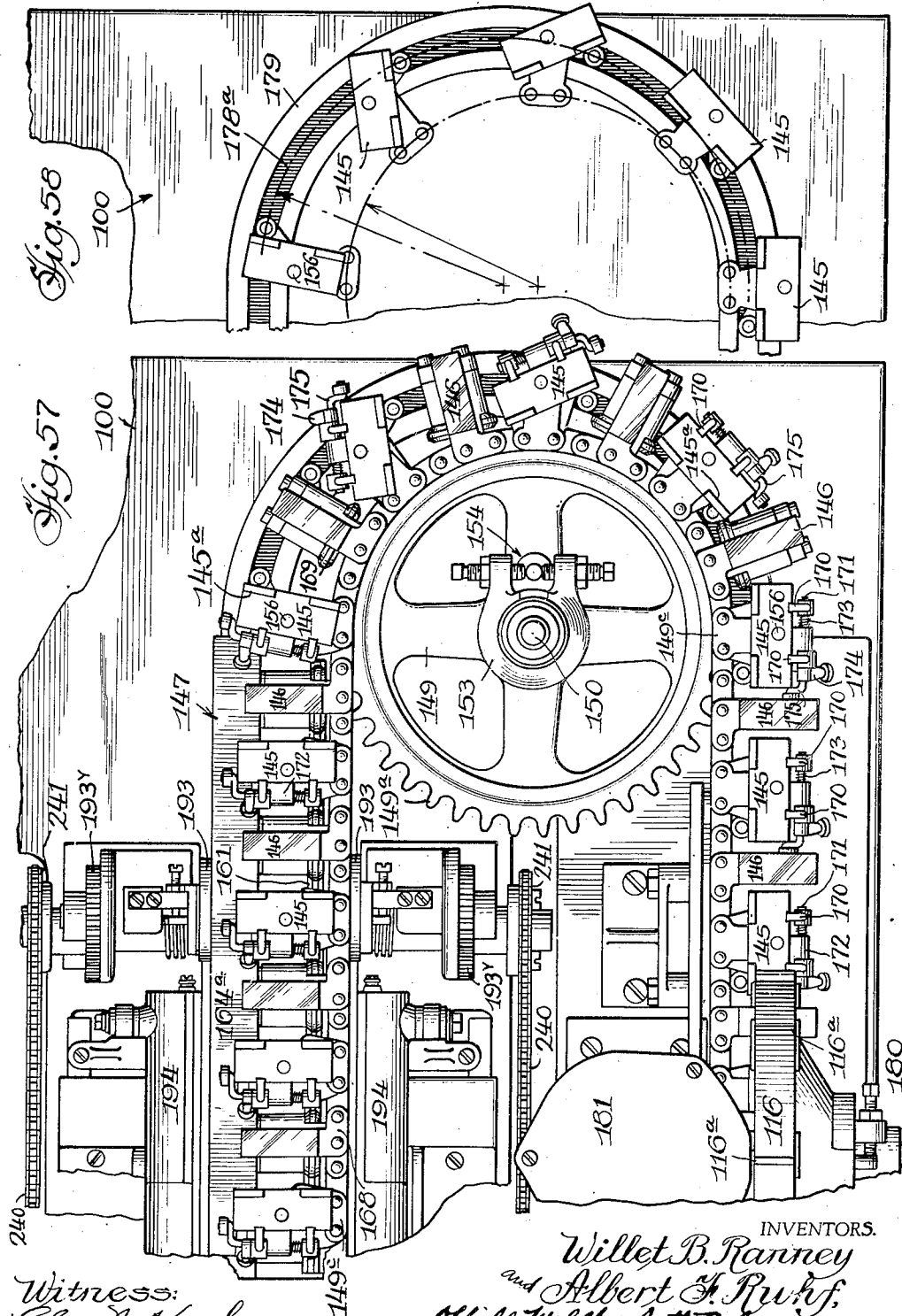
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 23



Witness:
Chas. A. Koush.

INVENTORS.
Willet B. Ranney
and Albert H. Ruff.
OFFICE: *Widdows Smith & Pook* ATTORNEYS.

Nov. 9, 1943.

W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 24

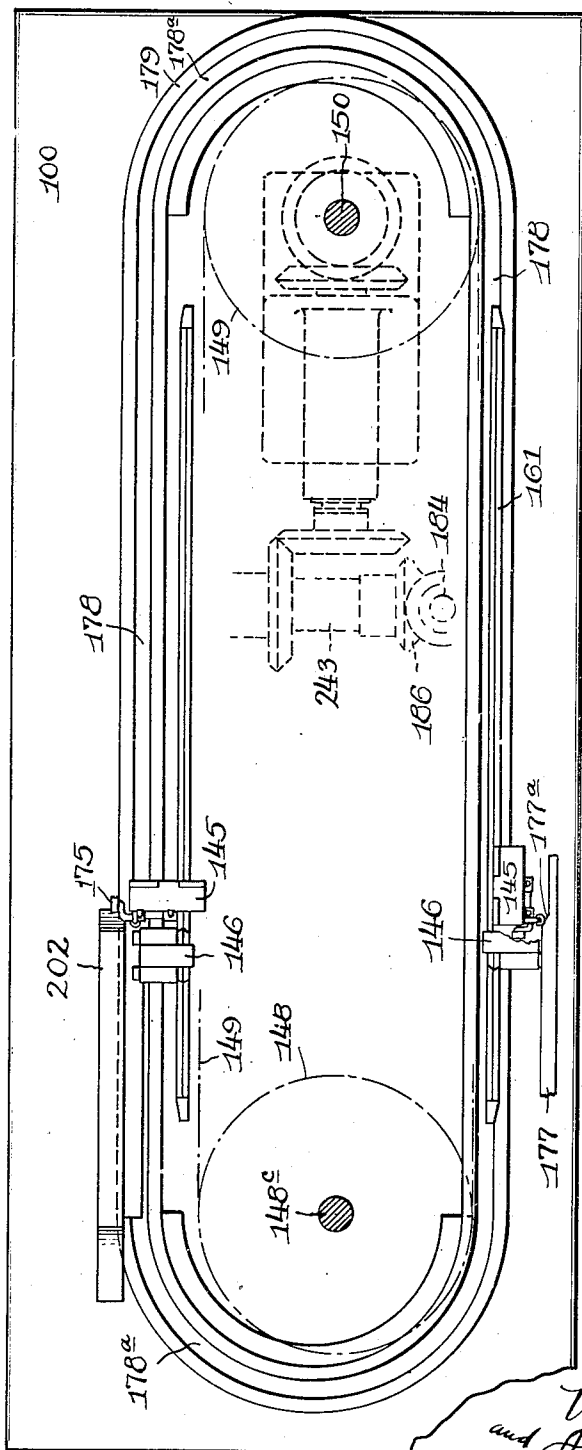


Fig. 59

INVENTORS.

Willet B. Ranney
and Albert E. Kuhf,

Attorneys.

Witness:
Chas. R. Koush.

Nov. 9, 1943.

W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 25

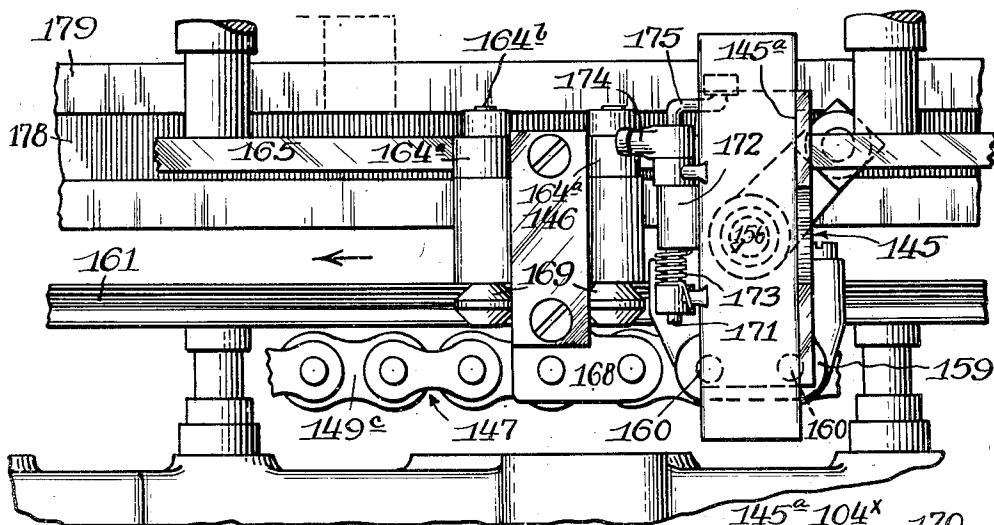


Fig. 60

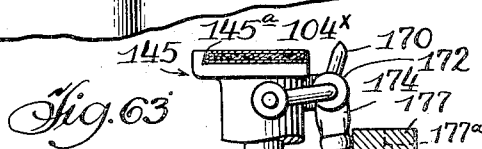


Fig. 63

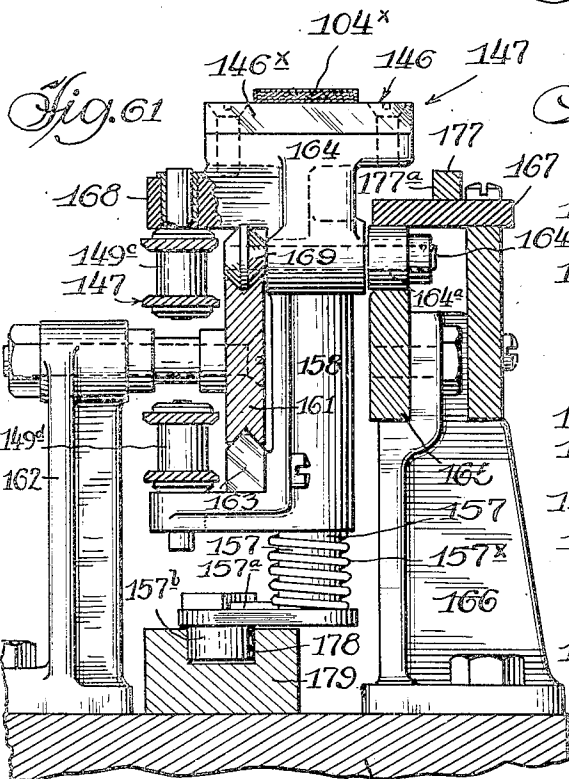


Fig. 61

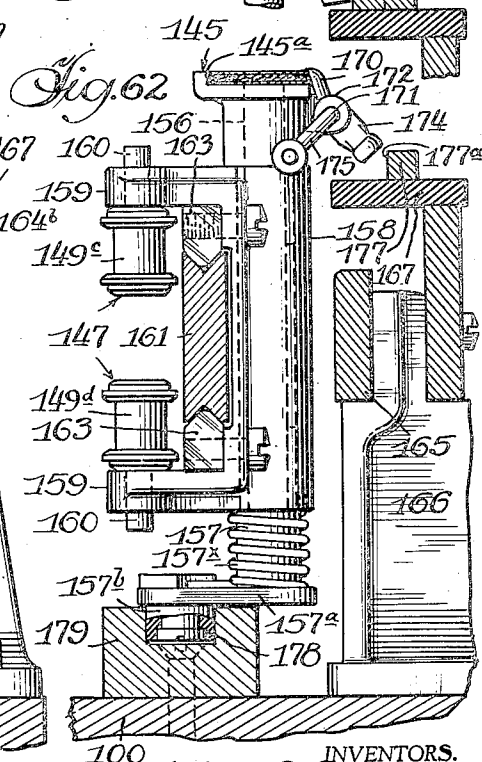


Fig. 62

Witness:
Chas. R. Toursh.

INVENTORS.
Willet B. Ranney
and Albert S. Rukh,
Attorneys.

Nov. 9, 1943.

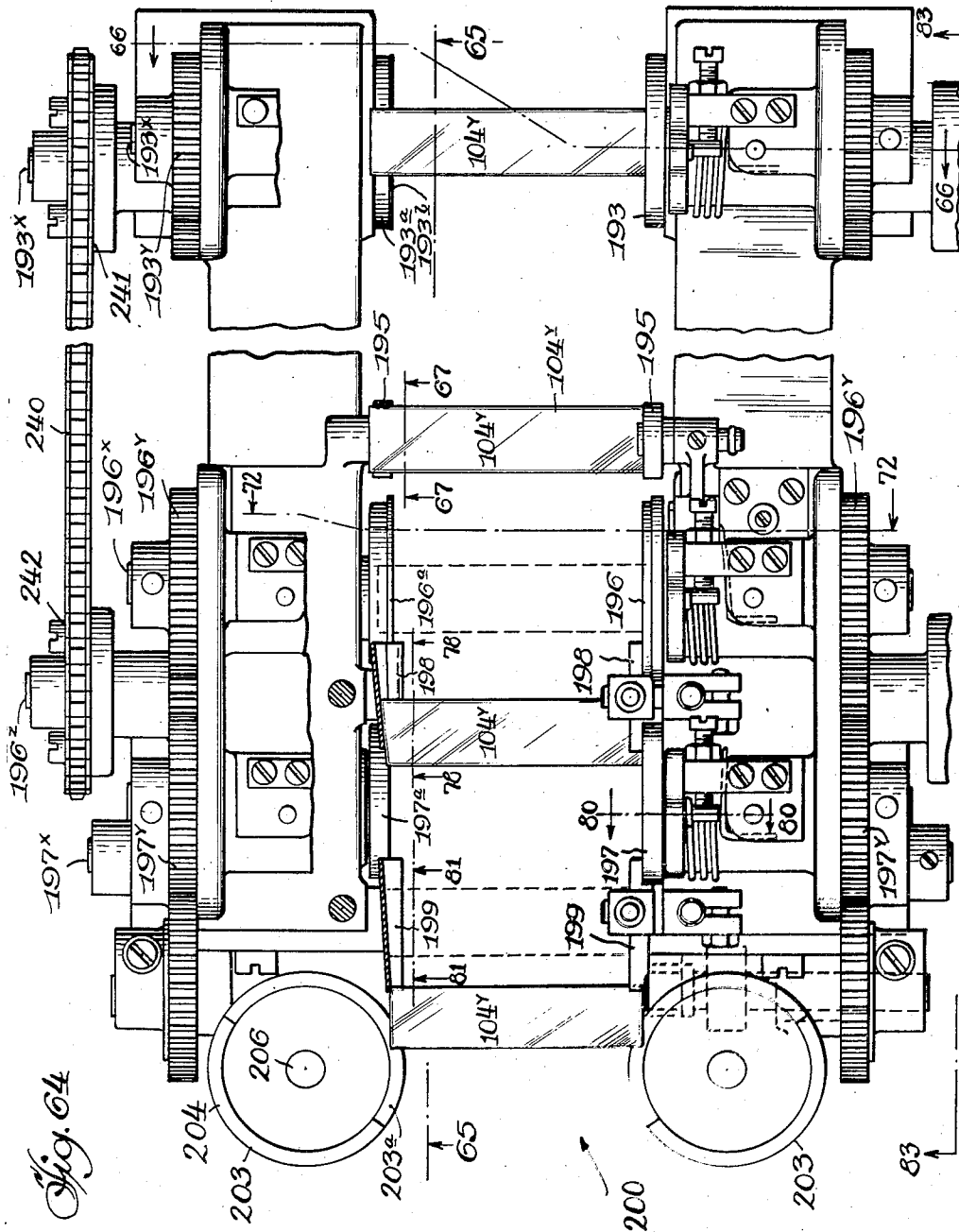
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 26



Witness:
Chas. L. Korsch.

