

No. 688,284.

Patented Dec. 10, 1901.

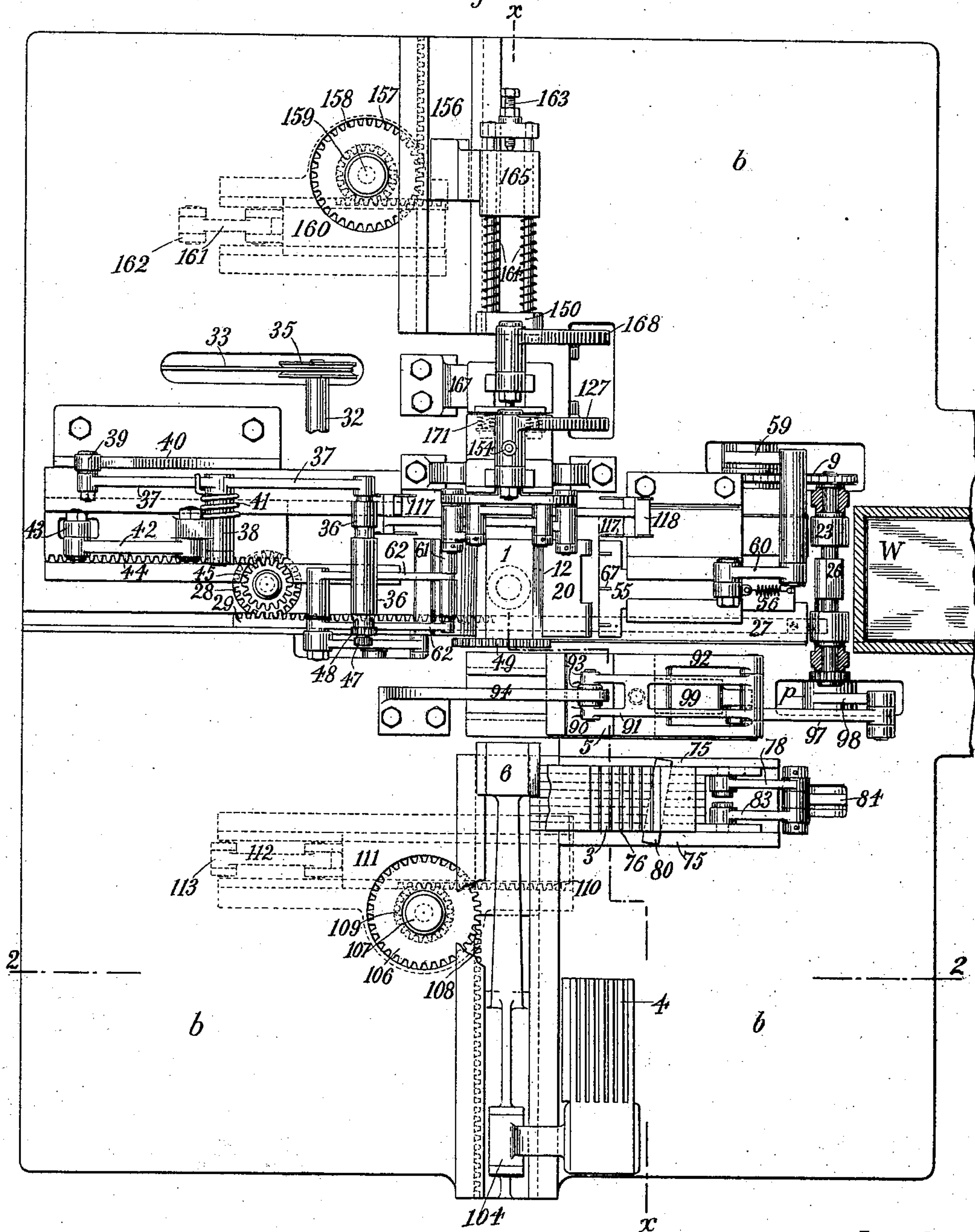
H. BILGRAM & O. L. SCHEHL.
MACHINE FOR FORMING PACKAGES OF CIGARETTES.

(Application filed July 25, 1900.)

(No Model.)

10 Sheets—Sheet 1.

Fig. 1



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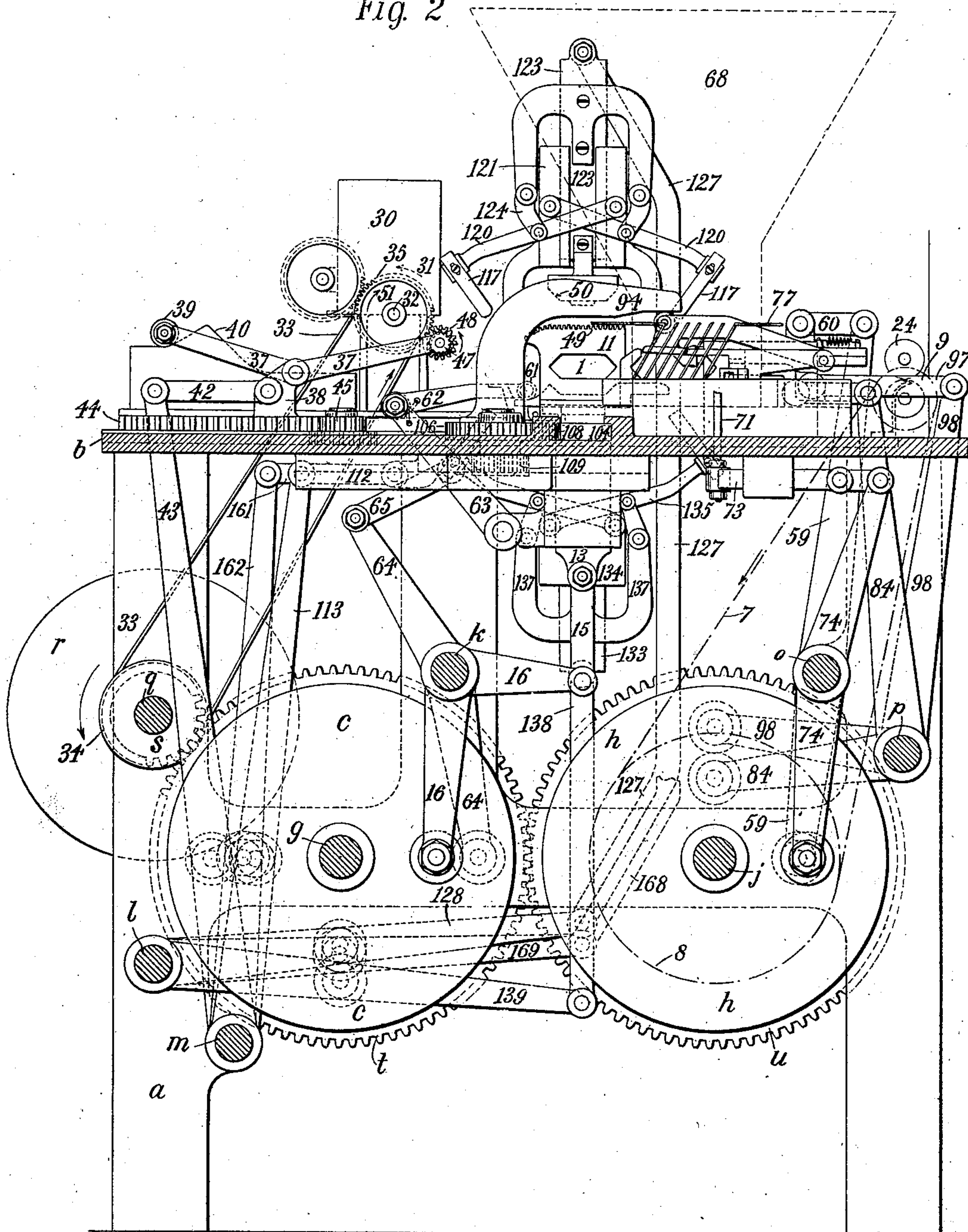
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(No Model.)

10 Sheets—Sheet 2.

Fig. 2



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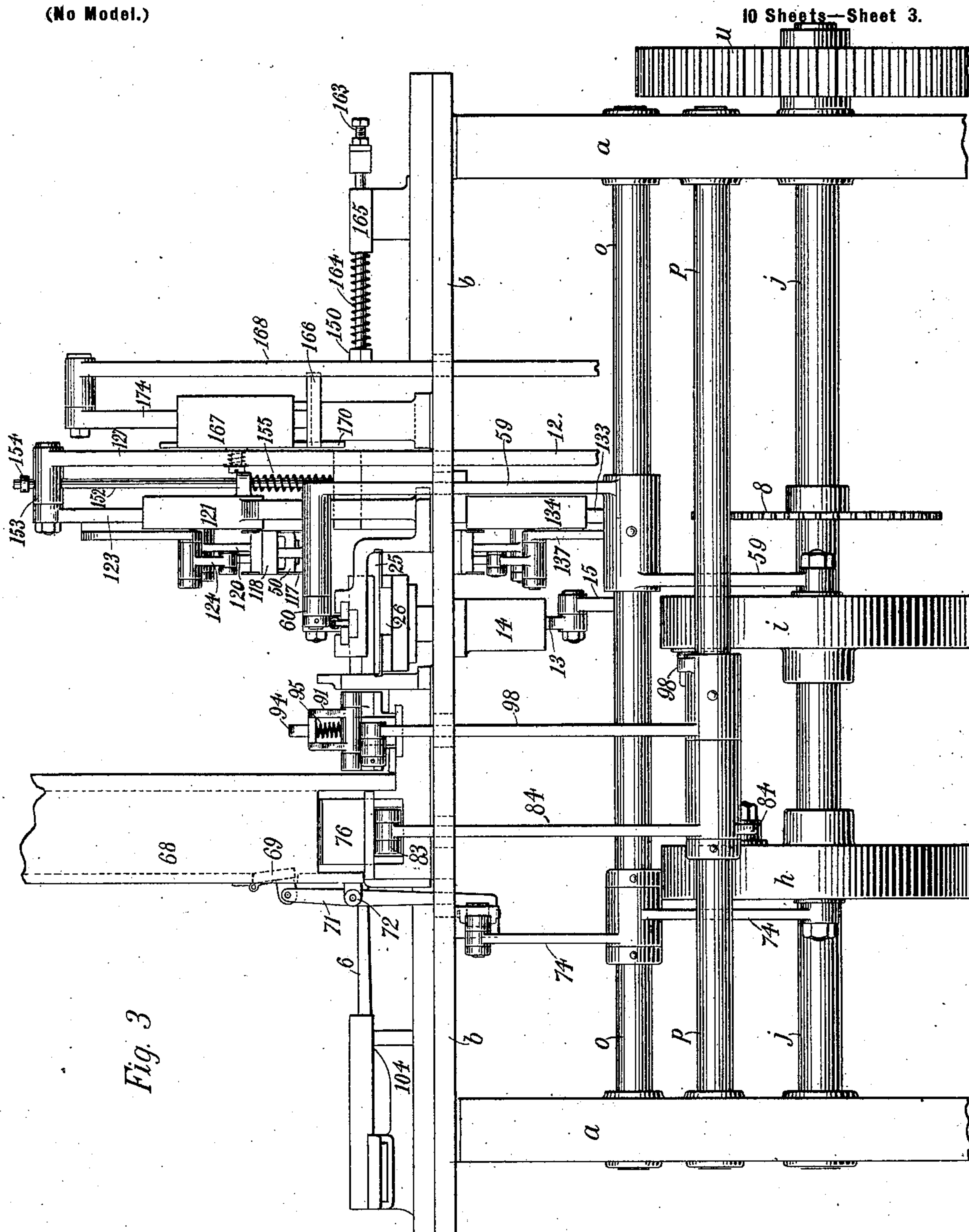


