

(No Model.)

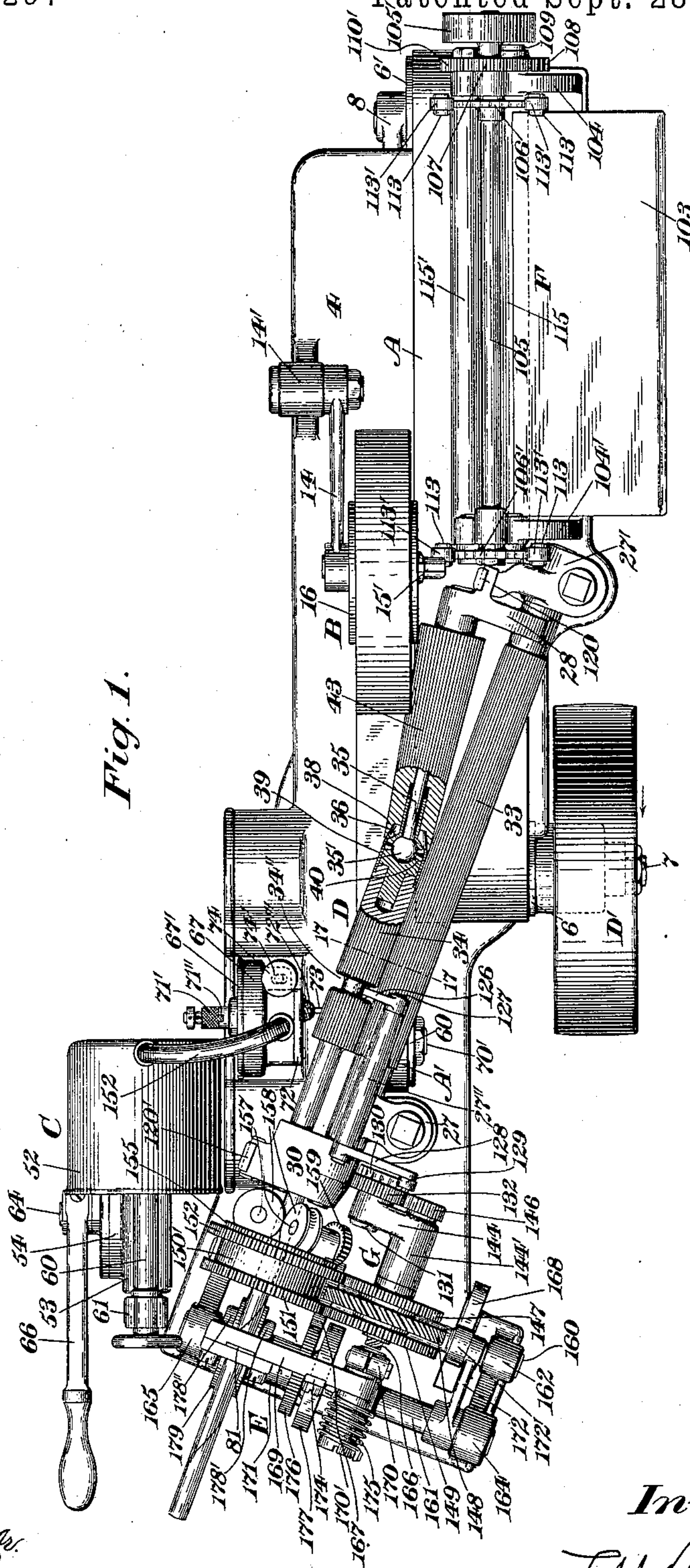
10 Sheets—Sheet 1.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.

Fig. 1.



Witnesses:  
J. L. Edwards Jr.  
Fred. J. Dole.

Inventor:  
F. H. Richards.