INVENTORS.
Willet B. Ranney
and Albert E. Ruffy
Attorneys.
Office: 1111 North 1st St., St. Paul, Minn.

Nov. 9, 1943.

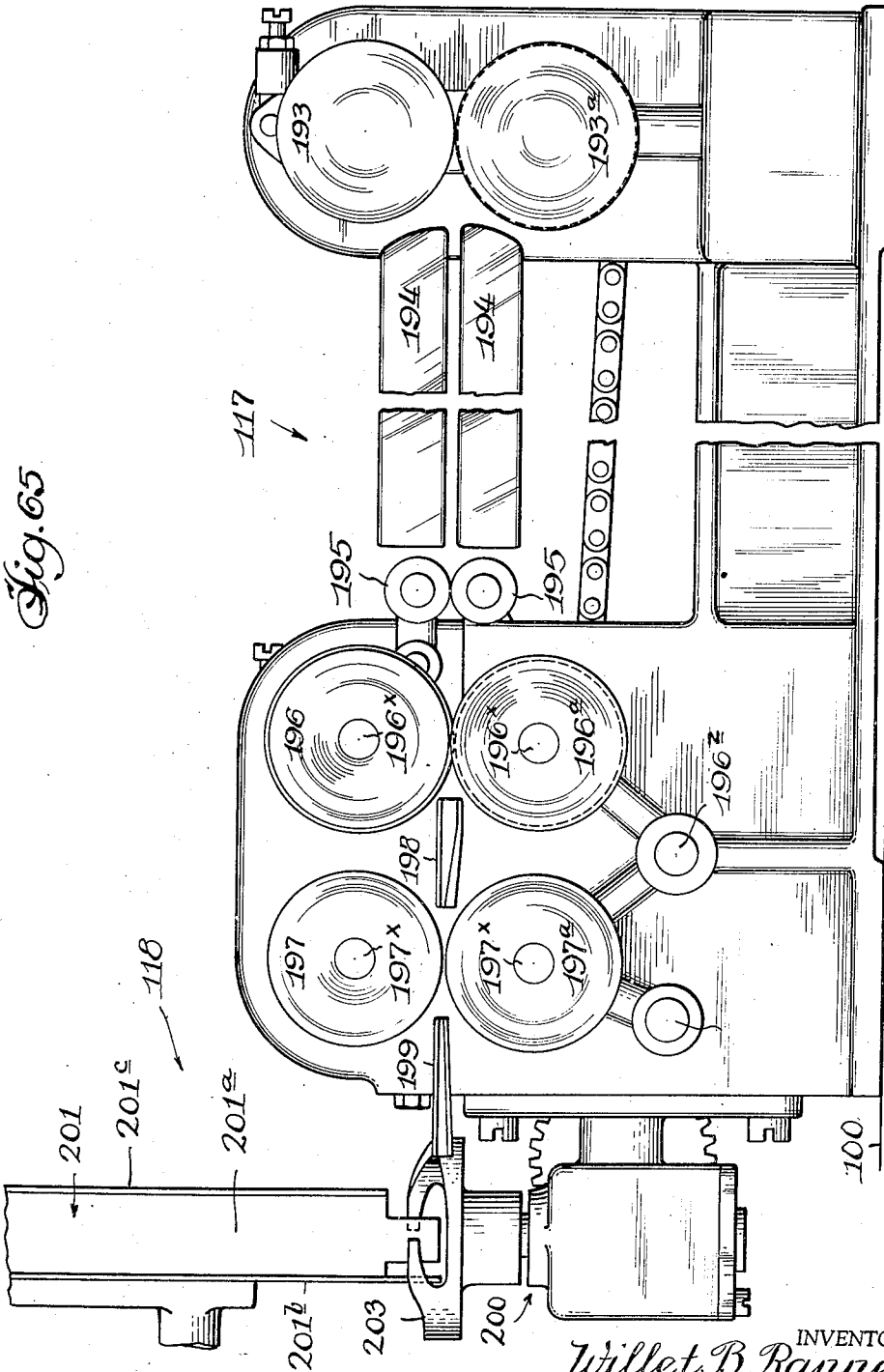
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 27



Witness:
Chas. R. Koush

INVENTORS.
Willet B. Ranney
and Albert H. Ruffy
Official M. H. Hoff, Art. & P. Co. ATTORNEYS.

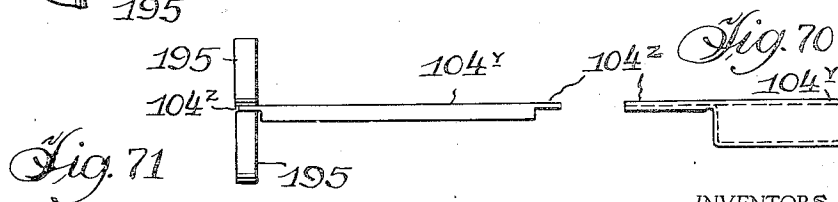
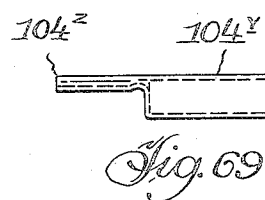
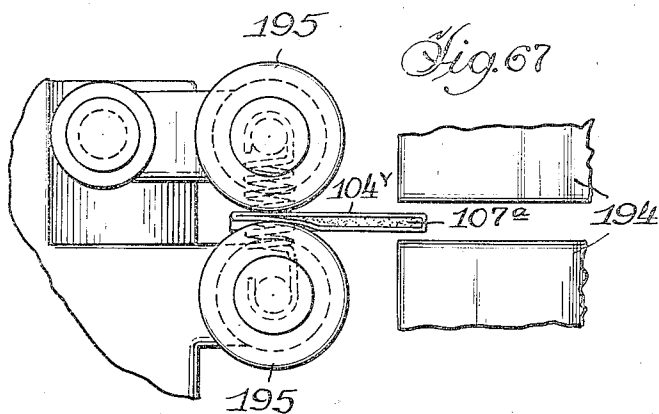
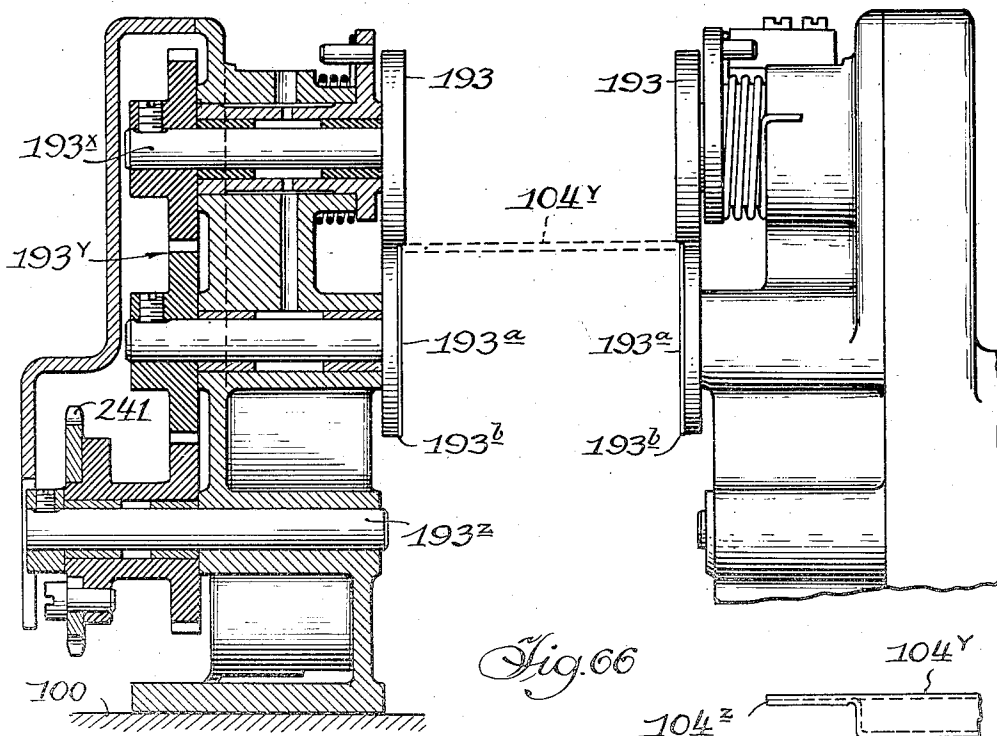
Nov. 9, 1943.

W. B. RANNEY ET AL
GUM STICK WRAPPING MACHINE

2,334,029

Filed April 1, 1940

34 Sheets-Sheet 28



Witness:
Chas. R. Korsch

INVENTORS.
Willet B. Ranney
and Albert H. Ruck,
Attorneys.

Nov. 9, 1943.

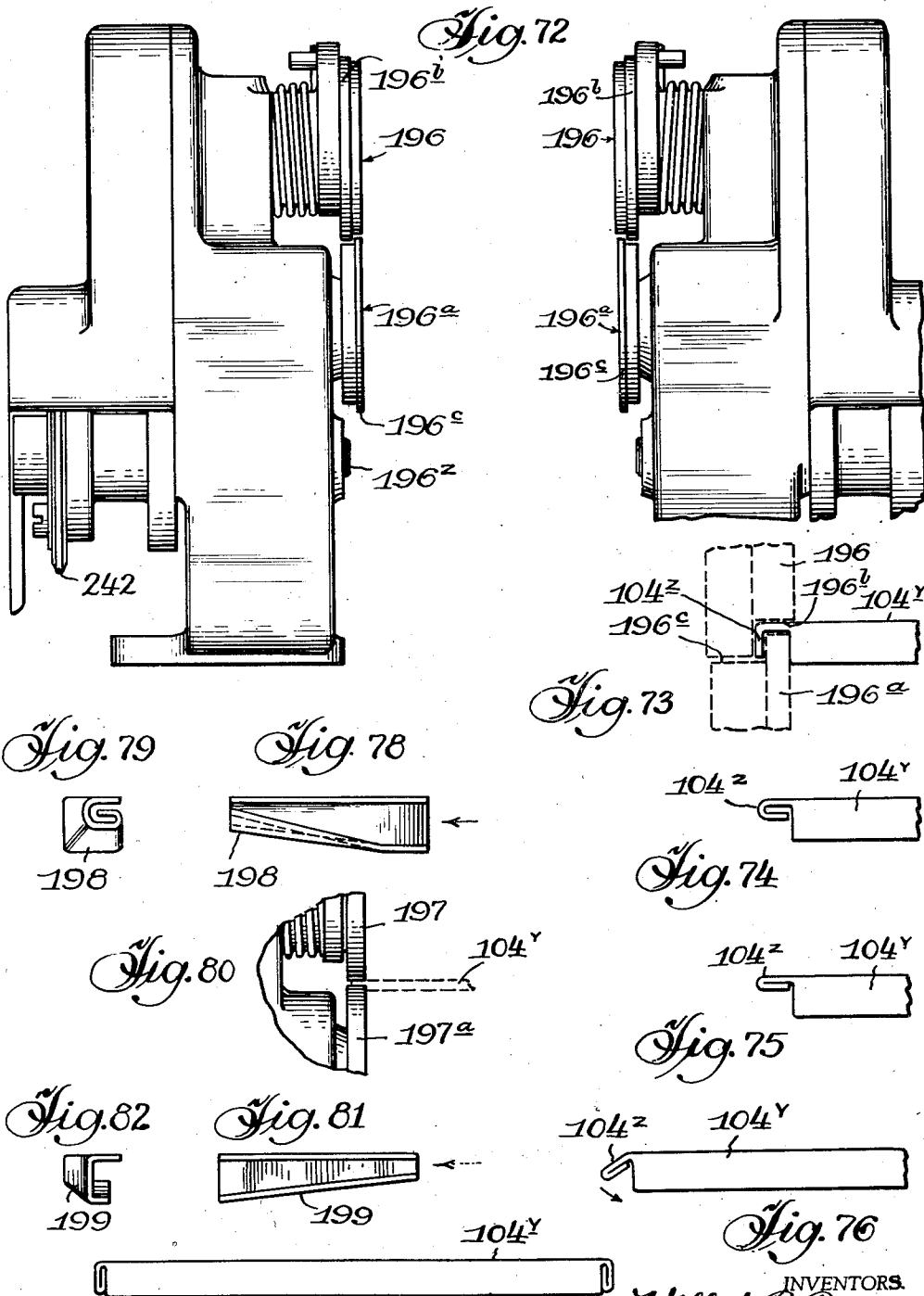
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

34 Sheets-Sheet 29



Witness:
Chas. R. Korsch.

INVENTORS.
Willet B. Ranney
and Albert S. Ruffy
Official Watchdog Service, Inc. ATTORNEYS.

Nov. 9, 1943.

W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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Fig. 85

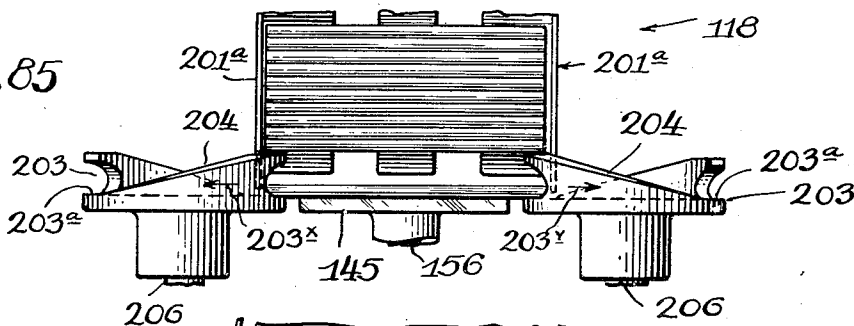
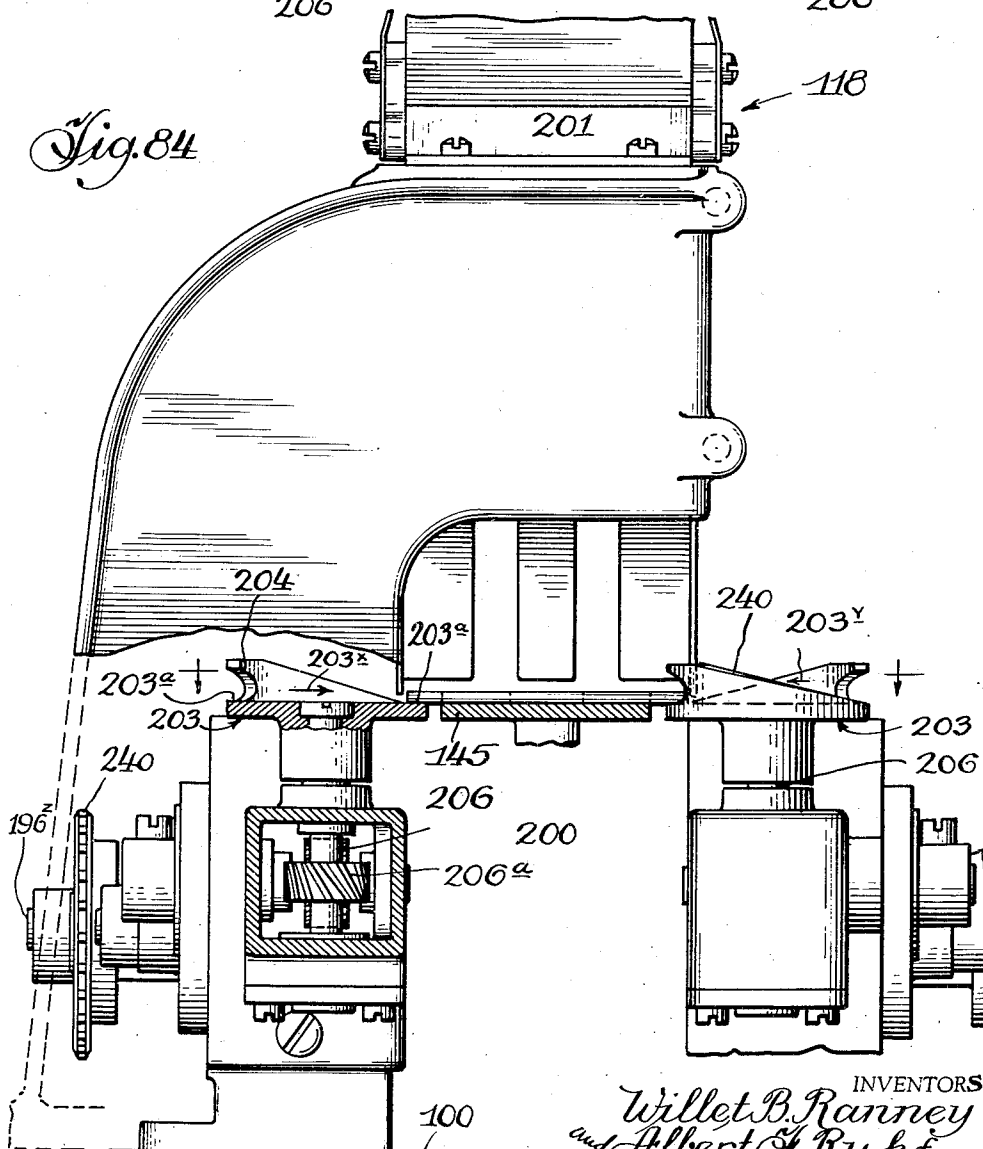


Fig. 84



Witness:
Chas. L. Kourcho

INVENTORS.
Willet B. Ranney
and Albert S. Rudy,
Offield McAllister Smith & Pook ATTORNEYS.