Fig. 3

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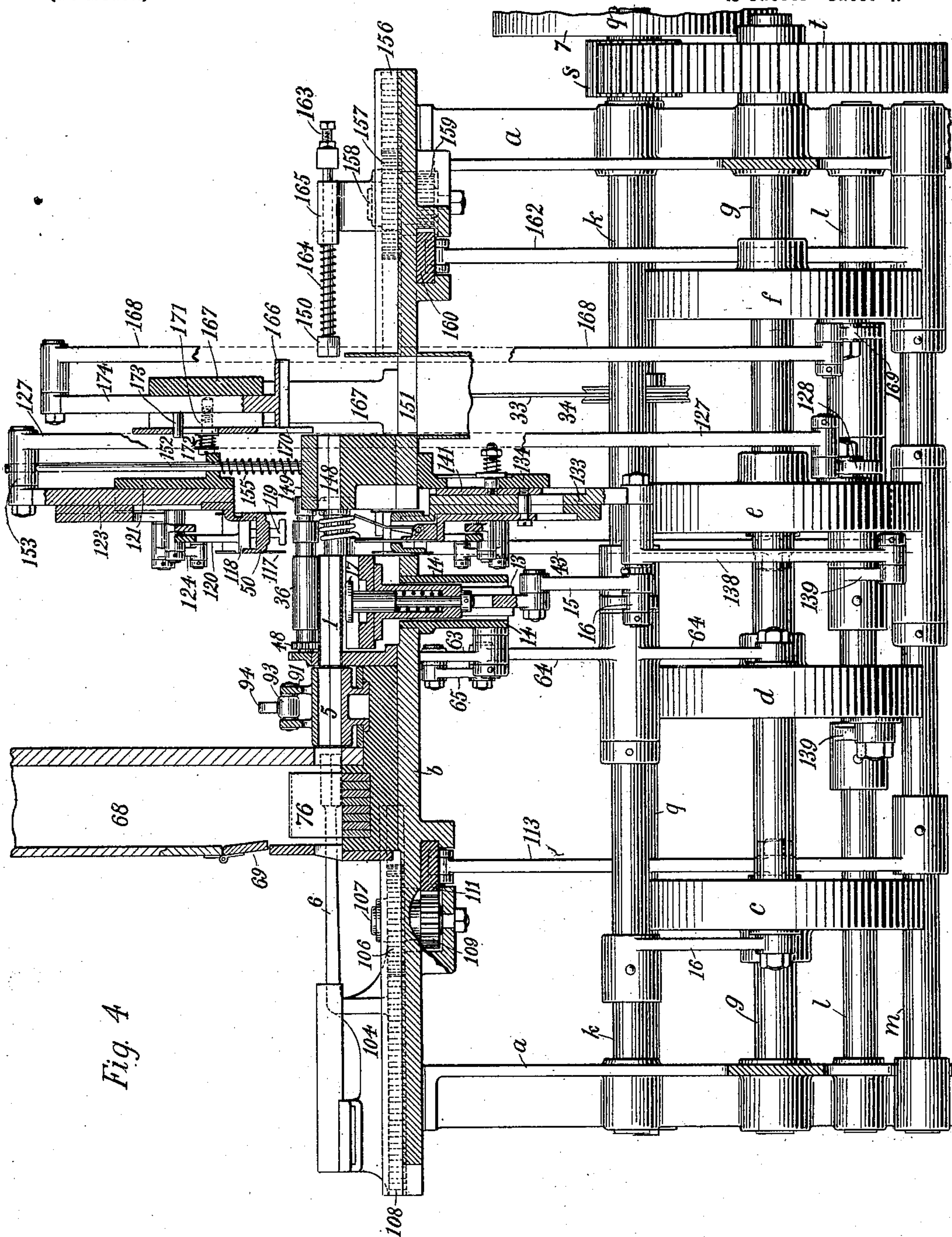


Fig. 4

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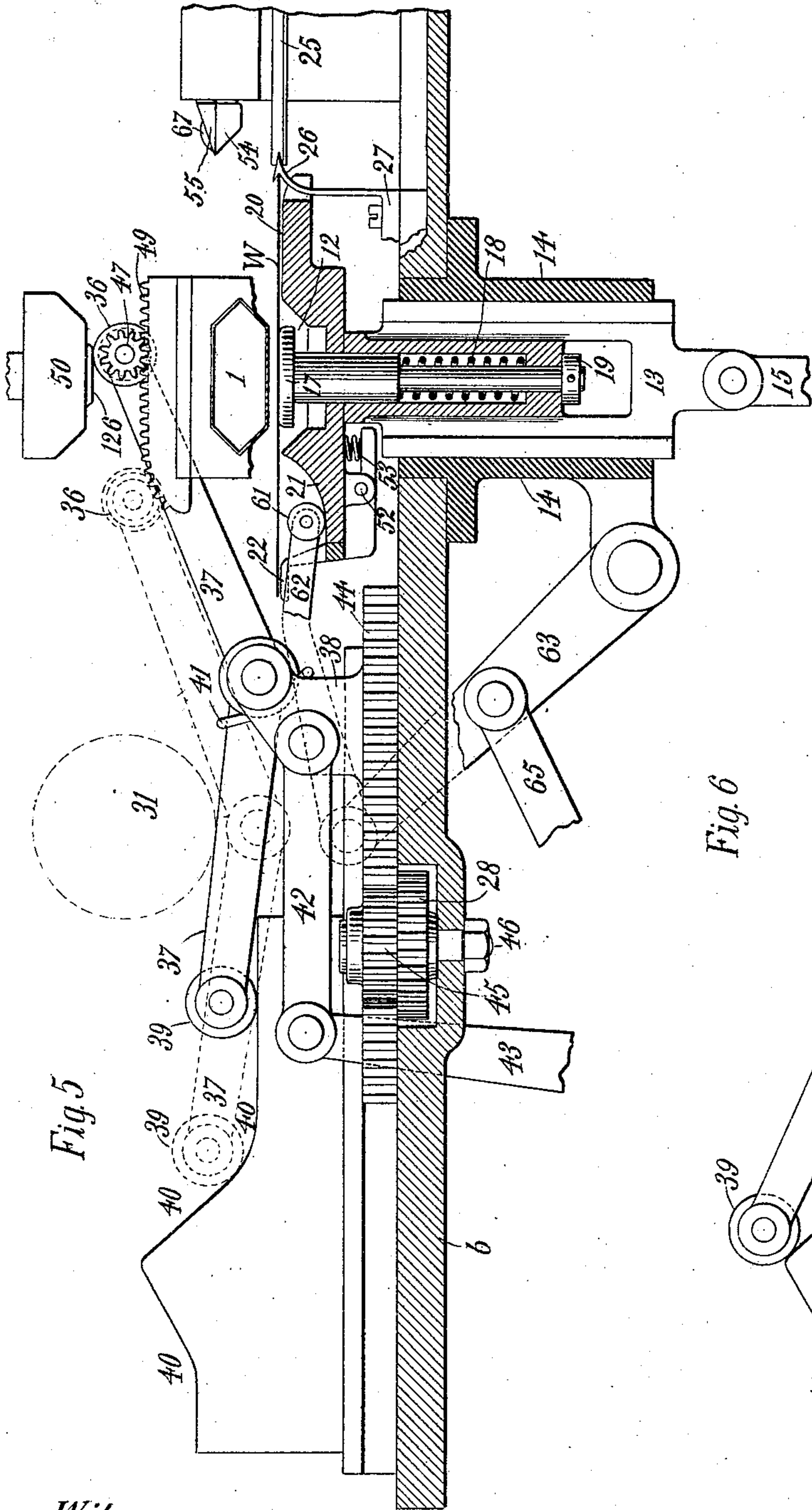
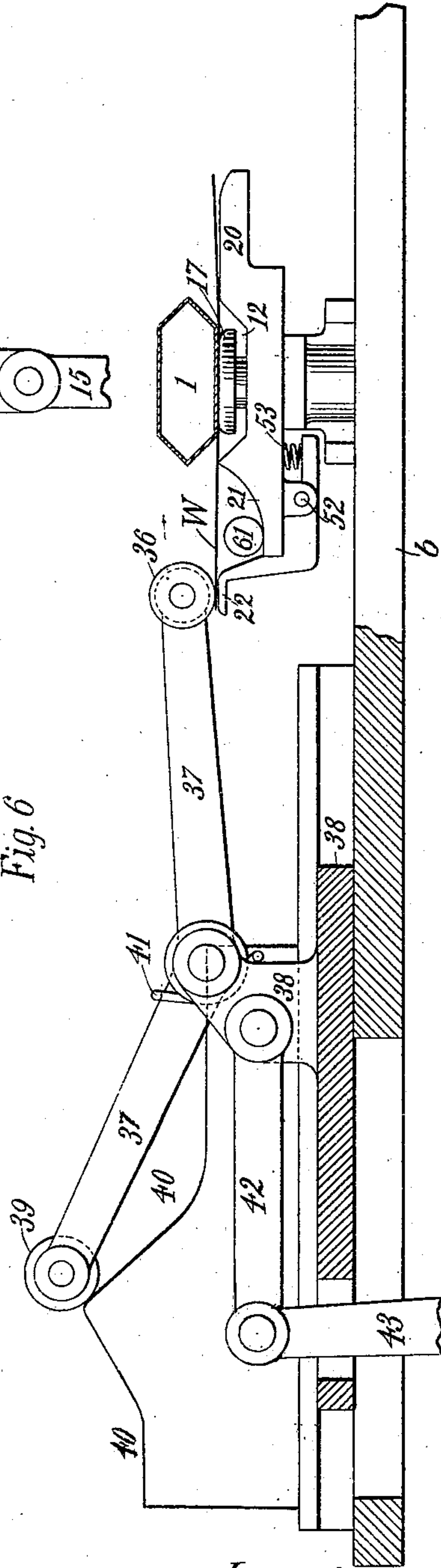


Fig. 5

Fig. 6



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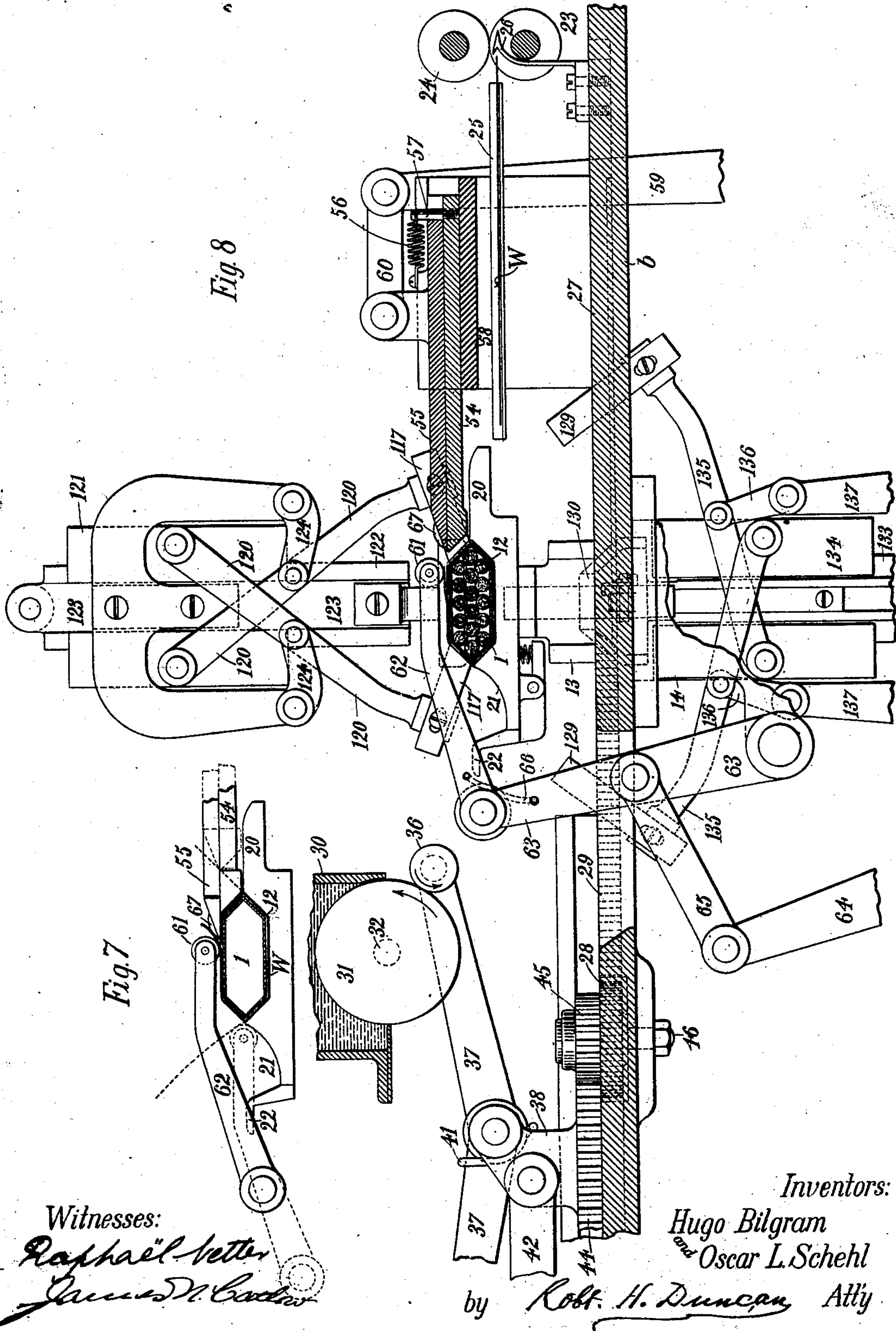
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(No Model.)

10 Sheets—Sheet 6.



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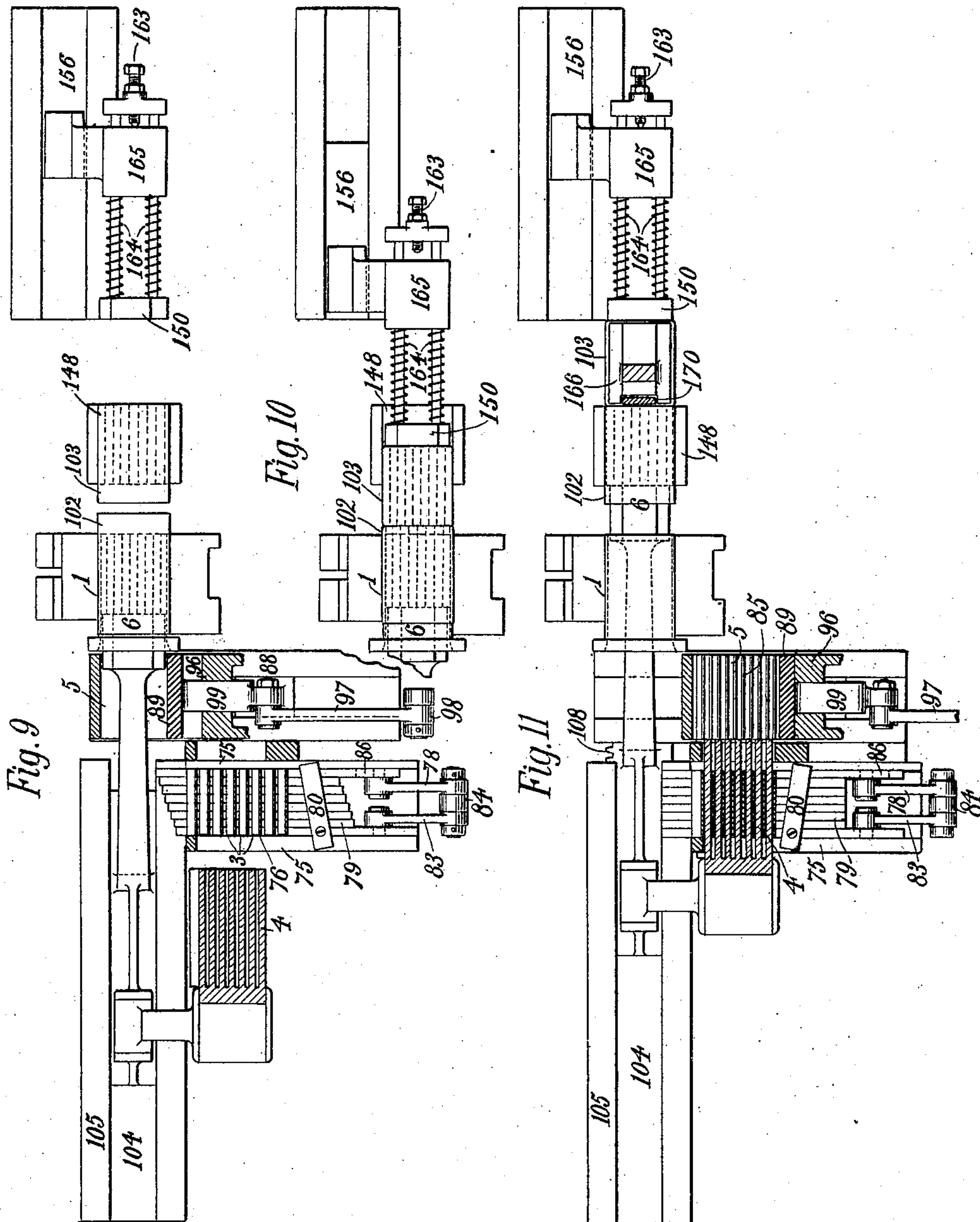
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(No Model.)

10 Sheets—Sheet 7.



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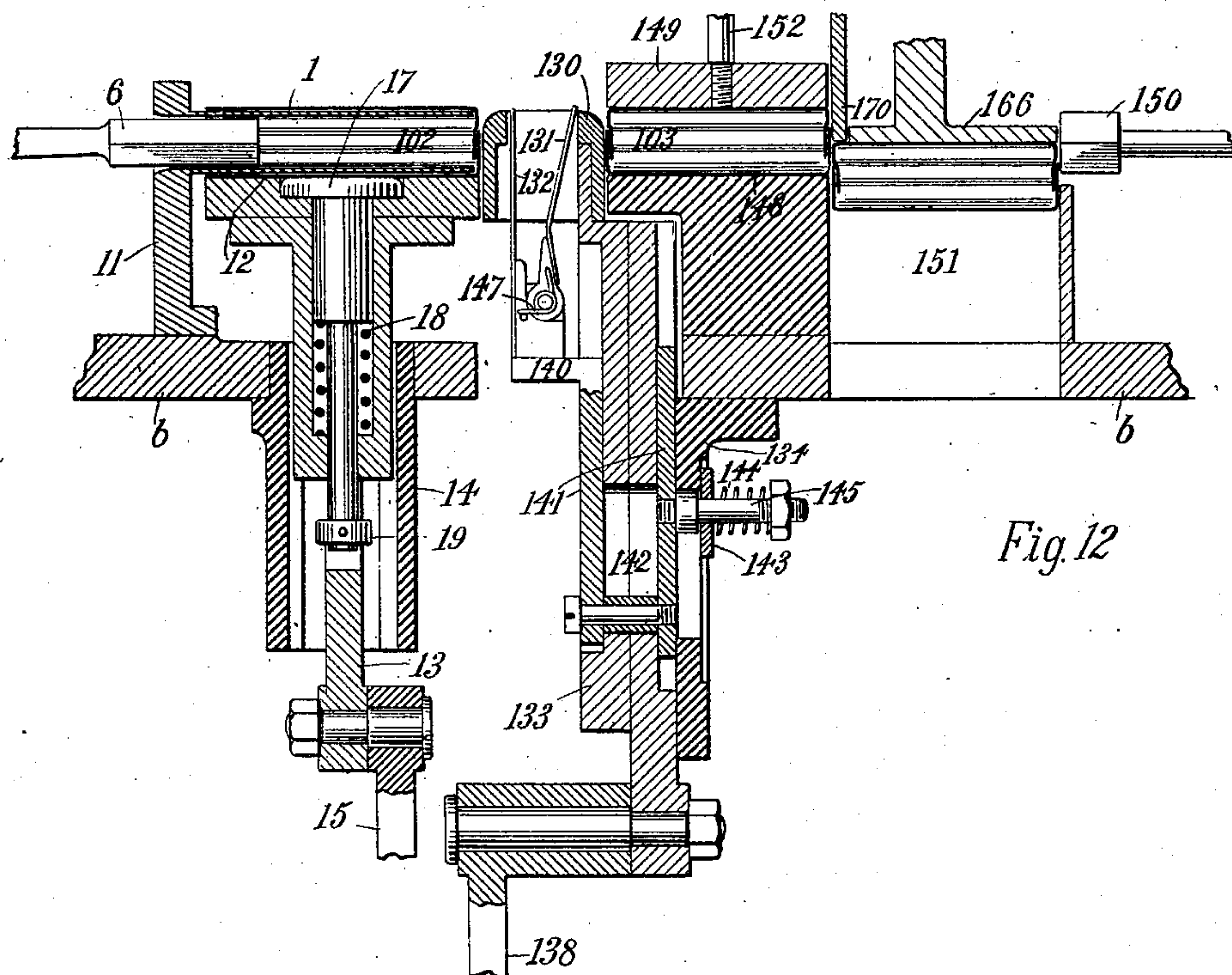