Nov. 9, 1943.

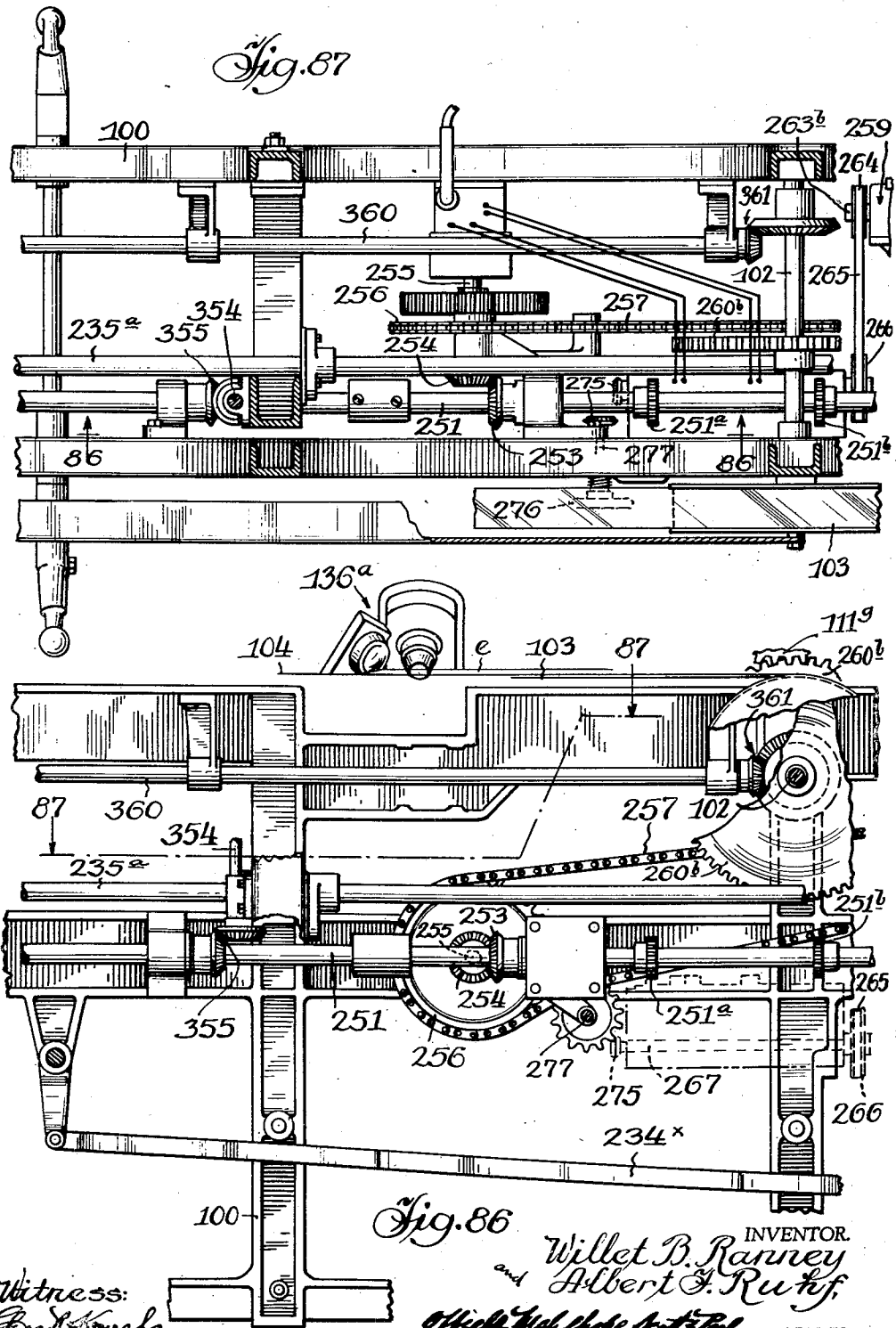
W. B. RANNEY ET AL

2,334,029

GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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Nov. 9, 1943.

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GUM STICK WRAPPING MACHINE

Filed April 1, 1940

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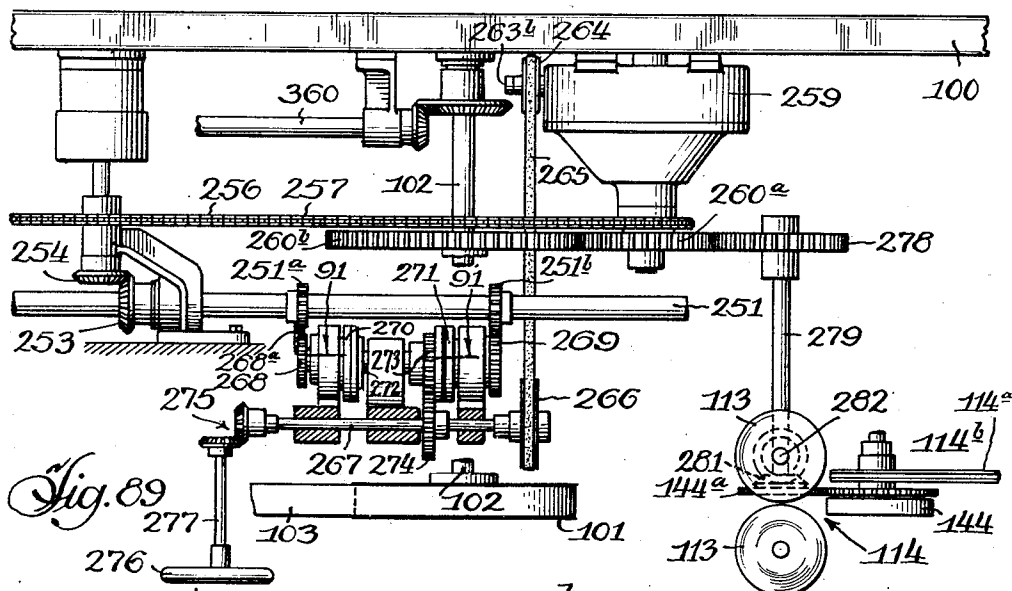


Fig. 89

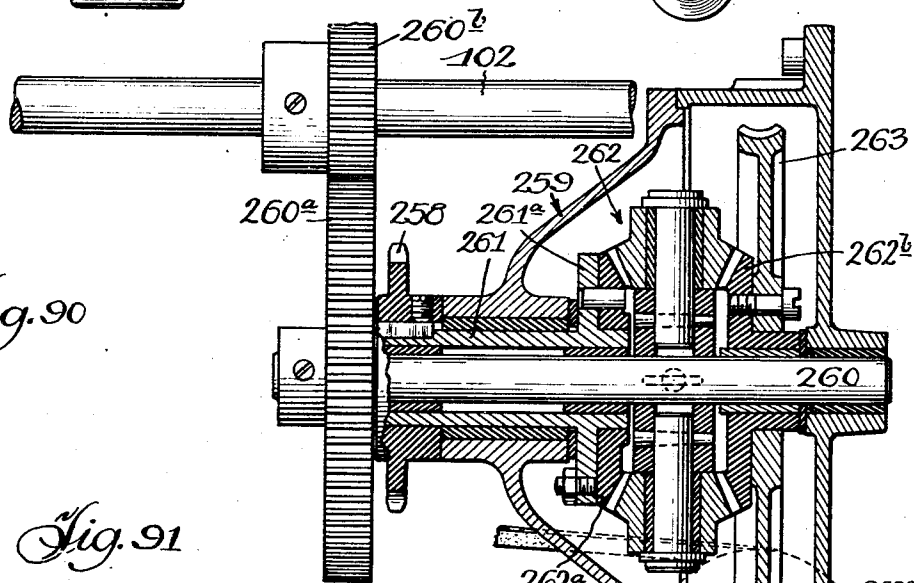


Fig. 90

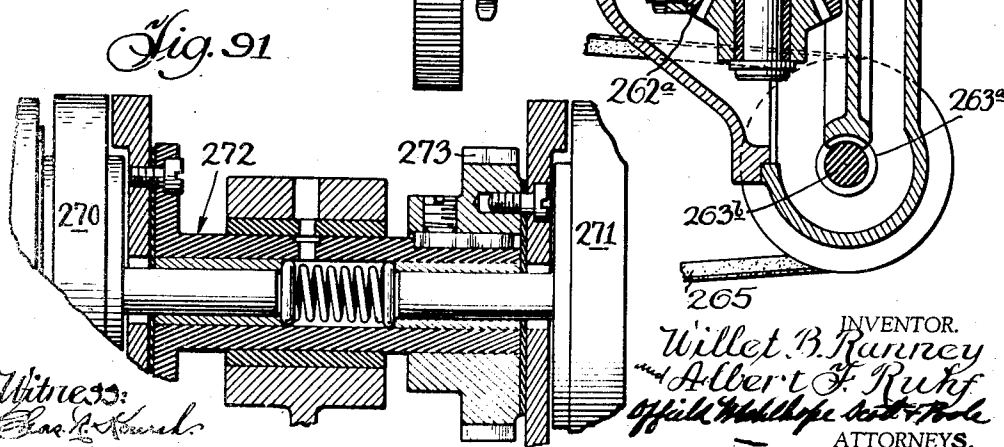


Fig. 91

Witness:
Chas. A. Kunkel

INVENTOR.
Willet B. Ranney
Albert F. Ruck
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,334,029

GUM STICK WRAPPING MACHINE

Willet B. Ranney, Chicago, Ill., and Albert F. Ruhf, Springfield, Mass., assignors to Wm. Wrigley Jr. Company, Chicago, Ill., a corporation of Delaware

Application April 1, 1940, Serial No. 327,262

33 Claims. (Cl. 93—2)

This invention relates to an improved gum stick wrapping machine and consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The object of the invention is to provide a machine for automatically wrapping and sealing single sticks of chewing gum in wrappers which present top and bottom registering display panels, with the ends of the wrappers folded transversely and closed against the ends of the sticks.

Another object of the invention is to provide an automatic machine for wrapping and sealing single sticks in wrappers as described from a continuously fed wrapper-forming web wider than the sticks, having on its bottom surface display panels for the top and bottom of a wrapper spaced at predetermined lateral and longitudinal intervals, by depositing sticks on said web at like longitudinal intervals in register with the display panels to appear on the bottom of the wrapper, then folding said web laterally and sealing it to form a flat, continuous tube presenting the top panels in register with the tops of the sticks, thereafter severing said tube into wrapper lengths with like tubular end projections, and then sealing and folding said projections upon themselves and closing them against the ends of the enclosed sticks.

Another object of the invention is to provide a machine in which the operations above described will be performed while continuously advancing the wrapper-forming web with the gum sticks deposited thereon towards a magazine to which the completely wrapped sealed sticks are delivered, in a continuously advancing movement, thus making possible a greatly increased speed of operation of the machine, whereby the number of sticks that may be wrapped in a given time is correspondingly increased.

Another object of the invention is to provide in such a machine a mechanism for severing from a continuously fed web tearing strips and applying and sealing them at predetermined intervals to the advancing wrapper-forming web in position to tear the sealed wrapper transversely to remove the stick.

Another object of the invention is to provide control mechanism operated by the so-called electric eye associated with suitable equally spaced marks on the wrapper-forming web by means of which said web may be automatically advanced or retarded as required in order that the gum sticks may be deposited accurately in register with the panels displayed thereon, and that the formed tubular wrapper may be severed at the predeter-

mined desired points midway between the ends of proximate sticks of gum enclosed.

Another object of the invention is to provide in such a machine mechanism by which the continuously advancing wrapped sticks, after they are severed, may be caused to travel along a path which turns back upon itself, thereby reducing the necessary length of the machine.

These and other objects and advantages of the invention will appear more fully in the following specification.

In the drawings:

Figure 1 is a diagrammatic top plan view on a greatly reduced scale of the improved machine.

Figure 1^a is a top plan view of a fragment of the wrapper-forming web illustrating the display panels thereon.

Figure 1^b is a transverse section through the wrapper-forming web at one point in its travel, showing an enclosed stick.

Figure 1^c is a transverse section of the tubular wrapper sealed longitudinally and in the form of a flat continuous tube.

Figure 2 is a like diagrammatic view in front elevation of the machine shown in Figure 1.

Figure 3 is a front elevation on an enlarged scale showing the part of the machine included below the bracket A in the diagrammatic front elevation shown in Figure 2.

Figure 4 is a front elevation on a like scale showing the part of the machine included below the bracket B.

Figure 5 is a front elevation showing the part of the machine included below the bracket C in Figure 2.

Figure 6 is a partial front elevation on a still further enlarged scale showing the feed end of the machine and the tearing strip, cutting and gluing devices for applying the tearing strip to the forwardly moving wrapper-forming web.

Figure 7 is a perspective view of the tearing strip severed and spot-glued as when applied to the wrapper web.

Figure 8 is a section through Figure 6 in planes indicated by the broken line 8—8 of Figure 6.

Figure 9 is a section in a plane indicated by the line 9—9 of Figure 8.

Figure 10 is a fragmentary section in a variable plane of the parts enclosed in Figure 9 by the dotted circle 10^a.

Figure 11 is a section through Figure 6 in a plane indicated by the line 11—11 of Figure 6.

Figure 12 is a diagrammatic view of the feeding, cutting, gluing and strip mechanism for severing and gluing the tearing strips to the wrapper strip.

Figure 13 is a partial perspective view of some of the parts shown diagrammatically in Figure 12.

Figure 14 is a partial perspective view of the stripper belt, tearing strip and wrapper-forming web with a tearing strip applied to said wrapper web.

Figure 15 is a fragmentary view on an enlarged scale, partly in section and partly in front elevation, in the vertical plane of one of the stripper belts including the pulleys for said belts and a speed-control mechanism therefor.