Fig. 12

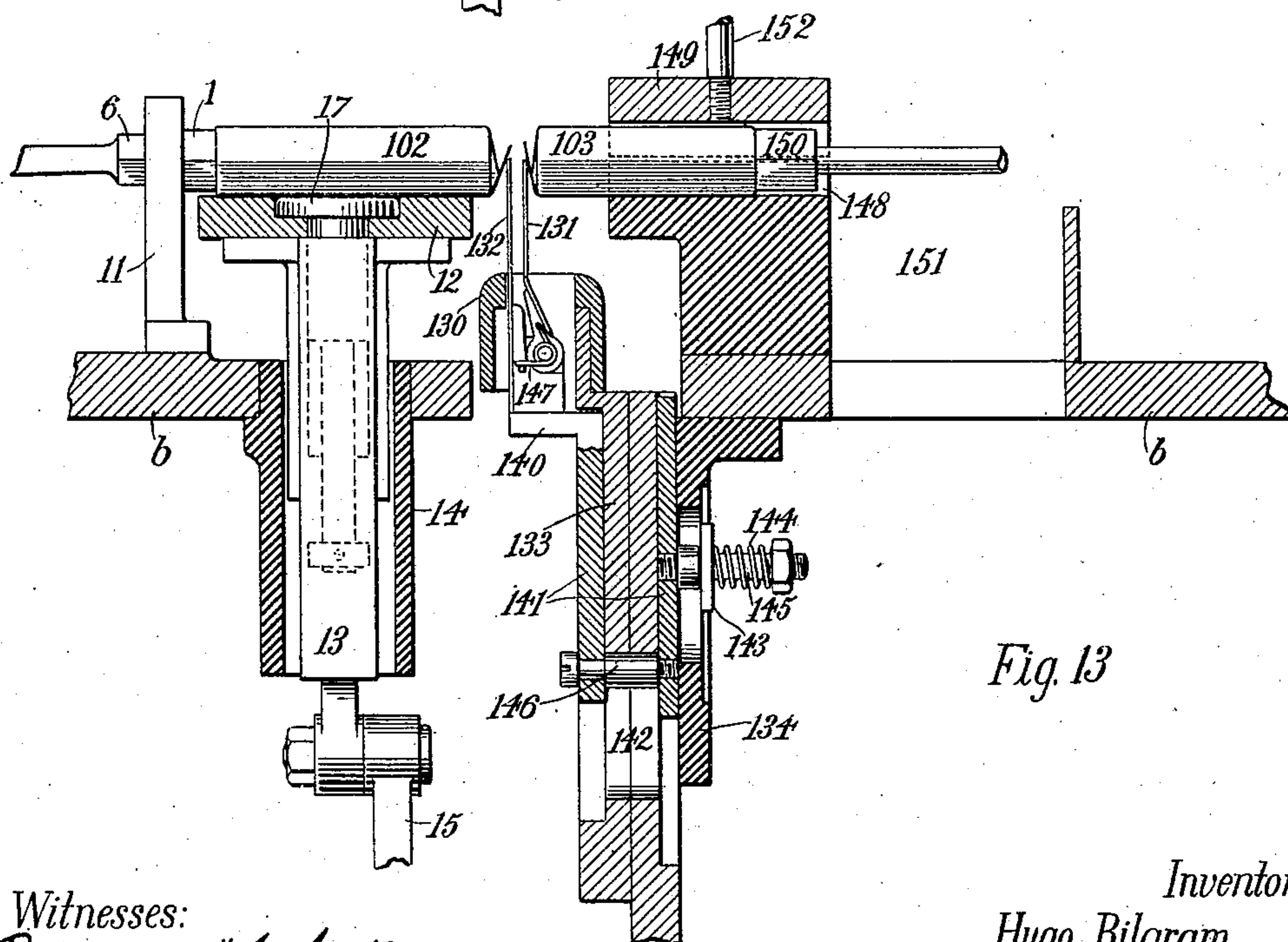


Fig. 13

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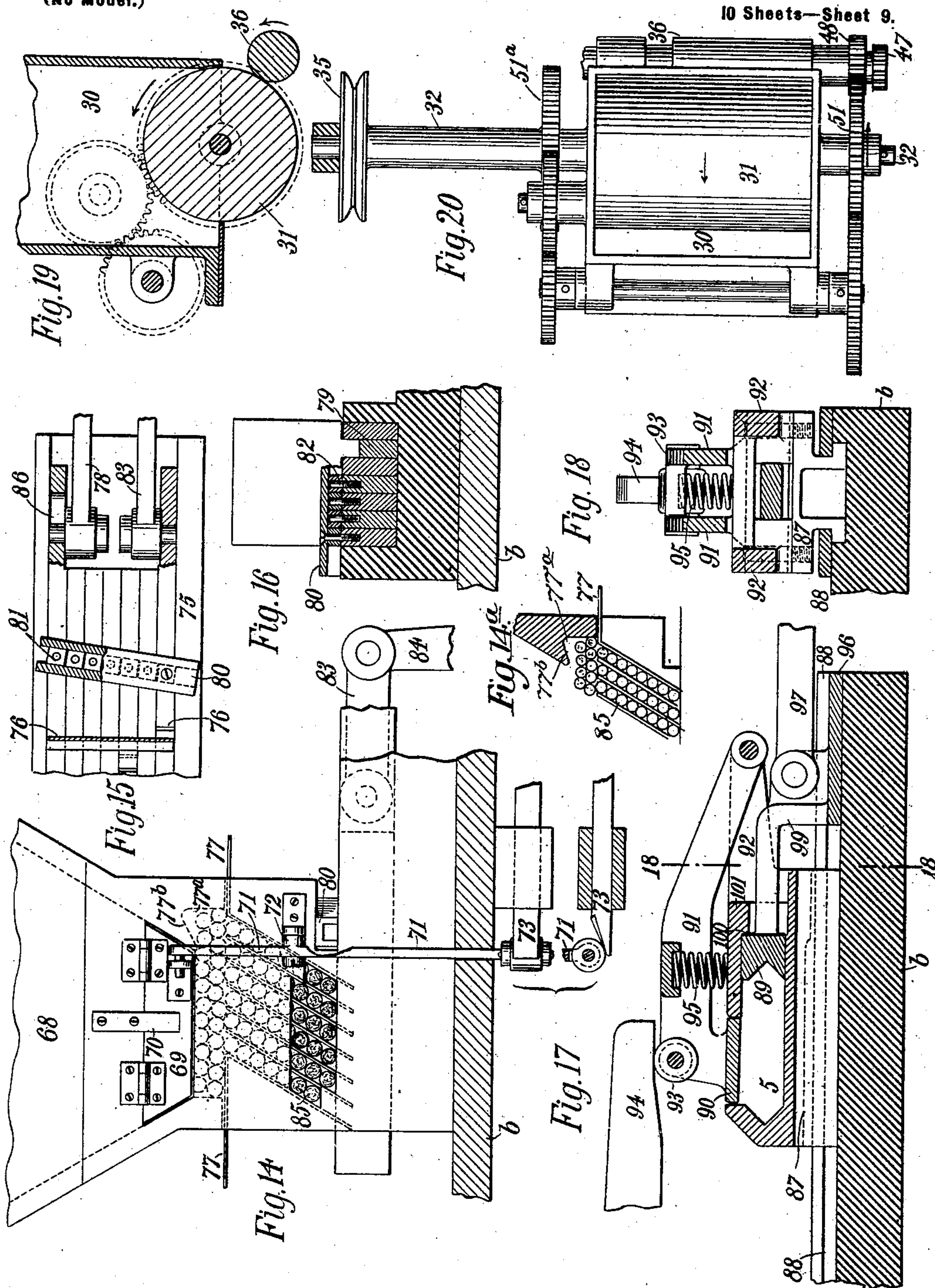
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(No Model.)



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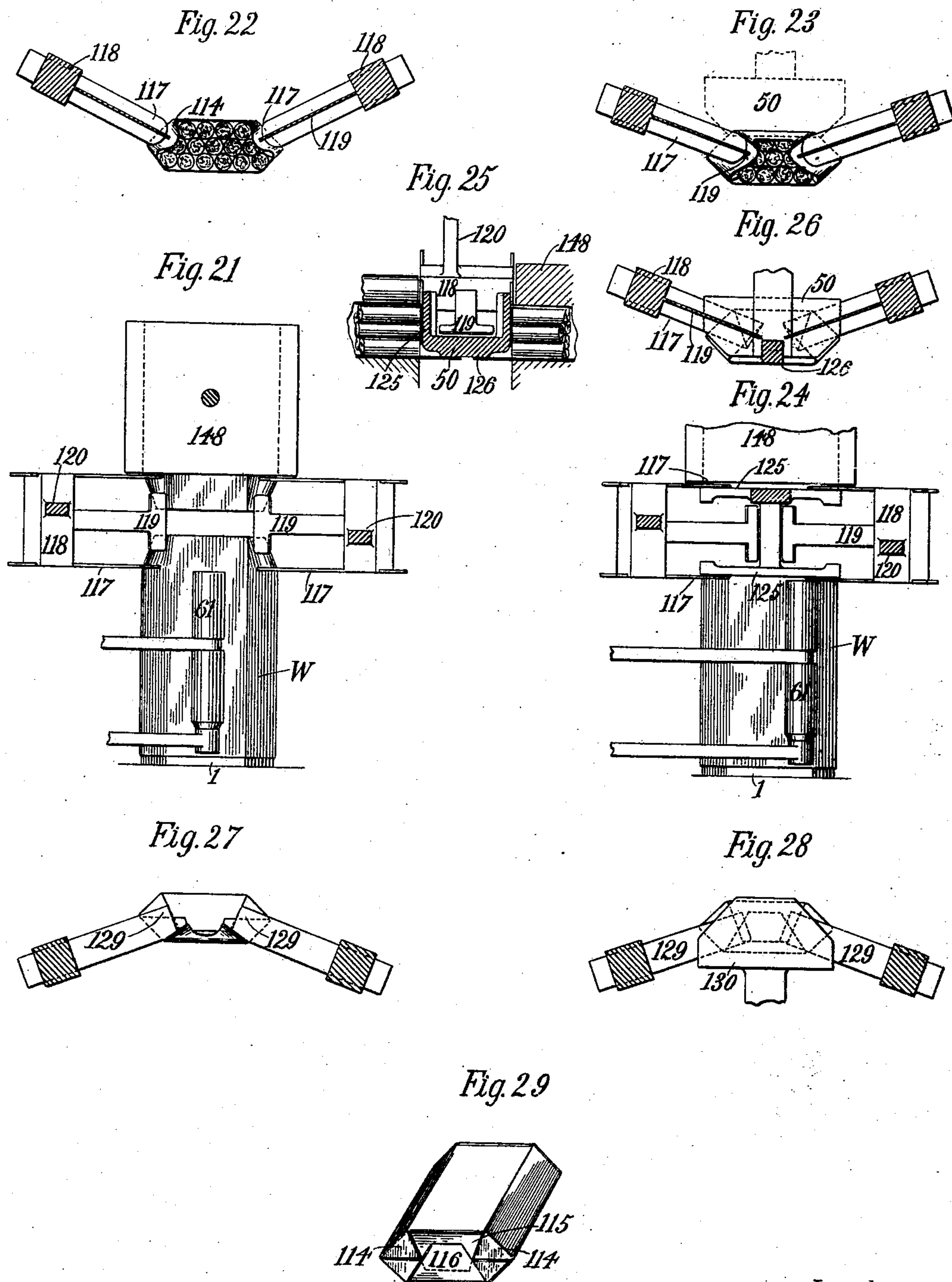
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(No Model.)