Figure 16 is a partial horizontal section through Figure 15 in a plane indicated by the line 16—16 of Figure 15.

Figure 17 is a vertical sectional view on an enlarged scale in a plane indicated by the line 17—17 of Figure 3.

Figure 18 is a plan section of the part shown in Figure 17 indicated by the line 18—18 of Figure 17.

Figure 19 is a view partially in section and partially in elevation on an enlarged scale in a plane indicated by the line 19—19 in Figure 18.

Figure 20 is a horizontal section through Figure 3 in a plane indicated by the line 20—20 of Figure 3. Said section is also indicated by the line 20—20 of Figure 21.

Figure 21 is a vertical sectional elevation indicated by the plane 21—21 in Figure 20.

Figure 22 is a top plan view on a greatly enlarged scale of the mechanism including the magazine for the gum sticks shown in front elevation at the right of the vertical median line of Figure 3, for taking the gum sticks from the magazine and depositing them in succession upon the advancing wrapper-forming web.

Figure 23 is a partial perspective view of the gum stick feeding and delivering mechanism shown in Figure 2, with parts left out to more clearly illustrate the operation.

Figure 24 is a perspective view of a part of the wrapper-forming web with the gum sticks located thereon as it appears in advance of and at one end after passing part way through the folding mechanism for turning up the rear margin of the web-forming strip.

Figure 25 is a perspective view on a magnified scale of the spacing lug member advancing with the wrapper-forming web for locating the gum sticks end for end in proper spaced relation.

Figure 26 is a partial section through Figure 22 in a plane indicated by the line 26—26 of Figure 22.

Figure 27 is a fragmentary enlarged perspective sectional view of parts shown in Figure 26, but in a position somewhat more advanced than that shown in Figure 26.

Figure 28 is a vertical section on an enlarged scale indicated by the line 28—28 of Figure 22.

Figure 29 is a vertical sectional view on an enlarged scale indicated by the broken line 29—29 in Figure 4.

Figure 30 is a top plan view of a part of the wrapper web-feeding belt and the web thereon, together with the folder for folding the rear margin of the advancing wrapper web about the far edge of the gum stick.

Figures 31 and 32 are transverse sectional views of Figure 30 indicated respectively by the lines 31—31 and 32—32 of Figure 30.

Figure 33 is a horizontal section on an enlarged scale (with parts above the plane of the section removed) said plane being indicated by the line 33—33 of Figure 4.

Figure 34 is a view representing a vertical section through Figure 33 in a plane indicated by the line 34—34 of Figure 33, with the parts removed in Figure 33, replaced.

Figure 35 is a partial vertical section through Figure 34 in a plane indicated by the line 35—35 of Figure 34.

Figure 36 is a partial section through Figure 34 in a plane indicated by the line 36—36 of Figure 34.

Figure 37 is a sectional view on a much enlarged scale in a plane indicated by the line 37—37 of Figure 34.

Figure 38 is a perspective view of the wrapper web as it appears when viewed from the rear of the machine, with the far edge folded closely about the gum sticks and then into a vertical plane, and the near edge partially folded about the near edges of the gum sticks as it appears in the neighborhood of the section line 36—36 of Figure 34.

Figure 39 is a front elevation on an enlarged scale of the parts shown at the left of the median line of Figure 5.

Figure 40 is a top plan view of the parts shown in Figure 39.

Figure 41 is a sectional elevation taken in a plane indicated by the line 41—41 of Figure 40.

Figure 42 is a section through Figure 40 in a plane indicated by the line 42—42 of Figure 40.

Figure 43 is a partial section through Figure 40 in plane indicated by the line 43—43 of Figure 40.

Figure 44 is a partial section through Figure 40 in a plane indicated by the line 44—44 of Figure 40.

Figure 45 is a partial section through Figure 39 in a plane indicated by the line 45—45 of Figure 39.

Figure 46 is a sectional front elevation showing the part of Figure 5 at the right of that shown in Figure 39, the same being a continuation of Figure 39.

Figure 47 is a detail front elevation showing one of the flights and an associated shear plate together with the grippers attached to the flight and a part of the finished tubular wrapper enclosing the gum sticks engaged by said grippers.

Figure 48 is a perspective view on an enlarged scale of one of the flights with the associated shear plate and grippers and the mounting for the same with the part of the grooved rail at the bottom of the mounting which guides the movement of said mounting.

Figure 49 is a side elevation, on an enlarged scale, of the cutter blade for severing the tubular wrapper enclosing the sticks, into separate sections, with the associated driving means.

Figure 50 is a view in side elevation of the part shown in Figure 49 as it appears when looked at in the direction of the arrows 50—50.

Figure 51 is a fragmentary section on an enlarged scale taken in a plane indicated by the line 51—51 in Figure 50.

Figure 52 consists of perspective views of the parts mounting the several cutter blades in the cutter disc shown in Figure 49.

Figure 53 indicates a perspective view showing the severed ends of proximate parts of the tubular wrapper enclosing proximate ends of two gum sticks.

Figure 54 is a vertical section on a much enlarged scale in the plane indicated by the broken line 54—54 in Figure 50.

Figure 55 is a plan sectional view taken in a plane indicated by the line 55—55 of Figure 54.

Figures 56 and 57 taken together show a top plan view of the rear end of the machine included between the arrows 56 and 57 in Figure 5.

Figure 58 is a top plan view of the right end of a grooved rail which guides a sprocket chain assembly including the package-supporting flights in its movement from the path of its near reach to that of its far reach, with the eccentric disposal of the guide groove as compared to the center about which said sprocket chain travels.

Figure 59 is a top plan view on a smaller scale of the rails and their supports and driving means, with the flights and the sprocket chain connecting them removed.

Figure 60 is a top plan view on an enlarged scale showing a fragment of the far reach of the sprocket chain assembly including one of the flights with a wrapped stick in a severed tubular wrapper section open at the ends and the grippers retaining it on its flight.

Figures 61 and 62 represent, respectively, vertical transverse sections in planes indicated by the lines 61—61 and 62—62 of Figure 54.

Figure 63 is a detail sectional view showing the position of the grippers just before they grip a stick of gum on the flight which carries it.

Figure 64 is a top plan view of the rear reach of the sprocket chain assembly on its way to and including the means for stacking and delivering the finished, wrapped sticks to a receiving magazine.

Figure 65 is a view representing a vertical section through Figure 64 in a plane indicated by the line 65—65 of Figure 64.

Figure 66 is a sectional elevational view in a plane indicated by the broken line 66—66 of Figure 64.

Figure 67 is a fragmentary sectional elevation in a plane indicated by the line 67—67 of Figure 64.

Figures 68, 69, 70 and 71 indicate various successive steps in the folding of the open tubular end of the wrappers of the sticks, and will be referred to more particularly as we proceed with the specification.

Figure 72 is a view in elevation as it appears when looked at from the plane indicated by the line 72—72 of Figure 64.

Figures 73, 74, 75, 76 and 77 are diagrammatic views showing the successive steps performed in folding the projecting sealed fin at each end of the wrapper in closing it upon the end of the stick.

Figures 78 and 79 are, respectively, views in side elevation and end elevation of the folder which forms the fin as shown in Figure 74.

Figure 80 is a fragmentary sectional elevation showing the parts which bring the end fin to the shape shown in Figure 75.

Figures 81 and 82 are, respectively, a side elevation and an end elevation of the folding member which takes the fin through the step shown in Figure 76 and finally closes it against the end of the wrapped stick as shown in Figure 77.

Figure 83 is a view in front elevation of the part shown in Figure 64, with the drive sprocket wheel and chain which is on both sides of the mechanism shown in Figure 64 at the rear only.

Figure 84 is a sectional elevation taken on a plane indicated by the line 84—84 of Figure 83.

Figure 85 is an elevation showing the bottom of the magazine which receives the wrapped sticks, together with the devices which raise and

stack them as they advance toward the observer, as in Figure 84.

Figure 86 is a front elevation of the parts below the bed of the machine corresponding in position to the front elevation shown in Figure 4, with parts back of the vertical plane indicated by the line 86—86 of Figure 87, removed.

Figure 87 is a horizontal sectional view indicated by the broken line 87—87 of Figure 86.

Figure 88 is a horizontal sectional view in a like plane, the same being a continuation to the end of the machine of the structure shown in Figure 87.

Figure 89 is a top plan view of parts shown in Figures 87 and 88, with some parts in a different plane from actual positions, and parts above removed to more clearly illustrate the connections.

Figure 90 is a part vertical sectional view on an enlarged scale taken in a plane indicated by the line 90—90 of Figure 88.

Figure 91 is a sectional view on an enlarged scale indicated by the line 91—91 of Figure 89.

Referring now to that embodiment of the invention illustrated in the drawings and first to the diagrammatic views shown in Figures 1 to 2, inclusive, for a brief outline of the several parts of the machine and their successive operations: 100 indicates the frame of the machine. It is an elongated table with a top, having openings where necessary, and auxiliary supporting elements connected thereto as required, each and all of which will be hereinafter referred to as the frame 100.

Like, longitudinally spaced drums 101, 101 are mounted on horizontal shafts 102, 102 on the near side of said frame. An endless horizontally disposed feed belt 103 is trained about the drums 101, which rotate clockwise, as indicated by the arrows thereon. The upper lap of the belt advances from the left or loading end of the machine towards the right or finishing end, in the plane of the top of the frame 100.

A wrapper-forming web 104 is drawn from a spool 105. Said wrapper-forming web passes about the left-hand drum 101 in contact with the top lap of the feed belt 103 toward the right-hand drum 101 from which it is advanced by other means as will presently be described.

The gum-sticks to be wrapped are stacked vertically in a magazine 106, open at top and bottom, with the sticks disposed lengthwise of the machine. The magazine is spaced horizontally back of the feed belt 103.

The web 104, shown in Figure 1^a, is wider than the gum-sticks to be enclosed. It is printed or otherwise treated upon its bottom face next to the feed belt to provide a top panel *a* at its near margin, of the width of the gum-stick; an edge-engaging section *b*; a bottom panel *c* of the width of the top panel *a*; and a sealing section *e* of width to include an edge-engaging section *d*.

107 indicates a gum-stick feeding disc disposed in a horizontal plane between the gum-stick magazine 106 and the feed belt 103. It bears right angular, approximately radial, pick-up arms 108 slightly thinner than the gum sticks indicated at 107^a. 109 indicates a horizontal support member located slightly above the plane of the feed belt 103. It supports the stack of sticks in the magazine 106, from the bottom of which the pick-up arms 108 wipe away and carry with them on the support 109, in succession, the bottom stick 107^a in the magazine as the stack drops after the removal of each bottom stick.

The feed belt 103 carrying the wrapper-web 104 and the stick-feeding disc 107 are so located and correlated as to speed and to the spacing of the pick-up arms 108 that the sticks will be deposited upon the advancing web 104 at intervals and in line to register with the bottom panels c.

Transverse, longitudinally spaced lugs carried by a sprocket chain 95 designed to travel at the same speed as the feed belt 103 and extending in contact with the top of the wrapper-web, engage the rear end and the near edge of each gum stick to maintain the predetermined spacing between the sticks and their longitudinal alignment in registration with the bottom panels c of the web 104.

Thence the properly spaced and aligned sticks on the advancing wrapper-web travel below an endless steel pressure band 110 mounted on longitudinally spaced discs 111 with the lower lap of the band in engagement with the gum sticks to hold them flat in their predetermined position on said web. Said band 110 travels at the same speed as the advancing feed belt 103.

By folding means to be described later in detail, the wrapper-web 104, in its passage below the steel band 110, is folded first to bring the edge section d of the sealing section e to engage the far edges of the advancing gum sticks, and to fold it part-way flat down upon the top surfaces of the advancing gum sticks with the remaining part bent upwardly into a vertical plane (see Figure 1^b). And thereafter the near margin of the web is folded to bring the section b into engagement with the near edges of the advancing sticks and to fold the top panel section a part-way flat down upon the advancing sticks, with the remaining part bent upwardly into a vertical plane and in close parallel relation to the similarly disposed part of the sealing section e.

Thereafter and beyond the influence of the band 110, the proximate vertical panels of the sections a and e are passed between heating devices 112, 112 and ironing devices 113, 113 by means of which they are sealed together as an upstanding, longitudinally extending fin e-a. Then by devices to be described, said fin is folded down toward the far side, flat upon the advancing gum sticks (as shown in Figure 1^c), and sealed to form a continuous flat tubular envelope of uniform cross-section, with the bottom panels c and the top panels a in registration with the sticks enclosed therein.

Then the tubular sealed wrapper is carried forward on an endless sprocket assembly 147 including longitudinally spaced supporting flights and intermediate shearing plates to a cutter 116 which severs the wrapper midway between the ends of the successive sticks into like lengths, each enclosing a stick. Thereafter the severed wrapper sections are carried forward to mechanism indicated at 117 by which the ends of the wrapper sections are closed by folding them upon themselves and against the ends of the sticks, after which they are delivered to a receiving magazine indicated at 118 in Figure 1.

Proceeding now to a more detailed description of the machine: As shown in Figure 3, the wrapper-forming web 104 is engaged on the right side of the spool 105 by a brake band 104^a and in its path to the left-hand drum 101 is led about tension devices 104^b, 104^c and 104^d to hold it taut as it passes to the feed belt 103. A driven friction drum 104^e, interposed between the tension devices, acts to pull off the web 104 from the spool

105. To support the upper lap of the feed belt between two drums 101, a plurality of rollers 103^a (see Figures 3 and 4) are mounted on the frame below said belt. A spring-controlled take-up roll 103^b engages the bottom lap of the belt adjacent the drum 101. 103^b indicates an upright longitudinally extending guide plate fixed to the frame.

The gum-stick feeding mechanism is shown in Figures 22 and 23. The pick-up arms 108 are each in the form of a carpenter's square, with one branch 108^a fixed at its inner end to the bottom face of the rotative feed disc 107 fixed to the vertical shaft 107^b. Said arms travel in contact with the fixed supporting member 109, which is formed in the arc of a circle concentric with the shaft 107^b. It comprises radially spaced rails 109^x, 109^y and a plate 109^z which extends to a point 109^a, where the gum sticks are pushed off in succession by the pick-up arms and deposited upon the advancing wrapper-web. The pick-up arms 108 and the gum sticks engaged thereby are held down on the said support by radially spaced flat rings 109^b, 109^c fixed above said support.

Said pick-up arms 108 are inclined in a direction reverse to the direction of rotation of the disc 107 at an angle, preferably 45°, to a radial position. When the gum sticks are swept from beneath the stack of sticks in the magazine, a composite endwise and sidewise movement is produced so that the sticks are caused to travel in a direction diagonal to the stack and at an angle to both axes of said sticks. The right angularly disposed branches engage the near end and the outside edge of said sticks and cooperate to retain them against centrifugal force. Said sticks are swung in a horizontal plane end to end as they are advanced from the magazine to the point where they are dropped upon the web in succession in aligned registration with the panels c. At that point the pick-up arms impart a minimum of lateral movement to the sticks but an endwise movement in the direction of and at the rate of speed of travel of the advancing web.

An immediate drop is assured by the following construction: 119 indicates what may be called a stripper disc. It is disposed in a vertical plane extending at an acute angle to the direction of travel of the wrapper-web 104 and is mounted on a horizontal shaft 121 angling slightly forward in said direction from the shaft 107^b of the feed disc 107. It carries, as shown, four radially extending stripper arms 120. The shafts 121 and 107^b are connected at their proximate ends by reduction gears 121^a and 107^c in timed relation to bring a stripper arm 120 into engagement with the top of a gum stick 107^a as shown in Figure 23, when each pick-up arm advances to the position indicated at 108^x. This is at the instant above referred to, when the gum sticks have been freed of the last support by the plate 109.