10 Sheets—Sheet 10.



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UNITED STATES PATENT OFFICE.

HUGO BILGRAM AND OSCAR L. SCHEHL, OF PHILADELPHIA, PENNSYLVANIA;
ASSIGNORS TO GEORGE W. FACKLER, OF NEW YORK, N. Y.

MACHINE FOR FORMING PACKAGES OF CIGARETTES.

SPECIFICATION forming part of Letters Patent No. 688,284, dated December 10, 1901.

Application filed July 25, 1900. Serial No. 24,844. (No model.)

To all whom it may concern:

Be it known that we, HUGO BILGRAM, a citizen of the United States, and OSCAR L. SCHEHL, a subject of the King of Prussia, German Emperor, both residing in the city and county of Philadelphia and State of Pennsylvania, (having their post-office address at the corner of Twelfth and Noble streets, in said city,) have jointly invented a new and useful Machine for Forming Packages of Cigarettes, of which the following is a specification.

The present invention relates to machines for counting out or selecting from a mass of cigarettes a definite number and inclosing them in wrappers to form convenient packages for use or sale.

The machine embodying the invention includes devices or mechanisms for accomplishing the following results, viz: feeding the package-wrappers and applying paste thereto, folding the wrappers around a hollow case or mandrel into which the desired number of cigarettes for a package are fed, counting out the desired number of cigarettes and feeding them into the hollow mandrel, folding the ends of the packages, sealing the end laps in place, and expelling the finished packages from the machine.

The invention consists, stated generally, in improvements in the construction of various devices and in combinations and subcombinations of devices by which the machine is adapted to accomplish the results heretofore enumerated, as hereinafter more fully described, shown in the drawings, and recited in the claims.

The accompanying drawings (ten sheets) illustrate a machine embodying the invention, and for the sake of clearness various parts of the machine are shown as detached from their contiguous parts.

In the drawings, Figure 1 is a plan or top view of the machine. Fig. 2 is a sectional view along the line 2 2 of Fig. 1, showing the parts beyond the section in elevation. Fig. 3 is a side elevation as seen from the right of Fig. 1. Fig. 4 is a sectional view along the broken line *x x* of Fig. 1. Fig. 5 is a cross-section through the mandrel and its mold, showing paste-applying devices and other op-

erative parts. Fig. 6 is a similar view, many of the parts being omitted and others shown in different operative positions. Fig. 7 is a cross-section of the mandrel in position in its mold or seat, showing devices for folding the wrapper around the mandrel and pasting its opposite edges together. Fig. 8 is a cross-section through the mandrel, especially showing devices for feeding wrappers to the mandrel, for applying paste, and folding the wrappers around the mandrel, and devices for forming the end folds of the packages. Figs. 9, 10, and 11 are plan views of devices for counting out, gathering, and feeding the cigarettes into the mandrel and devices for detaching the partly-completed packages from the mandrel and expelling the completed packages from the machine, the operative parts being shown in different positions in the several figures. Figs. 12 and 13 are detail sectional views illustrating the position of the packages where their ends are folded and the construction and operation of lap-retaining blades or fingers in connection with the bottom end folder and while the ends of the packages are moving into abutment. Fig. 14 is a view in elevation of the cigarette-hopper and a series of cigarette-compartments arranged beneath the hopper and devices for regulating the delivery of the cigarettes from the hopper and the width of the compartments. Fig. 14^a is a sectional view of a recess or chamber located outside of the hopper and above the compartments. Figs. 15 and 16 are respective plan and sectional views of the cigarette-compartments and the devices for regulating their widths. Figs. 17 and 18 are respective longitudinal and cross sections of a sliding receptacle or carriage for gathering and transporting the cigarettes into alinement with the hollow mandrel. Figs. 19 and 20 are respective transverse sectional and plan views of the paste-reservoir and paste delivering and applying rolls and accompanying gear-wheels. Figs. 21 to 26, inclusive, are detail views of upper end package-folders, showing their construction and operation at various stages of their work. Figs. 27 and 28 are detail views of the bottom end folders, and Fig. 29 is a perspective view of a finished package.

In the drawings, *a* represents the frame or standards of the machine, which support a table *b*, upon which are mounted the operative devices or mechanisms, which are mostly actuated by suitable connections with cam-grooves formed in wheels *c*, *d*, *e*, and *f* on rotating shaft *g* and in wheels *h* and *i* on rotating shaft *j*, located beneath the table *b*, these connections generally consisting of links jointed to rock-levers, which are fulcrumed on rock-shafts *k*, *l*, *m*, *o*, and *p*, also located beneath the table *b*, as shown in Figs. 2, 3, and 4 of the drawings. The shaft *g* is rotated by its connection with the driving-shaft *q* through pinion *s* and gear *t*, the shaft *q* being driven by pulley *r*, and the shaft *j* is rotated by the intermesh of its gear *u* with gear *t* on shaft *g*. The several shafts are properly journaled in the frame of the machine.

A general idea of the location of the operative parts or groups of mechanism, which may aid in understanding the more detailed descriptions, may be obtained from the following brief statement in connection with Fig. 1 of the drawings, in which the hollow mandrel into which the cigarettes are fed and around which the wrappers are folded is indicated by the numeral 1 and occupies a central position above the table. The wrappers are fed to this mandrel from a point *W* at the right of the table. The cigarettes are deposited in a series of narrow compartments, (indicated by 3,) and a definite number are pushed therefrom by the gang of pushers 4 into a gathering and compressing receptacle 5, which is moved to the left to register with the mandrel and with the plunger 6, and then are pushed by the forward movement of the plunger into the mandrel, around which a wrapper is folded. The paste-reservoir (not shown in Fig. 1) is located above the table and at the left of the mandrel 1, and the ends of the packages are folded into laps at a point slightly in advance of the mandrel, the folders being so arranged as to operate simultaneously upon the forward end of a package at the mandrel and upon the rear end of the next forward package. The forward package is then moved backward by a spring-controlled pusher into abutment with the rear package, and then by the further advance of the plunger 6 both packages are moved forward till the advanced one is over an exit-guideway leading to an opening through the table, into which it is forced by a descending pusher. Several of these operations are carried on simultaneously.

The hollow mandrel or case and its mold or seat, (see Figs. 1, 4, 5, 6, 7, and 12 of the drawings.)—The hollow mandrel is conveniently made of thin smooth metal, as sheet-brass, and may be of any suitable shape in cross-section to produce packages of the desired form. Preferably its shape in cross-section is hexagonal, with its horizontal axis about twice the length of its vertical axis,

as seen in the drawings, since this will give a popular form of cigarette-package. The mandrel is fixed above the table *b* by the attachment of its rear end to standard 11 and forms an open-ended receptacle of uniform area throughout its length, which is preferably greater than that of the cigarettes. Located below the mandrel is a vertically-adjustable mold or mandrel-seat 12, whose bottom part corresponds in shape with the bottom part of the mandrel, and the mold is moved up and down by its connection to a slide 13 in ways formed in a bracket 14, attached to and projecting below the table *b*, the slide being operated through its connection by link 15 to rock-lever 16 on rock-shaft *k*, and the lever is rocked by the engagement of a cam-roller attached to its lower arm with a cam-groove formed in the left-hand face of wheel *c* on shaft *g*. Attached to the slide 13 and extending up through the central part of the mold 12 is an adjustable clamping-head 17, which is controlled partly by the slide and partly by a spring 18, seated in a recess in the slide and surrounding the stem of the clamping-head, the lower part of the stem projecting into a lower recess in the slide and being free to move vertically there in under the contraction and expansion of the spring, its upward movement being limited by the contact of boss 19 with the upper wall of the recess. The normal position of the clamping-head is slightly below the mandrel, so that the wrappers can be readily fed between them, and as the mold is moved upward the advancing head clamps the interposed wrapper against the bottom of the mandrel and prevents it from wrinkling or being displaced while the mold moves up to its seating position, the clamping-head then being received into a recess and forming a part of the bottom of the mold. By this operation the body of the wrapper is crimped around the lower half of the mandrel, while its opposite edges take the positions shown in dotted lines in Fig. 7. As the mold is moved down from its seating position the head retains its clamping position till the boss 19 contacts with the upper wall of its slot, when it also moves down to its normal position. The mold-block is provided with laterally-extended wings 20 and 21 and a yielding wrapper-edge-supporting wing 22, as seen in Figs. 5 and 6, for the purposes hereinafter described.

Wrapper-feeding and paste-applying devices, (see Figs. 1, 2, 3, 4, 5, 6, 7, 19, and 20.)—Wrappers of the desired size and shape may be fed to the machine by any suitable mechanism or by hand. It is preferred to use for this purpose a mechanism located at the right of Fig. 1, by which the individual wrappers *W* can be taken from the bottom of a pile and fed to the main machine by the feeding-rolls 23 and 24, (seen in Figs. 1 and 8,) which may be conveniently driven by a sprocket-chain 7, passing over sprocket-wheel 8 on

shaft *j* and over sprocket-wheel 9 on shaft of roller 23, the rollers 23 and 24 being connected by pillow-blocks in the usual manner and the roller 24 being driven from the lower roller-shaft by connecting-gears, as shown in Figs. 1 and 2. As a wrapper is fed through the rolls it is received in a slotted guideway 25, secured to the table *b* and in about the same plane with the upper face of the mold-block when in its lowest position, and a reciprocating sliding pusher 26 contacts with its rear edge and carries or feeds it through the guideway and over the mold 12 and clamping-head 17 and beneath the mandrel 1, as seen in Figs. 5 and 8, the feed-rolls being cut away centrally to permit the pusher to be behind the wrapper when it leaves the rolls. The pusher is attached to a slide 27, moving in ways on the table *b* and actuated by a pinion 28, in mesh with a rack 29 on the slide, as more fully described hereinafter.

Paste is applied to one edge of the wrapper before it is folded around the mandrel 1 and afterward to the ends of the wrapper, whereby the last end folds or laps of the package can be sealed or secured in place by the following-described devices: A paste-reservoir 30, located above the table and at the left of the mandrel 1 in Fig. 2, is provided with delivery-roll 31 on shaft 32, driven from driving-shaft *g* through connecting-belt 33 and pulleys 34 and 35. A taker and applying roll 36 is journaled in one end of rock-lever 37, which is pivoted near its middle to slide 38, while its other end is provided with a roll 39, pressed down upon a cam-surface 40 by a spring 41, arranged at its pivotal point, the cam-surface being shaped to properly control the movements of the roll 36. The slide 38 reciprocates in suitable ways in the table *b* and is actuated by its connection through link 42 with rock-lever 43 on rock-shaft *m*, this lever being rocked by its connection with cam-groove formed in the left-hand face of wheel *e* through a roller pivoted to the lever. The slide 38 is provided on one of its edges with a rack 44, meshing with a small pinion 45, fixed to larger pinion 28, before referred to, both pinions being arranged to rotate on stud 46, and pinion 28 meshes with rack 29 on slide 27, and thereby gives the desired reciprocation to the wrapper-pusher 26, which is attached to slide 27. The roller 36 is made in two operative sections, the longer of which applies the paste to one edge of the wrapper, while the shorter one applies paste to the upper end wrapper-folder. The free end of the roller 36 is provided with two gears 47 and 48, of which 47 meshes with rack 49 (see Fig. 5) and operates to positively rotate the roller as it applies paste to the under side of the end folder 50, by which it is afterward applied to the ends of the wrappers, as hereinafter described, while gear 48 meshes with gear 51, (see Fig. 20,) arranged to turn freely on delivery-roll shaft 32 and driven from gear 51^a, fixed to shaft 32 through a series of

intermediate meshing gears, and thereby causes the meeting peripheries of rollers 31 and 36 to rotate in opposite directions with a wiping action when in contact. The series of gears shown in Fig. 20 are for the purpose of giving the rollers 36 and 31 this relative rotation. The roller 36 after it has applied paste to the end folder 50 on its return movement contacts with the left-hand edge of the wrapper as it is supported on wing 22 of the mold-block in its upward movement, and in order to insure a proper paste-applying contact between the roller 36 and the edge of the wrapper without liability of jamming action its supporting-wing is yieldingly secured to the block in any suitable way, as by pivot 52 and spring 53.

Devices for folding wrappers around the hollow mandrel, (see Figs. 1, 2, 4, 5, 7, 8, 21, and 24.)—When the mandrel 1 has been seated in the mold 12, the opposite edges of the wrapper (shown in dotted lines in Fig. 7) are folded around the upper half of the mandrel simultaneously by the following devices, acting upon opposite sides of the mandrel. On the right-hand side is a two-part folder comprising parts 54 and 55, the operative end of 54 conforming in shape with the opposing wall of the mandrel and folding the wrapper against it, while the part 55 is arranged to slide upon the part 54 and fold the edge of the wrapper over and down upon the top wall of the mandrel. The two parts of the folder are connected together by a spring 56, one end of which is secured to part 55, while its opposite end is secured to part 54 through a pin 57, passing through a slot in part 55, the tension of the spring being such that when a moving force is applied to part 55 the two parts will move together or conjointly until part 54 contacts with the wall of the mandrel, when the part 55 will continue its forward movement independently to fold the extreme edge of the wrapper upon the top of the mandrel and will be returned to its normal position by the contraction of the spring as soon as the moving force will permit. This folder is arranged to reciprocate in ways 58, supported above the table *b* by any suitable means, and is actuated by rock-lever 59 on rock-shaft *o*, its upper arm being connected by link 60 to part 55, the lever being rocked by the connection of its lower arm with cam-groove formed in the right-hand face of wheel *i* on shaft *j*. The left-hand edge of the wrapper is folded over the upper part of the mandrel by the action of a roller 61, journaled in the ends of arms 62, which are pivoted to arm 63, which is in turn pivoted to bracket 14 and is actuated by rock-lever 64 on rock-shaft *k* through connecting-link 65, the lever being rocked by the connection of its lower arm with cam-groove formed in the right-hand face of wheel *d* on shaft *g*. A retaining-spring 66 holds the roller 61 in close contact with the surfaces over which it passes, and by its upward and outward movement it folds the edge of the

wrapper around the mandrel and carries its extreme pasted edge over the opposite edge, which has already been folded to and held in position by the part 55, which is provided with a series of thin projections 67 to prevent the paste on the overlapping edge from interference by contact with the folder 55 except at the thin projections 67, and as the part 55 is withdrawn the roller 61 moves still farther outward and forces the pasted edge of the wrapper down upon its opposite edge to form an overlapped pasted seam.

Mechanism for counting out the number of cigarettes for a package and feeding them into the mandrel and detaching the packages from the mandrel, (see Figs. 1, 2, 3, 4, 9, 11, 14, 15, 16, 17, and 18.)—The cigarettes are fed into the hopper 68 or other receptacle by hand or by any suitable devices, so that their lengths will conform to the shortest axis of the hopper, and they are supported at the exit of the hopper by being lightly clamped between the inner side of a door 69 when closed and the opposite wall, whereby the layer of clamped cigarettes will support the superimposed mass, and when the door is opened momentarily the desired number will fall into the space below, which opens into a series of cigarette-compartments 3, as seen in Figs. 2, 4, and 14. The hopper-door 69 is held in its closed position by a spring 70 and is opened by a rock-lever 71, fulcrumed at 72, and rocked by the contact with its lower end of an inclined-faced pusher 73, which is actuated by its connection with rock-lever 74 on rock-shaft *o*, the lever being rocked by the engagement of its lower arm with cam-groove in the left-hand face of wheel *h* on shaft *j*. Below the hopper is a case 75, divided by walls or partitions 76 into the series of compartments 3, into which the cigarettes are received. The front and rear walls of this case are cut away or made of such shape and extent as to expose the ends of the desired number of cigarettes for a package, and the partitions 76 are adjustable to increase the width of the compartments to facilitate the fall of the cigarettes therein and to decrease their width to bring the cigarettes together, so that the gang of pushers 4 can act upon them with precision. The walls of the compartments may be vertical or inclined at a greater or less angle, according to the shape in cross-section of the package to be formed and the hollow mandrel, which gives shape to the package. If the mandrel is of hexagonal shape, as shown in the drawings, or of somewhat similar shape, it is preferred to incline the walls to about the extent shown in Figs. 2 and 14, so that when the cigarettes of a package are pushed from the compartments into a receptacle they will be relatively so disposed that when gathered together the cigarettes of the different layers will easily form diagonal rows, as seen in Figs. 22 and 23, instead of vertical rows, as would be apt to be the case were the walls vertical. Where a

mandrel of substantially the shape shown in the drawings is used, it is also preferred to arrange the walls of case 75 so as to expose the ends of the cigarettes, as shown in Fig. 14, so that the end cigarettes of the middle layer will be disposed beyond the end cigarettes of the top and bottom layers and take their places in the extreme angles at the opposite sides of the mandrel. The bottom of the compartment-case is made up of a series of slides 79, to each of which is attached a single partition or wall in such position that the walls will be the desired distance apart, and each slide is connected to a cross-cleat 80 in any suitable manner to permit of their easy relative movement, as by a series of square blocks 81, fitted into a groove in the cleat, and pins 82, so that as one slide is moved forward or backward each one of the series except the last one will be moved simultaneously in the same direction, but to a less extent than the preceding one, and thereby the walls, fixed one to each slide, will be adjusted to decrease or increase the width of the compartments according as the movement of the slides is in a forward or backward direction. After the slides have been moved backward to adjust the compartment-walls to their greatest distance apart through the cleat connection they are then moved still farther in the same direction, so as to move the compartments while at their greatest width beneath the superimposed cigarettes in order that the cigarettes may fall into and completely fill each compartment, and to prevent the cigarettes from dropping into case 75 and outside of the compartments during this movement the forward and rear walls are provided with laterally-projecting flanges 77. When the slides are moved from their backward to their forward position, the compartment-walls are first adjusted through their cleat connection to decrease the width of the compartments, and the slides are then moved together to bring the compartments into registration with the gang of pushers 4. Preferably a recess or chamber 77^a, provided with a roof 77^b, inclined upwardly from the chamber-entrance, extends laterally from the cigarette-space between the hopper and the compartments, into which a number of cigarettes may freely enter as the compartments are moved back and forth, and thus any tendency of jamming above the compartments to interfere with the entrance of the cigarettes thereto is readily relieved or prevented. The two outside slides of the series are actuated by their connection through links 78 and 83 with rock-lever 84 on rock-shaft *p*, the lever being rocked by the engagement of its lower arm with cam-groove in right-hand face of wheel *h* on shaft *j*, while the intermediate slides are actuated through the cleat connection to an outside slide, as before explained. The link 78 is attached to its slide through a slot 86, formed therein, in such relation as not to move the slide while the partitions are be-

ing adjusted, which is done by the fixed connection of link 83 with its slide, the link 78 coöperating with link 83 only when all of the slides are moved backward or forward together.

It is observed that the slides 79 are arranged side by side to form when taken together a smooth, close, and even bottom of the case for the cigarettes and that each slide passes underneath and sufficiently beyond all of the compartment-walls or partitions, so that as the slides are reciprocated the smoothness and evenness of the bottom of the case will not be affected.

When the series of compartments have been filled with cigarettes and moved into alinement with the pushers 4, the exposed cigarettes 85 at the bottom of the compartments are pushed therefrom by the forward movement of the gang of pushers into the adjustable open-ended receptacle or carriage 5, in which they are gathered into a space conforming in size and shape to the mandrel 1, and the receptacle is moved into alinement with the mandrel. This receptacle is normally in front of the compartments 3 and is mounted upon a sliding piece 87, arranged to reciprocate in ways 88, and is provided with an adjustable side 89 to gather or compress the cigarettes laterally and an adjustable top 90, attached to arms 91, which are journaled to arms 92, secured to the sliding piece 87. A roller 93, journaled in the arms 91, contacts with a cam 94, attached to the table *b*, and forces the top 90 down to gather or compress the cigarettes vertically, a spring 95, between the roller 93 and the arms 91, operating to raise the top 90 when released from the cam. The side 89 is attached to a slide 96, which is actuated by its connection through link 97 with rock-lever 98 on rock-shaft *p*, this lever being rocked by the engagement of its lower arm with a cam-groove in the left-hand face of wheel *i* on shaft *j* and the slide 87 being moved forward by the contact of bent arm 99 with its rear end and backward by the contact of the side 89 with the wall of receptacle 5, this construction being especially shown in Figs. 17 and 18.