A further aid to the instant drop of a gum stick upon the wrapper-web is illustrated in Figure 27. The arrow 104^x in that view indicates a direction transverse of the travel of the web 104. The top surface of the supporting plate 109 is slightly inclined downwardly towards its discharge edge 109^d. As a result, the gum stick advanced by the pick-up arm 108 is inclined downwardly toward the plane of the wrapper-web as it is advanced beyond the discharge edge 109^d of the plate 109, as indicated in dotted lines at 107^x. And the strip-arm in the position indicated at 120^x is coming to position to strip the gum stick 107^x from

pick-up arm 108 and supporting plate 109, the instant the following edges of the gum stick have cleared the plate.

The construction and operation of the sprocket chain 95 with its longitudinally spaced lugs 95^a may be more easily observed in Figures 3, 4, 22, 23 and 25. As will be seen in Figures 3 and 4, the sprocket chain 95 is disposed in a vertical plane and at its left-hand end is trained about a sprocket 96 (Figure 3) mounted at the top of a vertical arm 96^a adjustable to left or right upon a pivotal connection to the frame 100 at its bottom end 96^b. At its right-hand end (Figure 4) said chain is trained about a driving sprocket 97 rotatively adjustable upon a disc 97^a fixed to a driving shaft 97^b and beyond that about an idle sprocket 97^c mounted on the frame 100. These mountings provide for adjustments of the sprocket chain 95 and its spacing lugs 95^a in relation to the pick-up arm disc 107 as may be required to synchronize them in their operation.

The sprocket chain 95 with its gum-stick spacing lugs 95^a come into engagement with the wrapper-web somewhat in advance of the stripper disc 119, as shown in Figures 3 and 22. The spacing lugs are shown in Figures 22 and 25. The spacing lug 95^a has a base 95^b fixed to a block 95^c of the sprocket chain 95. It extends laterally from the vertical plane of the sprocket chain in close association with the top surface of the wrapper-web 104 and has a right angular extension 95^d adapted to engage the end and adjacent rear margin of a gum stick as it advances in aligned disposition in register with a bottom panel of the wrapper-web upon which it has been deposited. The movement of the sprocket chain 95 is timed and adjusted to bring the right angular extension 95^d of a lug 95^a into engagement with the following end of a gum stick the instant it is deposited upon the wrapper-web. Thereafter the spacing lugs 95^a are carried forward by the sprocket chain 95 at the same speed as that of the wrapper-web 104 which advances with the gum sticks disposed thereon upon their respective bottom panels as indicated in Figure 24.

Immediately after the wrapper-web 104 has passed beyond the position where the gum sticks are successively deposited thereon, there is located a pressure bar 122 as shown in Figures 22 and 23. This bar is supported by overhanging brackets 123 mounted on the frame 100. Said bar lightly bears upon the sticks of gum which pass below it. Alongside of said bar 122 and near its rear edge extends a guide bar 124 which acts to engage the rear edges of said sticks and maintain them in proper alignment and disposition upon the panels with which they are associated. This guide bar is spaced somewhat back of the bar 122 in the neighborhood of the gum-stick discharge point 109^a so that in case a stick under the high speed of the machine is thrown out of alignment, it will engage the rear edge of the stick and bring it back to proper position in the continued travel of the web.

As shown in Figures 22 and 30, 125 indicates a folding device mounted for operation against the rear margin of the wrapper-web 104. Said folding device 125 acts to gradually turn up the section *e* of the wrapper-web from the position shown in Figure 31 to the position shown in Figure 32, the fold being turned up about the rear edge of the pressure bar 122.

Said pressure bar 122 terminates at 122^a which is at the point where the spacer lugs 95^a begin

to leave the plane of the wrapper web 104. (See Figure 23.) Beyond this the wrapper and the gum sticks thereon are subjected to the action of the endless band 110 mounted on the discs 111, 111 shown on a large scale in Figures 4 and 34. The discs 111, 111 are fixed on horizontal shafts 111^a, 111^a mounted on a vertically adjustable frame 111^b.

126, 126 (see Figures 4, 33 to 36, inclusive, and 37) indicate a plurality of rolls located in the vertical plane of the discs 111, 111 and yieldingly engaged upon the top of the bottom lap of the band 110. Said rolls have bearing in inclined arms 127 pivoted to the frame 111^b and held down by coiled springs 128 mounted in tubular casings 129 rigid with said frame, as shown in Figure 37. The belt 103 is supported below said band 110 by twin rollers 130, 131, the roller 131 being in the vertical plane of the band-engaging rollers 126 as shown in Figures 35 and 37.

As the web with the longitudinally spaced gum sticks thereon pass below the band 110, the fold of the rear margin of the wrapper, begun prior thereto, is carried further over the gum stick by folder 132, shown in plan view in Figure 33, and part of it is laid on top of the stick by means of said band, as shown in Figure 35, the rear margin of the web being turned up vertically against a bar 133 disposed above the level of the bottom lap of the band 110 as shown in Figure 35. Then a folder indicated at 134 in Figure 33 picks up the rear margin of said wrapper web 104 and folds it over upon the top of the gum stick and finally brings a margin thereof up in contact with the rear upturned margin as indicated in Figure 36.

Thus we have the wrapper-web folded about the sticks, with part of each of the two margins, the sealing margin *e* and the top panel margin *a*, each flat upon the face of the sticks and turned up in a vertical plane to form an upright duplex, longitudinal fin against the face of the disc 111 (as shown in Figure 36), in which condition the wrapper-web then passes to the heater device 112.

In passing below the band 110 in the folding operation above described, just as the rear folding device 134 begins to pick up the rear margin of the wrapper as indicated at 135 in Figures 33 and 37, the rear margin of the wrapper contacts an arm 136 which holds it up in an approximately vertical position, where it is exposed to the ray of the so-called electric eye shown at 136^a in dotted lines in Figure 37. By this and mechanisms controlled thereby, the wrapper-web feed is momentarily advanced or retarded to compensate for variations in the feed due to expansion, slip or contraction of the wrapper-web which otherwise would prevent the required register of the sticks with the display panels on which they are to be deposited. The said electric eye is affected by the interference of an opaque mark on the wrapper with a light ray directed thereon. The opaque marks are spaced at exactly equal distances and in exact relation to the printed panels, and are indicated at 137, 137 in Figures 30 and 38. Figure 38 is a partial perspective view showing the partially folded wrapper as when passing the bar 136 in Figure 37. At this point the marks 137 will come in succession to alignment with said ray of the electric eye and will affect the control of the web feed mechanism one way or the other, in order to register it with the gum sticks.

The heater 112, located beyond the band 110,

is shown in detail in Figures 39, 40 and 42. The heater is of familiar construction and comprises two opposed heating elements 112^a, 112^b with vertical faces 112^b, 112^b extending in the direction of the feed of the wrapper-web. Said heating elements when in operation are slightly spaced apart as shown in Figure 42, so that they do not act to compress the fins *a—e*, but merely to heat them. When the machine is not in operation, familiar mechanism indicated generally at 138 in Figure 39 acts to throw them further apart to prevent scorching or burning during the time the feed of the wrapper-web is idle.

As the tubular wrapper with the upright duplex fin passes from the band 110 to and beyond the heater 112, it is supported by a channel bar or plate 139 (see Figures 40 and 42 to 44). On said bar it is engaged between horizontal ironing discs 113 (as shown in Figures 41 and 43) by which the parts of the duplex fin *a—e* are secured together as one, as shown in Figure 43.

The ironing discs 113 are geared together as shown in Figures 40 and 41. One is mounted on an arm 140 pivoted to the frame 141 and connected by a spring 142 to the frame (see Figure 41) to hold one ironing disc in yielding engagement with the other. The other ironing disc is driven by mechanism later to be described, and the ironing discs exert such pressure upon the upright fin *a—e* as to feed the tubular wrapper through the machine.

Beyond the ironing disc 113 the upright fin *a—e* is engaged by a folding device 143 (see Figures 40 and 44) which acts to turn down the fin towards the rear or far side flat on top of the tubular wrapper with the panel *a* on top. Beyond this the wrapper with enclosed sticks passes between secondary ironing discs 144, 144 (see Figure 45) by means of which the said fin is finally brought to flat relation against the enclosed sticks. Said discs 144 are geared together by gears 144^a, 144^a as indicated in Figure 41.

From the secondary ironing discs 144, 144 (see Figure 5) the closed sealed continuous tubular wrapper indicated by the numeral 104^x enclosing the longitudinally spaced gum sticks, passes over a plurality of longitudinally spaced supporting plates or flights 145 with interposed shearing plates 146 forming part of a sprocket chain assembly disposed in an approximately horizontal plane indicated generally by the numeral 147, which is inclined at a small angle upwardly to the right.

The construction of this sprocket assembly may be best seen in Figures 46, 54, 55, 56, 57, and 60 to 63, inclusive. 148 in Figure 56 and 149 in Figure 57 indicate the two end sprockets. Said sprockets are duplex, having upper and lower sets of sprocket teeth 148^a, 148^b and 149^a, 149^b. The sprocket 149, the one at the right-hand end of the assembly, is fixed on the top end of an upright shaft 150 having bearing in a sleeve 151, the top end of which at 152 abuts and supports the hub 153 of the sprocket 149. Suitable means of familiar construction for making micro-adjustments of the driving sprocket 148 on its shaft 150 are indicated at 154. The bearing sleeve 151 is preferably formed integral with the bracket 155 which is secured to the frame 100 in such manner as to support said sleeve.

The sprocket 148 is idly mounted upon a stud 148^c which is adjustable upon the frame 100 in such manner as to compensate for stretch of

the sprocket chains. (See Figures 46 and 56.) The duplex sprockets 148 and 149 are connected by upper and lower roller sprocket chains 149^c, 149^d.

The flights 145 and the interposed shearing plates 146 may be readily seen in Figures 56 and 57 and on a larger scale in Figure 54. Each flight 145, as shown in Figure 54, is in the form of a plate extending generally in the direction of the length of travel of the sprocket chains. It is pinned to the reduced top end 156 of a vertical shaft 157 which is rotatively mounted in a sleeve 158. The sleeve 158 is provided with top and bottom horizontally spaced arms 159, 159 carrying vertical pins 160, 160 by means of which the sleeve 158 is connected to the sprocket chains 149^c and 149^d.

A horizontal rail 161 (see Figures 61 and 62) provided as shown with V-grooves in its top and bottom edges, extends longitudinally of the machine parallel to the near reach of the sprocket assembly 147. Said rail is supported by brackets 162 rising from the frame 100 at the rear of said rail and having studs projecting between the upper and lower sprocket chains and fixed to said rail 161. Each sleeve 158 has fixed top and bottom shoes 163, 163 riding in the grooves of said rail (see Figure 62).

146 indicates the shearing plates (see Figures 54 and 61.) Each plate extends transversely of the chain and is equally spaced from the ends of the proximate flights 145. It is fixed to the top of a bracket 164 on the near side of the sprocket chain with rollers 164^a, 164^a which bear on a horizontal rail 165 supported on a standard 166 rising from the frame 100. 167 indicates a plate which bears upon and retains the rollers 164^a, 164^a upon said rail 165. The shearing plate has rearwardly projecting, top and bottom, laterally spaced arms 168 which are connected to the top and bottom sprocket chains 149^c, 149^d in the same manner as in the case of the flight bracket arms. The rollers 164^a, 164^a are mounted on horizontal shafts 164^b supported by the bracket 164 and are provided beyond the same with laterally spaced V-shaped rollers 169 which ride in the V-notch at the top of the rail 161.

Each flight 145 is provided with spaced gripper arms 170 to engage the near edge of the tubular sealed wrapper 104^x, when said wrapper has come to bear upon it. Said flight has on its far side an upstanding undercut shoulder against which the rear edge of said tubular wrapper 104^x is engaged. Said gripper arms (see Figure 63) are shaped at their ends so that when swung into engagement with the near edge of the tubular wrapper 104^x (shifting from the position shown in Figure 63 to the one shown in Figure 62) said gripper arms will present a gripping edge at an angle opposed to that of the undercut edge of the flange 145^a, thus securely holding the tubular wrapper 104^x seated upon the flight.

The gripper arms are fixed to a rock shaft 171 (see Figure 54) having bearing in a horizontal sleeve 172 fixed to the upper end of the vertical sleeve 158. A coiled spring 173 interposed between the bearing sleeve 172 and one of the gripper arms 170 normally holds said arms in engagement with the forward edge of the tubular wrapper. 174 indicates a rock arm fixed to the shaft 171 and projecting slightly forward. A second rock arm 175 projects at a slight angle rearwardly.

As will be observed in Figure 5, the sprocket chain assembly 147 with the flights and shearing plates, as it moves with the left-hand sprockets from the rear reach to the forward reach, travels in a plane below that of the tubular wrapper 104^x, which at this point passes under a smoothing plate 176. Said travel is inclined slightly upwardly towards the right to an extent that when a flight reaches a position vertically below the disc 114^z, the tubular wrapper seats upon and is held in contact with the flight by said disc 114^z.

When the sprocket chain assembly comes to alignment with its near reach, a cam bar 177, which is supported on the retaining plate 167 adjacent the path of the near edges of the flights 145, is engaged by the rock arms 174 of the several grippers on said flights and swing said grippers from closed to open position as shown in Figure 63. When a flight 145 comes to position with its median line vertically below the axis of the disc 114^z, this cam bar is so formed as indicated at 177^a in Figure 56 as to release said rock arms 174, which then grip the near edge of the tubular wrapper as shown in Figure 62.

After this has occurred, the continued movement of the tubular wrapper 104^x brings a shearing plate 146 in contact with a blade 116^a vertically below the axis of said cutter disc. This is timed to occur so that the blade 116^a will engage and sever the tubular wrapper at a point midway between the ends of two proximate sticks in the wrapper. Thereafter the severed wrapper lengths 104^y, each containing a stick with the wrapper projecting beyond the stick at equal distances at its ends is carried forward securely gripped to its associated flight.

The sprocket chain assembly is then carried around the right-hand sprocket 149 from its near reach to its back reach. In this movement by mechanism now to be described, the flights 145 are severally caused to swing on their vertical shafts 157 from the position traveling lengthwise, as in the near reach with the gripping mechanism at the near edge, through an angle of 270° until it assumes a position in the rear reach at right angles to the travel of the sprocket chain assembly with the gripping mechanism disposed at the advancing edge of said flight. It is to be understood that in this travel the gripper arms engage and hold the tubular wrapper lengths 104^y securely to their respective flights, with the turned-down fins *e-a* of the wrapper lengths at the following edges of the flights.

To guide the flights in this movement, each upright shaft 157 of a flight is provided at its bottom end with a rock arm 157^a carrying a roller 157^b on a vertical axis. Said rollers follow a cam groove 178 formed in a bar 179. This cam groove extends parallel to the near and rear reaches of the sprocket chain assembly 147. But at its end loops it is disposed in a path 178^a, eccentric to the centers of the sprockets about which said loops pass. This eccentricity is due to the required lag of the cam rollers 157^b in the cam groove 178^a and may be determined by plotting or calculation in a well known manner. The cam rollers are maintained in contact with the groove by a coiled spring 157^c acting to maintain them against the outer flange which determines their path. In returning to the front reach of the sprocket chain assembly, the flights 145 are severally swung in a reverse direction to return their gripper mechanisms to the near edge of the assembly. (See Figure 56.)

Referring back to the cutter disc 116 and the cutter blades 116^a mounted thereon as shown in detail in Figures 49 to 52, inclusive, the cutter disc 116 is mounted on a horizontal shaft 180 having bearing in a housing 181 rising from the machine frame 100. Said shaft 180 is connected by beveled pinions 182, 183 to a vertical shaft 184, which is connected by beveled pinions 185, 186 to a horizontal drive shaft 243. The disc 116 is secured to the shaft 180 by means providing for micro-adjustment as indicated generally at 187.

The blades 116^a are equally spaced about the periphery of the disc 116 from which they project radially at distances equal to the designed length of the stick-enclosing tubular wrapper length 104^y. For each blade there is provided a cylindrical recess in which is mounted a plug 188 with a coiled expansion spring 189 interposed between the end of the recess and the base of the plug 188. At each side of the disc adjacent its periphery in the neighborhood of the blades 116^a are fixed cross plates 190 having notches 191. The blade 116^a is provided at its top with laterally extending shoulders 192, 192 which engage in opposed slots in the marginal face of the disc and limit the outward radial movement of the blade.

By this construction each blade engages the flat tubular wrapper under spring pressure and severs it against a shearing plate, as shown in Figure 53. The shearing plate 146 is preferably made with a tool steel cover plate 146^x.

After the flights 145 come to position at right angles to the rear reach of the sprocket chain, the ends of the severed tubular wrapper 104^y are passed in succession between cramping and folding devices 193, 193^a now to be described. (See Figure 65.) It will be understood that said mechanism is provided at both sides of the rear reach of the sprocket chain assembly as shown in Figures 64 and 66, and each set is disposed to operate in vertical planes adjacent the ends of the gum sticks enclosed in said tubular wrapper sections 104^y.

Said cramping and folding devices comprise heating devices 194 and spring-pressed ironing rolls 195, 195; and then in succession upper and lower rolls 196, 196^a and upper and lower rolls 197, 197^a. Folding devices 198 are interposed between the two sets of rollers 196, 196^a and 197, 197^a, and a final folding device 199 following the operation of the rollers 197, 197^a cramp and close ends of the severed wrapper 104^y against the ends of the gum stick enclosed thereby. Thence the completed wrapped stick is conveyed to an elevating device 200 associated with a magazine 201 in which the gum is stacked from below.

Referring first to the cramping rolls 193, 193^a (best shown in Figure 66), the upper rolls 193 have flat peripheries, but the lower rolls have radial end flanges 193^b which are in vertical planes adjacent the stick ends. The two rolls are fixed on horizontal shafts 193^x, 193^x and are geared together to rotate at the same peripheral speed by gearing 193^y. Said gearing is driven from a horizontal shaft 193^z to be referred to later.

When a severed wrapper length 104^y containing a gum stick and carried forward on its associated flight passes the rolls 193, 193^a, its projecting open tubular ends are cramped to form projecting duplex fins 104^z in the plane of the top of the tubular wrapper, as shown in Figure

From the cramping rollers 193, 193^a the severed wrapper section 104^v is carried on its flight to pass the end fins 104^a between the heating devices 194, 194, thence between the spring-pressed ironing rollers 195 as shown on exaggerated scale in Figure 67. This heats the parts of the duplex fin 104^a and seals them together, as shown in Figures 70 and 71.

In the further advance of the wrapper section 104^v the sealed end fins 104^a are passed between upper and lower rolls 196, 196^a. Said rolls and their operation upon the fins 104^a may be observed in Figures 72 and 73. They are provided with complementary laterally spaced radial flanges 196^b and 196^c which, with the required spacing between the rolls and their disposal in planes adjacent the ends of the wrapped sticks, bend the fins to L-form. Said rolls 196 and 196^a are mounted on horizontal shafts 196^x, 196^x (see Figure 83) connected by gearing 196^y to rotate them at like peripheral speed. Said gearing is driven from a shaft 196^z.

From the rolls 196, 196^a the fins 104^a are passed through folding devices 198 which fold the fin back upon itself as shown in Figure 74. Next the fins pass between the rolls 197, 197^a which bring the two parts of the fin into contact as shown in Figure 75. In the further advance of the wrapped sticks on their flights the fins 104^a pass through folding devices 199, shown in Figures 81 and 82, which fold them against the ends of the gum stick to finally close the ends of the wrapper, the fins being turned by the folder from the position shown in Figure 75 through that shown in Figure 76 to its final position shown in Figure 77.

The final cramping rollers 197, 197^a as in the case of the other cramping rollers are mounted on vertically spaced horizontal shafts 197^x, 197^x connected by gears 197^y and driven by the aforesaid shaft 196^z which drives the preceding cramping rollers.

It will be understood that during the operation of the cramping, heating, ironing and final folding of the projecting ends of the tubular wrapper section, as above described, the wrapper section is held on its associated flight by the grippers 170. But after passing through the final folding devices 199, said grippers are released from the sealed wrapped sticks by the engagement of the secondary crank arm 175, with a cam plate 202 disposed parallel to the sprocket chain assembly as shown in Figure 56.

A magazine 201 is located in the path of the wrapped gum sticks for receiving and stacking them (see Figure 83). Said magazine is in the form of a vertical chute with side walls 201^a, 201^a, a back wall 201^b, and a front wall 201^c. These walls terminate at a level above the path of the wrapped gum sticks; but the back wall has depending, laterally spaced fingers 201^d, 201^d which stand in the path of the advancing marginal ends of the wrapped gum sticks to arrest them in their travel.

At the point where the grippers release the wrapped gum sticks, below the magazine 201 and in position to receive and support the marginal ends of said sticks, are located transversely opposed elevating cam discs 203, 203 disposed at the sides of the sprocket chain assembly, as shown in Figures 56, 83, 84 and 85. Figures 84 and 85 present the wrapped gum sticks as advancing toward the observer. Referring specifically to said figures: The cam discs 203 are alike; are disposed in the horizontal plane of the flights 145, and are

fixed on vertical shafts 206 which are driven through worm gearing 206^a and intermediate gearing by the sprocket shaft 196^z (see Figure 83). Each cam disc consists of a horizontal disc with peripheral, opposed, semi-circular cams 204 having like, upwardly inclined cam surfaces rising from the plane of the disc. The high points of said cams are spaced from the low points thereof to leave short, flat, opposed peripheral margins 203^a of the discs to receive the marginal ends of a wrapped gum stick.

The cam discs 203 are rotated so that their peripheries adjacent the ends of the flights travel with said flights. That is to say, as viewed in Figures 84 and 85, with the flights 145 traveling towards the observer, the cam disc at the left rotates clockwise, and that at the right rotates counter-clockwise, as indicated by the arrows 203^x and 203^y.

In the travel of the wrapped sticks on their respective flights, after their release therefrom in succession, each stick is received and supported at its ends by the flat margins 203^a of the cam discs between the proximate low and high points of the cams 204, and with their end edges in position for guiding engagement by the side walls 201^a of the magazine. The further travel of the successive sticks with their respective flights is arrested by the engagement of their advancing edges, with the fingers 201^d (see Figure 8) depending from the back wall of the magazine. By the rotation of the cam discs the ends of the wrapped sticks are caused to ride up the cams 204. The succeeding stick, received at its ends in the same manner by the flat margin 203^a of the disc rides up the following cams 204; and this operation is continued with succeeding sticks, with the result that the wrapped sticks are elevated into the magazine and stacked from below therein.

Heretofore in describing the machine we have for clearness limited the description to the operation and performance of the various elements of the machine with reference only to the immediate operating connections of said parts. We now proceed to a description of the power drive and its various connections to impart the movements described heretofore.

The mechanism of the machine is driven by a motor 225 which is shown in Figure 5 at the right end of the machine. The motor has a driving pulley 226 which is also shown in Figure 88 where it appears connected by a belt 227 to a pulley 228 fixed to a horizontal transverse shaft 229 journaled in the frame 100.

On said shaft is provided suitable clutch mechanism indicated at 231, with a clutch lever 232 pivoted to swing in a horizontal plane on a vertical stud 233 mounted in the frame. Said stud is rotated by means of a horizontal shaft 234 projecting forwardly beyond the front of the frame 100 and operated by an upright crank arm 235 to start and stop the machine. By this clutch mechanism and the crank arm 235 the machine may be connected or disconnected from the continuously operating motor. On said shaft 229 near the front of the frame is fixed a helical gear 236 which meshes with a second helical gear 237 feathered to a horizontal shaft 238 spaced to the right of the shaft 229. The second helical gear 237 is fixed to a sleeve 237^a bearing in the frame 100 and movable in line with the shaft 238 to advance or retard the shaft 238 and the parts driven thereby with reference to the shaft 229. A hand wheel 237^b fixed to said sleeve provides

ready means for this adjustment in a familiar manner.

239, 239 (Figure 88) indicate sprockets connected by sprocket chains 240, 240 (see also Figures 56 and 83) which are respectively trained about the sprockets 241 and 242 which are fixed respectively on the shafts 193^a and 196^a. Said shafts, it will be recalled, drive the sets of cramping and folding rollers which cramp and fold the end fins on the wrappers. They also drive the elevating cam discs 203, 203.

Referring again to Figure 88, 243 indicates a second transverse shaft mounted in the frame and extending parallel to shaft 238. Said two shafts are connected by a pinion 244 and gear 245. (See also Figure 5.) Spaced forwardly from the gear 245 a beveled pinion 246 is fixed to the said shaft 243. Said pinion engages a beveled pinion 247 fixed to the end of a shaft 248 extending lengthwise of the machine and carrying a beveled pinion 249 at its opposite end. Said last named pinion engages a beveled pinion 250 at the bottom of the vertical shaft 150 (see Figures 46 and 57) to the top of which is fixed the driving sprocket 149 of the sprocket chain assembly 147. The pinion 186 which drives the cutter disc 116 as heretofore described and shown in Figure 49, is fixed on the shaft 243 at a point spaced forward of the pinion 246.

As will be obvious from the foregoing description, the sprocket chain assembly 147 with its flights and shearing plates; the cutter disc 116; the wrapper end crimping rolls 193 to 197, inclusive; and the elevating cam discs 203^a are all directly geared together to travel at the same peripheral speed in the plane of the movement of the wrapper and of its severed sections. In case of overnight or other interval of operation of the machine, the wrapper-forming web shall indicate longitudinal expansion or contraction such that the blades of the cutter disc 116 and the coating shearing plates 146 of the sprocket chain assembly are out of step or timing with the gum stick depositing means, so that the flat tubular stick enclosing wrapper would be severed much back or forward of the designed midway point between the proximate ends of the sticks, the shaft 238 may be shifted by the hand wheel 237^b in one direction or the other to restore the connected mechanisms to their proper timed relation.

251 (see Figures 86 to 89, inclusive) indicates a longitudinally extending power shaft located near the forward part of the frame and journaled therein. Said shaft 251 is connected in a familiar manner by a suitable reduction gearing enclosed in the housing 252 to the transverse motor-driven shaft 229. The power shaft 251 (see Figure 87) is connected by beveled pinions 253, 254 to a transverse shaft 255 suitably journaled in the frame. 256 indicates a sprocket (see Figures 86 and 87) pinned to the shaft 255. From said sprocket a sprocket chain 257 extending to the right is connected to drive a sprocket 258 (Figure 88) which is operatively connected to a differential gearing enclosed in a housing 259. Said differential gearing is shown on an enlarged scale in detail in Figure 90.

In the housing 259 is mounted a horizontal shaft 260. Said shaft is concentric with that of the sprocket 258 which is keyed to a sleeve 261 rotatively mounted on the shaft 260. 262 indicates a differential gearing of familiar construction rotatively mounted on the shaft 260. The sleeve 261 of the sprocket 258 has a radial flange

261^a which is fixed to the proximate ring gear 262^a of the differential 262. The opposed ring gear 262^b is fixed to a worm gear 263 of large diameter. Suitable bushings and end-thrust discs are included to provide bearings for the several parts in the housing 259 and between those which are rotative one upon the other. The worm gear 263 is engaged at the bottom by a worm 263^a mounted on a horizontal shaft 263^b mounted in the housing 259 and extending at right angles to the shaft 260 and projecting beyond said casing as shown in Figures 88 and 89, where it has fixed to it a pulley 264.

From the foregoing description, it is obvious that the ring gear 262^b of the differential is locked against rotative movement of the worm gear 263 and the worm 263^a; and that the drive by the sprocket chain 257 to the sprocket 258 will be imparted through the sleeve 261 and the differential gearing 262 to drive the shaft 260. It will also be obvious that any momentary rotation of the worm 263^a to rotate the worm wheel 263 in one direction or the other, will correspondingly act through the ring gear 262^b to momentarily retard or advance the shaft 260, depending upon which direction the shaft 263^b is rotated.

The shaft 260 projects beyond the housing 259 and has fixed to its end a gear 260^a engaged with a gear 260^b fixed on the horizontal shaft 102 on which is mounted the driving drum 101 for the feed belt 103.

The gearing 260^b engages a gear 111^a (see Figures 4, 33 and 87) on the horizontal shaft 111^a which drives the right-hand drum 111 of the pressure band 110. The horizontal shaft 102 is connected to a horizontal shaft 359 (see Figures 20, 21 and 87) by beveled gearing 361. Said shaft extends to the left towards the loading end of the machine where it is connected by beveled gearing 362 to a transverse horizontal shaft 363 (see Figure 20), located above and extending parallel to the shaft 351, the function of which will be described later.

The pulley 264 on the worm shaft 263^b (see Figure 89) is connected by a belt 265 to a pulley 266 on a parallel shaft 267. The shaft 261, parallel to the two shafts 263^b and 267, is provided with longitudinally spaced fixed gears 251^a, 251^b.

Said last named gears are connected respectively by means of gears 268, 268^a and gear 269 to oppositely rotating magnetic clutch discs 270, 271 (see Figure 91). Between said clutch discs and coaxial therewith is a driven member 272 of the clutch. On said driven clutch member is fixed a gear 273 which is engaged with a gear 274 on the shaft 267. From the foregoing it will be obvious that when one of the clutch discs 270 or 271 is engaged with the driven member 272 of the clutch, a rotative movement will be imparted to the worm 263^a so as to advance or retard the feed of the shaft 260 and the parts driven thereby. The operation of the clutch disc 270 or 271 is controlled by the electric eye and the position of the marks on the wrapper relative thereto, the one clutch disc being actuated if the said mark is in advance of its normal travel, and the other clutch disc being actuated if the mark is lagging in its feed.

To operate the worm 263^a independently of the electric eye to advance or retard the wrapper-forming web 104, the shaft 267 is connected by beveled pinions 275 to a hand wheel 376 on a horizontal shaft 277 (see Figure 89).

278 is a gear driven by the gear 260^a and is mounted on a horizontal shaft 279 (see Figure 41). In the plane of the gears 144^a, 144^a operatively connecting the ironing discs 144 is gearing 280 engaged with the bottom gear 144^a. Said shaft 279 by interengaging pinions 281 is connected to the shaft 282 upon which one of the ironing devices 113 is fixed. The upper disc 144 and the disc 114² each have sprockets respectively, 114^a, 114^b, which are connected by a sprocket chain 114 (see Figures 5, 41 and 89).

From the foregoing description it will be seen that the shaft 260 connected to the differential gearing is connected to drive the several mechanisms, not heretofore described as directly driven by the motor; that is to say, it drives the drums 101 on which is mounted the feed belt; it drives the band 110 which in association with folding devices forms the longitudinally extending duplex fin; and it drives the ironing devices 113, 113; and said mechanisms are controlled by the familiar so-called electric eye which is designed to correct the feed of the wrapper-web to compensate for undue advance or lag of the wrapper-web.