When receptacle 5, carrying the gathered cigarettes of a package, has been moved into alinement with the mandrel 1, pusher or plunger 6 moves forward from its normal position, as shown in Fig. 1, to that shown in Fig. 9 and passing through the receptacle pushes the cigarettes therefrom and forces them into the mandrel, around which a wrapper is folded, with its forward end projecting sufficiently to form the end laps of the package. The plunger then recedes to permit the receptacle 5 to return to its normal position in register with the compartments 3 and then again advances to the mandrel. During this backward-and-forward movement of the plunger folders operate to form necessary laps on the forward end of the package at the mandrel and on the rear end of a preced-

ing package simultaneously; these partly-completed packages when in their end-folding positions being indicated by 102 and 103 in Figs. 9 and 12. As the plunger continues its advance it passes through the mandrel and forces package 102 therefrom and into its rear-end-folding position and at the same time pushes the now completed package 103, whose rear end has been moved into abutting contact with the forward end of package 102 by means hereinafter described, into its expelling position, as shown in Figs. 10 and 11, and again returns to its starting position. This plunger is attached to slide 104 in ways 105 in table *b* and is reciprocated by a pinion 106, (see Fig. 1,) arranged to rotate on stud 107 and meshing with rack 108 on the edge of the slide, this pinion being fixed to and driven by a smaller pinion 109 on the same stud, which in turn is rotated by its intermeshing rack 110 on cross-slide 111, which is reciprocated by its connection through link 112 with rock-lever 113 on rock-shaft *m*, the lever being rocked by its engagement through a cam-roller with a cam-groove in right-hand face of wheel *c* on shaft *g*, the groove being shaped to give the plunger a forward movement from its normal position (shown in Fig. 1) to that shown in Fig. 9 and then back to its normal position and then immediately forward again to the position shown in Fig. 11 and then back to its starting or normal position. The gang of pushers 4 is attached to the plunger-slide 104 in such position that as the plunger is advanced from the position shown in Fig. 10 to that shown in Fig. 11 the pushers will enter the compartments 3 and push the cigarettes into the receptacle 5. (See Figs. 1, 2, 4, 9, and 11.)

Devices for folding the ends of the packages, (see Figs. 1, 2, 4, 8, 9, 12, 13, and 21 to 29.)—The wrapper ends of two packages are folded or tucked to form laps when the packages are in the positions of 102 and 103 of Figs. 9 and 12, the rear end of a forward package and the forward end of a rear package being folded simultaneously. For this purpose there is a set of upper folders consisting of two side folders arranged to operate upon opposite sides of two contiguous packages to form upper side laps, as 114 of Fig. 29, and similar laps on a contiguous package, and a top folder 50, which operates to form central upper end laps, as 115 of Fig. 29, on two contiguous packages and to apply paste to those parts of the wrappers which form the final central end laps as 116; also a set of three lower folders of similar construction and operation. Referring to Figs. 21 to 26, inclusive, it is seen that each upper side folder is composed of two thin strips or blades of metal or other suitable material 117, secured to a cross-piece 118, and a central thin strip with an extended operative blade 119, also secured to piece 118 and arranged to operate upon the ends of the wrappers slightly in advance of the operative ends of the blades

117 to press the ends of the wrappers inwardly and prevent the paper from wrinkling or kinking, and thus avoid the tendency to form creases in the wrong places. One of these
 5 folders is secured (preferably adjustably) to the ends of each of two levers 120, which are pivoted at their opposite ends to bracket 121, fixed to table *b*, and in ways 122 in the bracket is a slide 123, to which is fixed an inverted-
 10 U-shaped piece, to whose arms are pivoted links 124, which are also pivoted to the levers 120 about midway of their length, the levers being arranged to cross each other between their pivoted points, as shown in Figs. 2 and
 15 8, and the link connection between the levers and the U-shaped piece being such that the folders move rapidly from the position shown in Fig. 2 toward that shown in Fig. 8 and then move more slowly in the act of folding.
 20 The top folder 50, composed of two plain folding-surfaces 125, connected by a central bottom bar, whose lower projecting surface forms a paste-applying face 126, to which paste has been applied, as before described,
 25 is also fixed to the slide 123 in such relation to the side folders that it operates to make laps 115 on two contiguous packages slightly after the side folders have made laps 114 and moves down far enough to apply paste to the
 30 inner edges of the wrappers, which are to form the final bottom laps of the packages, the position of the folders during the different stages of the folding being shown in Figs. 21 to 26, inclusive. The slide 123 is reciprocated
 35 vertically by its connection through bent link 127 with rock-lever 128 on rock-shaft *l*, and the lever is rocked by the engagement of a cam-roller secured thereto with a cam-groove in the right-hand face of wheel *e* on shaft *g*.
 40 The lower end package-folders are so similar in construction, arrangement, and operation to the upper folders that only their differences need be described. The lower side folders 129 omit the central starting-folders
 45 119 of the upper folders, and the final end folder 130 omits the paste-applying face 126 of the folder 50, but operates in connection with lap-retaining fingers or blades 131 and 132, Figs. 12 and 13, which press against the
 50 laps as the folder 130 withdraws. The folders are operated by a slide 133, moving in ways in bracket 134, projecting below the table *b*, the levers 135, Figs. 2 and 8, carrying the side folders, being pivoted to the bracket
 55 and also pivoted to links 136, which in turn are pivoted to the arms of a U-shaped piece 137, which is fixed to the slide, while folder 130 is attached directly to the slide which is reciprocated vertically by its connection
 60 through link 138 with rock-lever 139 on rock-shaft *l*, the lever being rocked by the engagement of its cam-roller with a cam-groove in the left-hand face of a wheel *d* on shaft *g*. The construction and operation of the lap-retain-
 65 ing fingers or blades 131 and 132 in connection with the folder 130 are shown in Figs. 12 and 13, in which the blades are mounted

upon a flange 140 of a supplemental slide 141, connected to the main slide 133 by a screw or
 pin passing through a slot 142, formed there- 70
 in, and also connected to the bracket 134 through an overlapping piece 143, forced into frictional contact by a spring 144 on a screw 145, tapped into the supplemental slide, so
 75 that the main slide which carries folder 130 can have a movement independent of the slide which carries the retaining-blades until the connecting-pin 146 is brought into contact with the upper or lower wall of the slot,
 80 when both slides will move conjointly or together. One or both of the retaining-blades may be pivotally secured and controlled by a spring, as 147, so that they will be brought
 into contact with the laps as soon as the with- 85
 drawal of the folder will permit and will hold the laps in place till the adjacent ends of the folded packages are brought into abuttal to seal the laps in place.

It is observed that the end side folders and the top folder 50 of the upper set are attached 90
 to and operated by the same slide 123, the former being connected thereto through the crossed pivoted levers 120 and pivoted links 124, while the top folder 50 is attached to the
 slide directly. This arrangement gives to the 95
 side folders as the slide is moved toward the packages a more rapid movement than to folder 50, so that the side laps are substantially formed before the top laps are com-
 menced; but as the links 124 assume a posi- 100
 tion nearly at right angles to the line of movement of the slide the side folders remain substantially stationary and hold their laps in
 place, while the folder 50 passes down to fold 105
 its laps over the blades 117 of the side folders and apply paste to ends of the wrappers, as seen in Figs. 25 and 26, when the folders re-
 tire in the reverse order of their approach. Substantially the same arrangement and op- 110
 eration, except the application of paste, pertains to the lower set of folders.

Devices for sealing the end laps and expelling the finished packages, (see Figs. 1, 3, 4, 9, 10, 11, 12, and 13.)—While the adjacent ends
 of two contiguous packages are being folded, 115
 as described, the rear package, as 102, is held or supported by the mandrel 1 and the forward package, as 103, is supported in an open-ended box or case 148, provided with a
 clamping-top 149, which holds the package 120
 firmly during the folding. As soon as the folding is completed and the retaining-blades are in contact with the laps the clamping-
 top 149 is slightly lifted and the forward pack- 125
 age 103 is pushed toward the rear package 102 by a pusher 150, operating against its forward end, and it is thereby moved from the
 position shown in Fig. 9 to that shown in Fig. 10, where the adjacent folded ends of 130
 the packages are in abutting contact, and when in this position the plunger 6 and the pusher 150 recede till the forward package is
 moved over the expelling-guideway 151 in the table *b* and the rear one into the case 148 in

position for the folding of its rear end, and the final pasted laps of each package are sealed in place by the continued abutting pressure. The top 149 is operated to clamp and unclamp the package by its connection with rod 152, which passes freely through an eye in bracket 121 and through the joint 153, connecting link 127 to slide 123, which actuates the upper end folders, the top of the rod being provided with a lifting nut or boss 154 and its lower part with an expansion-spring 155, interposed between the top 149 and the fixed bracket. When the joint 153, under its cam connection, is raised against the boss 154, the clamping-top 149, to which the rod is fixed, is also raised from the package, as shown in Figs. 4 and 13; but otherwise the top is forced down by the spring upon the package and clamps it in the case. The pusher 150 is mounted upon a rack 156, arranged to reciprocate in ways in the table *b*, and is actuated by pinion 157, arranged to rotate on stud 158 and meshing with the rack and driven through smaller pinion 159, arranged on same stud and fixed to pinion 157 to rotate therewith, pinion 159 being rotated by its intermesh with cross-rack 160, which is also reciprocated in ways below the table by its connection through link 161 with rock-lever 162 on rock-shaft *m*, the lever being rocked by the engagement of its cam-roller with a cam-groove in the right-hand face of wheel *f* on shaft *g*. This pusher is preferably adjustably and yieldingly mounted by means of screw 163 and springs 164, operating upon opposite sides of its carrying-block 165, as seen in Fig. 1. The forward package when pushed out of case 148 by the contact therewith of the forward-moving rear package is held over the guideway 151 by the clamping action of the rear package and the pusher 150 and when in this position is pushed from between its clamps into the guideway by a downward-moving pusher 166, arranged to reciprocate vertically in ways in a bracket 167, fixed to table *b* and actuated by its connection through link 168 with rock-lever 169 on rock-shaft *l*, the lever being rocked by the engagement of its cam-roller with a cam-groove in the left-hand face of wheel *f* on shaft *g*. Coöperating with the pusher 166 is an end-package-lap retainer 170, which is so connected with the pusher that it is stationary and rests against the laps of the rear package to hold them in place while the pusher rises from its expelling position. This retainer is connected to bracket 167 by screws 171, passing through slots in the retainer and tapped into the bracket, and is frictionally held thereto by springs 172, and is actuated by a pin 173, fixed to the pusher-shaft 174 and moving freely in a slot in the bracket and the retainer, as seen in Fig. 4, so that when the pin contacts with the upper or lower wall of the retainer-slot the retainer is raised or lowered with the pusher, but remains stationary when the pin is out of such contact,

the position of the slot and the operative faces of the pusher and retainer being so related that when the pusher forces the package into the guideway 151 the retainer moves with it in contact with the end of the rear package, and when the pusher rises the retainer remains stationary against the laps of the rear package till the contact of the pin 173 with the upper wall of its slot compels it to rise above the end of case 148. The downward movement of the pusher need only be sufficient to force the package below the end of case 148, as the packages can be forced down the guideway 151 by the pressure of the following packages and when dropped through the opening in the table *b* may be received upon an endless belt or carried from the machine by any other convenient means.

The operation of the several groups of mechanisms or devices, as well as of the individual devices of such groups, has been so fully described in connection with their construction that it is considered that the operation of the machine as an entirety will be fully understood without further explanation. It is evident that the various operative devices are so timed through their connections with the means by which they are actuated that they will perform their work in proper succession and at the proper times, so as not to interfere with each other. It is also evident that the number of cigarettes in the packages, as well as the shape of the packages, may be varied by increasing or decreasing the lateral area and shape of the hollow mandrel and correspondingly varying the size and shape of the area of the exposed cigarettes in the compartments and their expelling-pushers and by making such other apparent changes as shall adapt the devices to operate upon a greater or less number of cigarettes or upon those of greater or less dimensions. It is also apparent that the construction and arrangement of the operative parts of the machine herein described and shown in the drawings may be changed in many particulars without departing from the principle of the invention.

What is claimed as new is—

1. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a hollow mandrel, devices for folding a package-wrapper around the mandrel, devices for separating from a mass of cigarettes the desired number for a package, devices for gathering the separated cigarettes into shape in cross-section to conform to the mandrel, devices for bringing the cigarettes into alignment with the mandrel, devices for inserting them into the mandrel, devices for folding one end of the wrapper to form end laps of the package, devices for removing the partly-completed package from the mandrel and devices for forming end laps upon the opposite end of the package.

2. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a mandrel, as 1, devices for sup-

porting a wrapper and folding it around the mandrel and devices for forming laps upon the ends of the packages, of a delivery-roller, as 31, a taker and applying roller, as 36, a lever, as 37, on one end of which is mounted the roller 36, a central end-lap folder, as 50, and means for moving the lever to carry the roller 36 into contact with the folder 50 to apply paste thereto and thence into contact with one edge of the wrapper while resting on its support and thence back to the delivery-roller.

3. In a machine for forming sealed packages of cigarettes, the combination substantially as set forth, of a paste-delivery roller, as 31, a gear-wheel, as 51, means to rotate such wheel in a direction opposite to the rotation of the roller 31, a paste-applying roller, as 36, a fixed rack, as 49, two gear-wheels, as 47 and 48, fixed to the shaft of roller 36, the wheel 47 being arranged to mesh with rack 49 and wheel 48 to mesh with gear-wheel 51, for the purpose set forth.

4. In a machine for forming cigarette-packages, the combination substantially as set forth, with a paste-delivery roller, as 31, and a paste-taker roller, as 36, of a gear, as 48, fixed to the taker-roller, a loose gear, as 51, on shaft of delivery-roller, a fixed gear, as 51^a, on same shaft, and a series of intermediate meshing gears, whereby the peripheries of the taker and delivery rollers when in contact will move in opposite directions with a wiping action.

5. In a machine for forming sealed packages of cigarettes, the combination substantially as set forth, with devices for applying paste to one edge of the package-wrapper, including a paste-applying roller, as 36, and devices for folding the wrapper around a mandrel, including a vertically reciprocating mold, as 12, of a yielding wrapper-edge support, as 22, whereby, when the paste-roller is brought in contact with the edge of the wrapper as it moves upward on its support, the support will yield sufficiently to obviate any liability of jamming action.

6. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a mandrel, as 1, a mold, as 12, and means for moving the mold to the mandrel, of a wrapper-edge support, as 22, and devices for yieldingly attaching the support to the mold.

7. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a mandrel, as 1, a mold, as 12, and means for moving the mold to the mandrel, of a wrapper-edge support, as 22, a pivot, as 52, and a spring, as 53, for the purpose set forth.

8. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a mandrel, as 1, and devices for folding a pasted wrapper around the mandrel to form an overlapped pasted seam, of a folder, as 55, having a series of projections,

as 67, arranged near its operative end, for the purpose set forth.

9. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a hopper or other cigarette-receptacle, a series of walls or partitions arranged to form narrow compartments below the hopper and means for moving the compartment-walls beneath the hopper, of a laterally-extended chamber or recess, as 77^a, into which the cigarettes may freely enter to prevent crowding or jamming between the hopper and the entrance to the compartments.

10. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a hopper or other cigarette-receptacle, a series of walls or partitions arranged to form narrow compartments below the hopper, and means for moving the compartment-walls beneath the hopper, of a laterally-extended chamber or recess, as 77^a, provided with an upwardly-extended roof, as 77^b, into which the cigarettes may freely enter, substantially as and for the purpose set forth.

11. In a machine for forming packages of cigarettes, the combination substantially as set forth, with devices, and as a part thereof, for counting out or separating from a mass the desired number of cigarettes for a package, of a series of inclined walls or partitions, as 76, forming a series of narrow compartments, as 3, whereby when the cigarettes are pushed from the compartments thus formed different layers can be readily arranged in diagonal rows and be adapted to form hexagonal packages.

12. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a hexagonal mandrel, as 1, inclined walls or partitions arranged to form a series of narrow compartments, as 3, means for filling the compartments with cigarettes, means for expelling from the compartments the desired number of cigarettes for a package, means for gathering the cigarettes into a shape in cross-section to conform substantially with that of the mandrel and means for inserting them into the mandrel.

13. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a mandrel, as 1, devices for counting out the desired number of cigarettes for a package, a receptacle, as 5, means for inserting the cigarettes of a package into the receptacle, means for adjusting the walls of the receptacle to gather the cigarettes into shape in cross-section to conform to that of the mandrel, devices for moving the receptacle into registration with the mandrel and devices for removing the cigarettes from the receptacle and inserting them into the mandrel.

14. In a mechanism for counting out the desired number of cigarettes for a package, the combination substantially as set forth, of a series of walls or partitions forming narrow

compartments, as 3, a series of slides, as 79, each slide carrying a wall of one of the compartments and passing beneath all of such walls and the slides together forming a close, smooth and even bottom of the case, and devices for reciprocating the different slides to different extents, for the purpose of adjusting the compartment-walls relatively to each other to increase and diminish the width of the compartments.

15. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a series of slides, as 79, a series of compartment-walls secured one to each slide, devices for reciprocating the different slides to different extents, to adjust the compartment-walls relatively to each other, and devices for reciprocating the adjusted walls to the same extent to facilitate the entrance of the cigarettes into the compartments.

16. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a series of slides, as 79, a series of compartment-walls secured one to each slide, a cleat or bar, as 80, pivotally attached to each slide, and devices for reciprocating one of the outside slides of the series, for the purpose set forth.

17. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a series of slides, as 79, a series of compartment-walls secured one to each slide, a cleat or bar, as 80, pivotally attached to each slide, a link, as 83, secured to one of the outside slides of the series, a link, as 78, secured in a slot in the other outside slide of the series and means for reciprocating the links, for the purposes set forth.

18. In a package-forming machine, the combination substantially as set forth, with devices for supporting two contiguous packages with the forward end of one adjacent the rear end of the other, of a folder adapted to be moved between the two packages to fold one part of each, and means for moving the folder.

19. A package-folder comprising two end blades, as 117, and an intermediate blade, as 119, substantially as and for the purpose set forth.

20. In a package-forming machine, the combination substantially as set forth, of two folders, each comprising two end blades, as 117, and an intermediate blade, as 119, and means for moving the folders in opposite directions between the ends of two contiguous packages, for the purpose set forth.

21. In a package-forming machine, the combination substantially as set forth, of a package-folder and paste-applier, as 50, comprising two folding-surfaces, as 125, and a paste-applying face, as 126, adapted to be moved between the ends of two contiguous packages to form laps thereon and apply paste to the ends of the wrappers, and means for moving the folder.

22. In a machine for forming packages of cigarettes, the combination substantially as

set forth, with devices, and as a part thereof, for folding the ends of a package to form laps, of a central end folder, as 50, provided with a paste-applying face, as 126, and devices for applying paste thereto and means for operating the folder, whereby it will form central end laps, as 115, and apply paste to the ends of the wrappers to seal the final laps in place.

23. In a machine for forming packages of cigarettes, the combination substantially as set forth, of two levers pivoted at one of their ends to fixed points of the machine and carrying upon their opposite ends folders for forming end side laps, as 114, a reciprocating slide, and links pivoted at one end to the slide and at the other to the levers between the folders and fixed pivotal point, whereby the folders will momentarily remain substantially stationary when they have completed their laps, for the purpose set forth.

24. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a reciprocating slide, two levers pivoted at one of their ends to fixed points and carrying upon their opposite ends side folders, and links pivoted at one end to the slide and at the other to the levers between the folders and the fixed pivotal points, of an end central folder attached directly to the slide, whereby as the slide is moved toward the package the side folders operate to form laps, as 114, and then momentarily remain substantially stationary while the central folder forms overlapping central laps, as 115 or 116, and recedes.

25. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a reciprocating slide, two levers pivotally attached to fixed points and carrying upon their free ends side folders, and link connections of the levers to the slide, of a central top folder, as 50, secured to the slide and provided with a paste-applying face, as 126, whereby side laps, as 114, are first formed and then top laps, as 115, and paste is applied to the parts of the wrappers which form the final laps of the package.

26. In a machine for forming packages of cigarettes, the combination substantially as set forth, with devices for forming laps upon the adjacent ends of two contiguous packages simultaneously, of devices for holding or retaining the laps in place as the folding devices are withdrawn.

27. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a folder constructed and operating to form the final laps on the adjacent ends of two contiguous packages simultaneously, of retaining fingers or blades, as 131 and 132, constructed and operating to bear against the laps of the package as the folder is withdrawn.

28. In a machine for forming packages of cigarettes, the combination substantially as set forth, with a folder constructed and operating to form the final laps on the adjacent

ends of two contiguous packages simultaneously and a reciprocating slide by which the folder is operated, of retaining blades or fingers, as 131 and 132, attached to the slide
5 and means for giving the folder and the retaining-blades conjoint and independent movements, for the purposes set forth.

29. In a machine for forming packages of cigarettes, the combination substantially as
10 set forth, of devices for holding the adjacent end laps of two contiguous packages in place, and means for moving the packages toward each other to bring their adjacent ends into abutting contact and means for operating the
15 holding devices.

30. In a machine for forming packages of cigarettes, the combination substantially as set forth, with devices for forming laps on the adjacent ends of two contiguous packages simultaneously and devices for moving the adjacent folded ends of two packages into abutting contact, of means for simultaneously advancing both packages to bring the rear one into its rear end folding position for the purpose set forth.
25

31. In a machine for forming packages of cigarettes, the combination substantially as set forth, of a pusher, as 150, constructed and

arranged to operate against the forward end of a package to push its folded rear end into
30 abutting contact with the forward folded end of a rear package, and a plunger, as 6, arranged to operate against the unfolded rear end of the rear package to push the two packages forward while in abutting contact, and
35 means for operating the pusher and plunger, for the purpose set forth.

32. In a machine for forming packages of cigarettes, the combination substantially as set forth, with means for holding a completed
40 package in its expelling position with one of its ends in abutting contact with the end of a contiguous package, of a pusher, as 166, and a lap-retainer, as 170, and means for giving the pusher and retainer conjoint and
45 independent movements, whereby, when the completed package has been pushed out of contact with its contiguous package, the retainer will remain stationary against the laps of the contiguous package while the pusher
50 recedes, for the purpose set forth.

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