In order to open a wrapped stick it is preferable to apply transversely to the wrapper-forming web a tear strip. This tear strip is applied to the web at equal distances apart and extends transversely thereof. It also projects slightly at one edge. Said tear strip is cut and applied to the wrapper-forming web by mechanism now to be described.

Referring to Figures 3, 6 to 14, inclusive: The tear strips are severed in succession from a web 300 wider than the wrapper-forming web 104, taken from a supply roll 301 mounted on a spindle 302 attached to an upright housing 303 rising above the main frame. Said web is fed about tension rolls to a feed roll 304 (see Figures 6 and 11) with which it is held in contact by a tension roll 305 mounted on a spring-controlled arm 306 pivoted on the housing. From the feed roll 304 the web passes loosely between idle rolls 307 and thence between feed rolls 308, 309. One of said rolls 309 carries spring-loaded gripper blades 310, spaced at equal distances about the roll and projecting slightly beyond its surface to grip the web 300 against the roll 308.

311 indicates a transfer roll, which is engaged by a cutting roll 312. Said cutting roll carries equally spaced spring-loaded, radially projecting cutting blades 312^a which are adapted to engage the transfer roll. Said transfer roll is provided with shearing inserts 313 (see Figure 10) set into its surface at points adapted to be engaged by the cutting blades 312^a in the rotation of the two rolls. The transfer roll 311 is provided adjacent the inserts 313, 313 on the leading side with suction ports 314 connected to air ducts 315 extending parallel to the axis of the roll. Said ducts register with and open into an arcuate port 316 in a plate 316^a against which the end of the roll 311 has wiping engagement and which is connected to an exhaust pipe 317 by a duct 317^a registering with said port. Said arcuate port 316 bridges two of the ducts 315 and extends nearly to a third duct 315 as shown in Figure 9.

The transfer roll 311 is engaged by a second transfer roll 318 which contacts the wrapper-forming web 104. It contains within it means forming fixed, laterally spaced discs disposed eccentrically of and below the axis of rotation of the transfer roll. Upon said discs are rota-

tively mounted pulley rings for endless strip-per cords which are adapted to disengage the severed tear strips from said second transfer roll and deposit it on the web 104, as shown in Figure 9.

The second transfer roll is provided with suction ports 319 opening through its surface at points spaced at distances equal to the distances of the suction ports on the transfer roll 311, but has an additional port because of its larger diameter. Said ports are connected by suitable ducts to an exhaust pipe 318^a in manner similar to that described in the case of the transfer roll 311 and illustrated in Figures 8 and 9.

The second transfer roll 318 is comprised of three laterally spaced sections fixed on a horizontal shaft 320 (see Figures 8 and 16). Intermediate said sections are the laterally spaced discs 321 which provide bearing for grooved pulley rings 322, 322 about which pass cord belts 323, 323 (see Figures 9 to 16, inclusive). The other ends of said belts are connected to grooved driving pulleys 324 (see Figure 15). The construction described and shown provides annular spaces opening through the periphery of the transfer roll 318 in the plane of and about the grooved rings 322 for the entrance of the cord belts 323 and also for the introduction of bracket arms 318^m which are fixed to the eccentrically mounted discs 321 and attached to the near face of the housing 303. This prevents the rotation of said eccentric discs 321 but permits the grooved rings 322 to rotate thereon.

The center of rotation of the grooved pulleys is so disposed that the bottom laps of the cord belts 323 will come into contact with the wrapper-forming web 104 when a tear strip has been applied transversely thereto and has been brought to position as shown in Figure 15 at 300^x. At this position the cords 323 traveling in contact with the web 104 will disengage said strip from the second transfer roll 318 by reason of the fact that the surface of the roll continues in a circular path rising above the level of the cords which travel with and at the same speed as the wrapper-forming web 104. The operation of this mechanism is clearly illustrated in the diagrammatic views, Figures 12 to 14, inclusive.

The transfer roll 318 is mounted on a horizontal shaft 320 (see Figures 6 and 8), and the transfer roll 311 and the cutter roll 312 are mounted respectively on horizontal shafts 311^x and 312^x. Said shafts are connected respectively by gears 320^x, 311^x and 312^x. By this means the cutter roll 312, the first transfer roll 311 and the second transfer roll 318 are geared to rotate in unison at the same peripheral speed in the directions indicated respectively by the arrows applied to said rolls in Figure 6. Said shaft 320 carries a sprocket 326 driven by a sprocket chain 326^a. The feed roll 308 (see Figures 6 and 11) is mounted on a horizontal shaft 308^x, and the feed roll 304 is mounted on a horizontal shaft 304^x. The gear 320^x meshes with the gear 311^x of the first transfer roll 311, which in turn meshes with a pinion 328^x on a horizontal counter-shaft 328. The pinion 328^x engages and drives a gear 308^x on the shaft 308^x of the feed roll 308. Said gear 308^x engages and drives a gear 309^x fixed on the shaft 309^x of the feed roll 309. A gear 304^x is mounted on the shaft 304^x of the feed roll 304. Said gear is driven by intermediate gearing 329^x, 308^x and 308^x. The counter-shaft 328 is connected by sprockets and chain 330 to a horizontal shaft 331 which projects forward from the face

of the housing 303 into a glue-pot 332 wherein it has fixed to it a glue roll 332^a. Associated with said roll is a rotary glue paddle 333 fixed upon a horizontal shaft 334 in position to transfer glue from the glue roll 332^a to the tear strip 300^x in spots 300^y, as indicated in Figure 7. Said shaft 334 has fixed to it a gear 334^a which is engaged and driven by gear 335 mounted on the shaft 331.

Referring now briefly to the operation of the mechanism above described for severing a strip from the tear strip web 300: Said web is fed continuously by the feed roll 304 to the rolls 308, 309 by which it is intermittently fed, there being an excess feed from the roll 304 to the feed rolls 308 and 309 as indicated by the loop 300^z shown in Figure 6.

The rolls 308 and 309 rotate continuously. But the blades 310 carried thereby are brought to engagement with the web 300 intermittently to feed the web 300 a distance equal to the predetermined width of the tear strip 300^z. Similarly the cutter blades of the cutter roll 312 come to engage the shearing inserts 311^a of the transfer roll 311 at successive intervals equal to those of the feed roll 309. And the intervals are coincident with the intervals of operation of the roll 309. As a result, the width of strip fed by the feed rolls 308 and 309 is severed by the cutter roll blades 312^a.

As the tear strip is sheared from the web 300 it is subjected to the pull at the suction port 314 and held to the surface of the transfer roll 311. In the continuous rotation of the transfer roll 311 the said tear strip is retained on said roll until said strip is brought to engagement with the second transfer roll 318. At this time the vacuum exerted at the suction port 314 is broken. A suction port 319 in the second transfer roll 318 picks up said tear strip and carries it until it is brought to position in engagement with the top of the wrapper-web 104 when the vacuum is broken. At that point the tear strip is stripped from the transfer roll as hereinbefore described, and deposited upon the web 104.

Prior to the deposit of the tear strip on said web 104, as it is carried about by the transfer roll 318, spots of glue 300^y are deposited on the tear strip by the glue paddle 333. The glue spots are spaced on the tear strip as are the cords 323, so that said cords will engage the strips above said glue spots and will hold said strips to the web until the glue is set.

The power shaft 251 is extended to the left towards the loading end of the machine, as shown in Figures 20 and 21. At its end it is connected by interengaging beveled pinions 350 to drive a horizontal shaft 351. On said horizontal shaft is fixed a sprocket 326^b which is connected to and drives the sprocket chain 326^a which drives the secondary transfer roll 318 for the tear strip. To hold said sprocket chain taut, an idling sprocket 326^c is engaged with one reach of said sprocket chain as shown in Figure 21. Said shaft 351 is connected by suitable gears 352 at its far end (Figure 20) to drive a horizontal shaft 104^a upon which the friction drive drum 104^a for the wrapper-web is fixed.

To the right of the gearing just described is located the vertical shaft 107^b (see also Figures 22 and 26) to the top of which is fixed the gum feeding disc 107. Said shaft 107^b is connected at its bottom end by beveled gearing 353 to the power shaft 251.

Still further to the right of the machine is mounted a vertical shaft 354 (see Figures 86 and

87) connected at its bottom end by beveled gearing 355 to the power shaft 251 and connected at its upper end to drive the sprocket 97 which drives the sprocket chain carrying the spacing lugs 95^a (see Figures 22 and 29). The sprocket 97 is mounted on the horizontal shaft 97^b, which shaft extends to the right as shown in Figure 29 where it is connected by beveled pinions 357 to the top end of the shaft 354.

The horizontal shaft 363 (which, as heretofore described, is driven by the shaft 360 which in turn is driven by the shaft 260 connected to the differential gearing 262) has fixed to its near end a pulley 364 (see Figures 3, 20 and 21) which is connected by V-belt 365 to a pulley 366 mounted at one end of a horizontal shaft 367 which is a shaft that carries at its other end the V-grooved pulleys 324 which drive the strip cords 323, as shown in Figures 17, 18 and 19. Thus said strip cords will be caused to lag or advance whenever the devices for feeding the wrapper-web are caused to lag or advance.

The pulley 366 at the upper end of the V-belt 365 is made in two sections, 366^a and 366^b (see Figure 19), one, 366^a, being keyed to the shaft 367, and the other, 366^b, feathered with respect to the shaft 367 by means of a pin 366^c and movable endwise of said shaft towards and away from the first section 366^a. Said section 366^b is fixed to a hub 366^d slidable upon a similar hub 366^e of the opposed section.

368 indicates a worm wheel carried by a bracket 369. Said worm wheel is fixed to a pin 370 extending diametrically of the shaft 367 and having a cam 368^a which is engaged in an annular groove 371 in the hub 366^d of the movable section of the pulley. A hand operated worm 372 is mounted in ears rising from said bracket 369 and engages said worm 368. Obviously by rotating the worm in one direction or the other the spacing between the two sections of the grooved pulley will be increased or decreased to enlarge or reduce the effective diameter of said pulley.

To move the various operating mechanisms of the machine, as when threading the wrapper-forming web in the first place or otherwise, the hand wheel 235^x is provided near one end of the machine and a like hand wheel 235^y near the other end. (See Figures 88 and 20.) Hand wheel 235^x is mounted on a transverse shaft 235^b connected at its forward end by sprocket chain and sprockets 235^a to the shaft 229 and by gearing 235^c to a longitudinally extending shaft 235^a. Said last named shaft is connected at its left-hand end (see Figures 20 and 21) by gearing 235^d to a shaft 235^e, upon which is mounted the hand wheel 235^y. The arm 235 (see Figures 3, 5 and 88) for shifting the clutch 231 is connected by link 234^x to a lever arm 234^y located near the left-hand end of the machine. By this means the machine may be started or stopped or may be moved, as described, from two different positions in its length.

The operation of the machine of the invention will be obvious from the foregoing description. Its advantages will be appreciated by those familiar with the art.

It will have been noted that the various mechanisms and devices which operate to advance the wrapper-forming web, to deposit the gum sticks thereon, to fold it into flat tubular form about said sticks, to sever said tube into wrapper lengths, each enclosing a stick, and to close the ends of said tubes against the ends of the enclosed sticks, all operate continuously, in the

same direction and at the same speed. And the gum sticks may be wrapped and delivered at greater speed with the result that the number of sticks wrapped in a given interval of time will greatly exceed the output of wrapping machines heretofore used.

While in describing the preferred embodiment of the invention it is shown as applied to the wrapping of gum sticks, it will be understood that it is applicable for wrapping sticks, pieces or other objects of any material. For the sake of brevity the term "sticks" will be used, where necessary, in the claims to refer to the articles which the machine is designed to wrap.

We claim as our invention:

1. A machine for wrapping single sticks, comprising means for advancing a wrapper web wider than the sticks; a device for depositing said sticks endwise and at predetermined intervals on said advancing web; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them; movable gripping means for holding said stick individually in said wrapper; means for severing said wrapper midway between the ends of said sticks; and means for closing the ends of said wrapper lengths transversely against the ends of the sticks.

2. A machine for wrapping single sticks, comprising means for advancing a wrapper web wider than the sticks; a device for depositing said sticks endwise and at predetermined intervals on said advancing web; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them; means for severing said wrapper midway between the ends of said sticks; and means for closing the ends of said wrapper lengths transversely against the ends of the sticks: said several devices and means operating continuously in one direction and at the speed of the advancing wrapper.

3. A machine for wrapping single sticks, comprising means for advancing a wrapper web wider than the sticks and having top and bottom panels displayed on its bottom spaced laterally to provide edge sections and longitudinally at predetermined intervals; a device for depositing said sticks endwise and at predetermined intervals on said advancing web in lateral and longitudinal register with said bottom panels; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them, with said top and bottom panels displayed in register with said sticks; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of said sticks; and means for closing the ends of said wrapper lengths transversely against the ends of the sticks.

4. A machine for wrapping single sticks, comprising means for advancing a wrapper web wider than the sticks and having top and bottom panels displayed on its bottom spaced laterally to provide edge sections and longitudinally at predetermined intervals; a device for depositing said sticks endwise and at predetermined intervals on said advancing web in lateral and longitudinal

register with said bottom panels; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them, with said top and bottom panels displayed in register with said sticks; means for severing said wrapper midway between the ends of said sticks; and means for closing the ends of said wrapper lengths transversely against the ends of the sticks: said several devices and means operating continuously in one direction and at the speed of the advancing wrapper web.

5. A machine for wrapping single gum sticks comprising means for continuously feeding a wrapper-web wider than the sticks; a device for depositing gum sticks endwise at predetermined intervals on said web; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to enclose their edges, with part of its margins on top of the sticks and the remaining parts disposed to form upright fins extending lengthwise of said web; means for folding said fins down toward said sticks to form a flat tubular wrapper; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of the wrapped sticks, and means to close the projecting ends of said wrapper lengths transversely against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

6. A machine for wrapping single gum sticks comprising means for continuously feeding a wrapper-web wider than the sticks and having top and bottom panels displayed on its bottom spaced laterally to provide edge sections and longitudinally at predetermined intervals, a device for depositing gum sticks at intervals on said web in lateral and longitudinal register with said bottom panels, means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to enclose their edges with part of the web displaying the top panel and a part of the undecorated web on top of the sticks and the remaining margins disposed to form upright fins extending lengthwise of said web; means for folding said fins down toward said sticks to form a flat tubular wrapper; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of the wrapped sticks, and means to close the projecting ends of said wrapper lengths transversely against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

7. A machine for wrapping single gum sticks comprising means for continuously feeding a wrapper-web wider than the sticks; a device for depositing gum sticks endwise at predetermined intervals on said web; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to enclose their edges, with part of its margins on top of the sticks and the remaining parts disposed to form upright fins extending lengthwise of said web; means for sealing and folding said fins down toward said sticks to form a flat tubular wrapper; movable gripping means for holding said sticks individually in said wrapper; means

for severing said wrapper midway between the ends of the wrapped sticks, and means to close the projecting ends of said wrapper lengths transversely against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

8. A machine for wrapping single gum sticks comprising means for continuously feeding a wrapper-web wider than the sticks and having top and bottom panels displayed on its bottom spaced laterally to provide edge sections and longitudinally at predetermined intervals, a device for depositing gum sticks at intervals on said web in lateral and longitudinal register with said bottom panels, means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web laterally about the sticks to enclose their edges with part of the web displaying the top panel and a part of the undecorated web on top of the sticks and the remaining margins disposed to form upright fins extending lengthwise of said web; means for sealing and folding said fins down toward said sticks to form a flat tubular wrapper; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of the wrapped sticks, and means to close the projecting ends of said wrapper lengths transversely against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

9. A machine for wrapping and sealing single gum sticks comprising means for continuously feeding a wrapper-forming web of a width wider than the sticks; a device for depositing gum sticks at predetermined like intervals on the top face of said web; means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web about the sticks to enclose their edges, with part of the margins on top of the sticks and the remaining parts turned upwardly to form continuous like upright fins extending lengthwise of said web; heating members between which said fins are passed; ironing devices for sealing them together; folding and secondary ironing devices for turning down said fins toward said sticks to form a continuous tubular flat wrapper; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of the wrapped sticks, and successively operating, cramping, heating, ironing and folding devices to close the projecting ends of said wrapper lengths against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

10. A machine for wrapping and sealing single gum sticks comprising means for continuously feeding a wrapper-forming web of a width wider than the sticks and having top and bottom panels displayed on the bottom surfaces thereof spaced laterally to provide edge-engaging sections and longitudinally at predetermined like intervals, a device for successively depositing gum sticks at intervals on the top face of said web in lateral and longitudinal register with said bottom panels, means independent of the web traveling at the speed of the web, adapted to maintain said sticks at said intervals; means for folding said web about the sticks to enclose their edges and to lay part of the web displaying the top panel and a part of the undecorated web on top of the sticks,

with the remaining margins turned upwardly to form longitudinally continuous like upright fins extending lengthwise of said web; heating members between which said fins are passed; ironing devices for sealing them together, folding and secondary ironing devices for turning down said fins toward said sticks to form a continuous tubular flat wrapper; movable gripping means for holding said sticks individually in said wrapper; means for severing said wrapper midway between the ends of the wrapped sticks; and successively operating, cramping, heating, ironing and folding devices to close the projecting ends of said wrapper lengths against the ends of the sticks, all of said devices and means operating continuously at the speed of said advancing wrapper web.

11. A machine for wrapping and sealing single gum sticks comprising means for continuously feeding a wrapper-forming web of a width wider than the sticks, a device for depositing gum sticks at predetermined like intervals on the top face of said web, a longitudinally traveling spacing device including lugs adapted to engage the following ends of said gum sticks, means for folding said web about the sticks to enclose their edges, with part of the margins on top of the sticks and the remaining parts turned upwardly to form continuous like upright fins, heating members between which said fins are passed, ironing devices for sealing them together, folding and secondary ironing devices for turning down said fins to form a continuous tubular flat wrapper; means for severing said wrapper midway between the ends of the wrapped sticks, and successively operating, cramping, heating, ironing and folding devices to close the projecting ends of said wrapper lengths against the ends of the sticks.

12. A machine for wrapping and sealing single gum sticks comprising means for continuously feeding a wrapper-forming web of a width wider than the sticks and having top and bottom panels displayed on the bottom surfaces thereof spaced laterally to provide edge-engaging sections and longitudinally at predetermined like intervals, a device for successively depositing gum sticks at intervals on the top face of said web in lateral and longitudinal register with said bottom panels, a longitudinally traveling spacing device including lugs adapted to engage the following ends of said gum sticks, means for folding said web about the sticks to enclose their edges and to lay part of the web displaying the top panel and a part of the undecorated web on top of the sticks, with the remaining margins turned upwardly to form longitudinally continuous like upright fins, heating members between which said fins are passed, ironing devices for sealing them together, folding and secondary ironing devices for turning down said fins to form a continuous tubular flat wrapper, means for severing said wrapper midway between the ends of the wrapped sticks, and successively operating, cramping, heating, ironing and folding devices to close the projecting ends of said wrapper lengths against the ends of the sticks.

13. A machine for wrapping single gum sticks comprising an endless belt adapted for continuously feeding a wrapper-forming web, a device for depositing gum sticks at predetermined intervals on said web, means including spacing lugs adapted to engage the following ends of said sticks, folding devices including an endless band engaged with said sticks adapted to fold said wrapper laterally and to form its margins into longitudinally extending upright fins, heating and

ironing devices adapted to seal said fins and lay them flat, a sprocket chain assembly including flights and intermediate shearing plates adapted to receive and support said tubular wrapper, means associated with each flight for gripping said wrapper thereto, a cutting device associated with said shearing plates for severing wrapper lengths each enclosing a stick and having projecting ends, and cramping, heating, ironing and folding devices to which said wrapper lengths are delivered in succession in the travel of said sprocket chain assembly by means of which said wrapper sections are closed at their ends.

14. In combination with means for advancing a continuous tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of similarly spaced flights advancing in the same direction and at the same speed timed to support said wrapper-enclosed sticks, a plurality of shearing plates intermediate said flights, means for operatively connecting and supporting said flights and shearing plates, and a cutter member adapted to sever said tubular wrapper into successive lengths against said shearing plates.

15. In combination with means for advancing a continuous flat tubular wrapper enclosing single sticks equally spaced in the direction of said advance, a plurality of similarly spaced flights advancing in the same direction and at the same speed timed to support said wrapper-enclosed sticks, a plurality of shearing plates intermediate said flights, means for operatively connecting and supporting said flights and shearing plates, and a cutter member adapted to sever said tubular wrapper into successive lengths against said shearing plates.

16. In combination with means for advancing a flat tubular wrapper enclosing sticks equally spaced in the direction of said advance, a plurality of similarly spaced flights advancing in the same direction and at the same speed timed to support said wrapper-enclosed sticks, a plurality of shearing plates intermediate said flights, a sprocket chain and sprockets engaged therewith, devices for operatively connecting said flights and said shearing plates to said sprocket chain, rails for supporting said flights and shearing plates, means for gripping said tubular wrapper to said flights, and a rotary cutter having spaced blades adapted to engage and sever said tubular wrapper against said shearing plates in succession.

17. In combination with means for advancing a flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of similarly spaced flights advancing in the direction and at the same speed, each flight having an upright shoulder at its far edge, a plurality of shearing plates intermediate said flights, a sprocket chain and sprockets engaged therewith, devices for operatively connecting said flights and said shearing plates to said sprocket chain, rails for supporting said flights and shearing plates, spring controlled gripper arms mounted on the near edge of each flight adapted to engage and, with said shoulder, hold said tubular wrapper on said flight, means for actuating said gripper arms, and a rotary cutter having spaced blades adapted to engage and sever said tubular wrapper against said shearing plates in succession midway between the proximate ends of the wrapped sticks therein.

18. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of similarly spaced flights advancing end-

wise in the same direction and at the same speed adapted to engage and support the bottom of said wrapper in register with the enclosed sticks, a plurality of shearing plates intermediate said flights, an endless sprocket chain and sprockets engaged therewith, devices for operatively connecting said flights and said shearing plates to said sprocket chain including upright rotative shafts to the tops of which the said flights are fixed, means providing a cam groove adjacent the bottom ends of said shafts, said cam groove extending parallel to the near and far reaches of said sprocket chain, but being disposed eccentrically with reference to the centers of rotation of said sprockets, and cam arms fixed to the bottom ends of said shafts engaged in said cam groove adapted to rotate said flights through an arc of 270° as said sprocket chain passes about said sprockets.

19. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of similarly spaced flights advancing endwise in the same direction and at the same speed adapted to engage and support the bottom of said wrapper in register with the enclosed sticks, a plurality of shearing plates intermediate said flights, an endless sprocket chain and sprockets engaged therewith, devices for operatively connecting said flights and said shearing plates to said sprocket chain including upright rotative shafts to the tops of which the said flights are fixed, means providing a cam groove adjacent the bottom ends of said shafts, said cam groove extending parallel to the near and far reaches of said sprocket chain, but being disposed eccentrically with reference to the centers of rotation of said sprockets, and cam arms fixed to the bottom ends of said shafts engaged in said cam groove adapted to swing said flights in their travel about the sprockets from their endwise position to a crosswise position, thereby changing the edge which was the near edge when traveling endwise to the leading edge when traveling crosswise.

20. In a sprocket chain assembly, a plurality of spaced flights, a plurality of shearing plates intermediate said flights, said flights and shearing plates being severally mounted on brackets each having top and bottom spaced arms provided with pins connected to said sprocket chain, a rail extending parallel to and between said sprocket chain and said brackets, means providing top and bottom bearing devices on said brackets engaged with the top and bottom edges of said rail, a second rail on the sides of said brackets remote from said sprocket chain, and bearing devices mounted on said shearing plate brackets engaged with the top of said second rail.

21. In a sprocket chain assembly, a plurality of spaced flights, a plurality of shearing plates intermediate said flights, said flights and shearing plates being severally mounted on brackets each having top and bottom spaced arms provided with pins connected to said sprocket chain, a rail extending parallel to and between said sprocket chain and said brackets, means providing top and bottom bearing devices on said brackets engaged with the top and bottom edges of said rail, a second rail on the sides of said brackets remote from said sprocket chain, bearing devices mounted on said shearing plate brackets engaged with the top of said second rail, and means for retaining said second named bearing devices on said second named rail.

22. In a sprocket chain assembly, upper and

lower sprocket chains, a plurality of spaced flights, a plurality of shearing plates intermediate said flights, said flights and shearing plates being severally mounted on brackets each having top and bottom spaced arms provided with upright pins connected to said upper and lower sprocket chains, a rail extending parallel to and between said sprocket chains and said brackets having V-grooves in its top and bottom edges, means providing top and bottom V-formed bearing devices on said brackets engaged in the top and bottom V-grooves of said rail, a second rail on the side of said brackets remote from said sprocket chains, bearing devices mounted on said shearing plate brackets engaged with the top of said second rail, and means for retaining said second named bearing devices on said second named rail.

23. In a machine for wrapping single sticks including means for advancing a wrapper-web with narrower sticks deposited thereon and maintained in endwise spaced relation, a bar for holding said sticks on said advancing web, a folding device for turning the rear margin of said wrapper up about said bar, longitudinally spaced drums and an endless band mounted thereon overlapping the rear lateral halves of said sticks and engaged with the wrapper above the same, cooperating supporting rollers for said web below said band by means of which said upturned rear margin of said wrapper is laid partly on the top of said sticks, with the remaining part upturned as a longitudinally extending fin, folding devices adapted to pick up and fold the rear margin of said wrapper on the top of said sticks, with the remaining part upturned as a longitudinally extending fin against the first named fin, and means for heating, sealing and folding said sealed fins down to form a flat tubular wrapper enclosing said sticks.

24. In a machine for wrapping single sticks including means for advancing a wrapper-web with narrower sticks deposited thereon and maintained in endwise spaced relation, a bar for holding said sticks on said advancing web, a folding device for turning the rear margin of said wrapper up about said bar, longitudinally spaced drums and an endless band mounted thereon overlapping the rear lateral halves of said sticks and engaged with the wrapper above the same, cooperating supporting rollers for said web below said band by means of which said upturned rear margin of said wrapper is laid partly on the top of said sticks, with the remaining part upturned as a longitudinally extending fin, and folding devices adapted to pick up and fold the rear margin of said wrapper on the top of said sticks, with the remaining part upturned as a longitudinally extending fin against the first named fin.

25. In a machine for wrapping single sticks including means for advancing a wrapper-web with narrower sticks deposited thereon and maintained in endwise spaced relation, a bar for holding said sticks on said advancing web, a folding device for turning the rear margin of said wrapper up about said bar, longitudinally spaced drums and an endless band mounted thereon overlapping the rear lateral halves of said sticks and engaged with the wrapper above the same, cooperating supporting rollers for said web below said band and spring-controlled rollers engaging said band by means of which said upturned rear margin of said wrapper is laid partly on the top of said sticks, with the remaining part upturned

as a longitudinally extending fin, and folding devices adapted to pick up and fold the rear margin of said wrapper on the top of said sticks, with the remaining part upturned as a longitudinally extending fin against the first named fin.

26. In a single stick wrapping machine in combination with means for continuously advancing a wrapper-web, means for depositing gum sticks on said web at endwise equal intervals at a predetermined point in the path of said web, means for turning the lateral margins of said web about said sticks and folding them down to form a flat tubular wrapper, a sprocket wheel assembly including longitudinal spaced flights with intermediate shearing plates, a cutting device associated with said assembly adapted to sever said flat tubular wrapper against said shearing plates in succession into wrapper lengths, mechanism for driving said stick-depositing means, said sprocket chain assembly and said cutting device at the speed of advance of said wrapper-web, and a device interposed in said driving mechanism for adjusting said sprocket chain assembly and cutting device to the proper timed relation with said gum stick depositing means.

27. In combination, an advancing sprocket chain assembly, longitudinally spaced flights carried by said sprocket chain, said flights each extending crosswise of the sprocket chain and carrying a tubular wrapper length projecting at its ends beyond an enclosed stick, means retaining said wrapper length on said flight, a plurality of like pairs of coacting rolls disposed in succession adjacent the ends of said flights, the first pair of rolls being formed to flatten the projecting ends of said wrapper lengths to form end fins in the plane of one face of said wrapper length, the following two pairs of rolls being adapted to fold said fins upon themselves in two stages, and folding horns located intermediate the second and third pairs of rolls, and after the third pair of rolls cooperating with said rolls and folding said fins against the ends of said sticks.

28. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of similarly spaced flights advancing endwise in the same direction and at the same speed adapted to engage and support the bottom of said wrapper in register with the enclosed sticks, said flights being rotatable in the plane of their travel, and means adapted to swing said flights in their travel about the sprockets first from their endwise position in the near reach to a crosswise position in the far reach, thereby changing the edge which was the near edge when traveling endwise to the leading edge when traveling crosswise; and then returning the flights to their normal position in the near reach.

29. In a machine for wrapping single sticks, means for advancing a wrapper web wider than the sticks, a device for depositing said sticks endwise at predetermined intervals on said advancing web, means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them, movable gripping means for holding said sticks individually in said wrappers, means for severing said wrapper midway between the ends of said sticks while said sticks are held by said movable gripping means, and means for closing the ends of said wrapper lengths transversely against the ends of the sticks.

30. In a machine for wrapping single sticks, means for advancing a wrapper web wider than the sticks, a device for depositing said sticks end-

wise at predetermined intervals on said advancing web, means for folding said web laterally about the sticks to form a flat tubular wrapper enclosing them while said web is being advanced, gripping means for holding said sticks individually in said wrapper, means for moving said gripping means at the same speed as said advancing web, means for severing said wrapper midway between the ends of said sticks while they are being moved by said gripping means and means for closing the ends of said wrapper lengths transversely against the ends of the sticks, while they are being moved by said gripping means.

31. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of gripping devices for engaging said sticks individually while enclosed in said wrapper, means for moving said gripping devices at the same speed as said wrapper advancing means, and means for severing said tubular wrapper between the ends of said sticks while the latter are engaged by said gripping devices.

32. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of gripping devices for engaging said sticks individually while enclosed in said wrapper, means for moving said gripping devices at the same

speed as said wrapper advancing means, means for severing said tubular wrapper between the ends of said sticks while the latter are engaged by said gripping devices, means for swinging said gripping devices to a crosswise position relative to their line of travel, and folding means operating on the ends of the wrapper projecting beyond the ends of said sticks while the latter are traveling in such crosswise position.

33. In combination with means for advancing a continuous flat tubular wrapper enclosing sticks spaced in the direction of said advance, a plurality of gripping devices for engaging said sticks individually while enclosed in said wrapper, means for moving said gripping devices at the same speed as said wrapper advancing means, means for severing said tubular wrapper between the ends of said sticks while the latter are engaged by said gripping devices, means for swinging said gripping devices to a crosswise position relative to their line of travel, and folding means operating on the ends of the wrapper projecting beyond the ends of said sticks while the latter are traveling in such crosswise position, said severing means operating continuously at the speed of the wrapper advancing and gripping means.

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