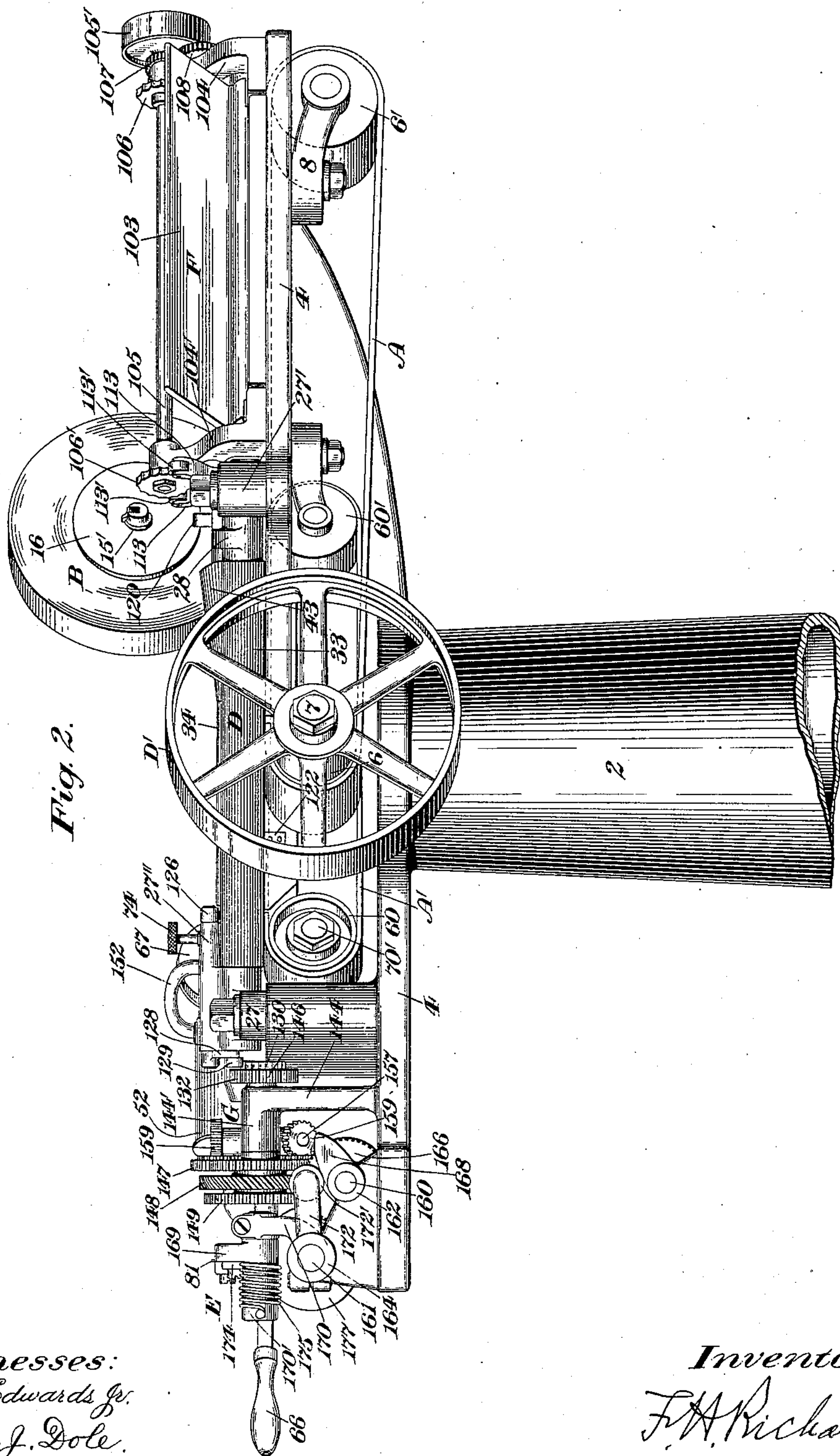
(No Model.)

10 Sheets—Sheet 2.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:  
 H. L. Edwards Jr.  
 Fred. J. Dole.

*Inventor:*  
F. A. Richards.



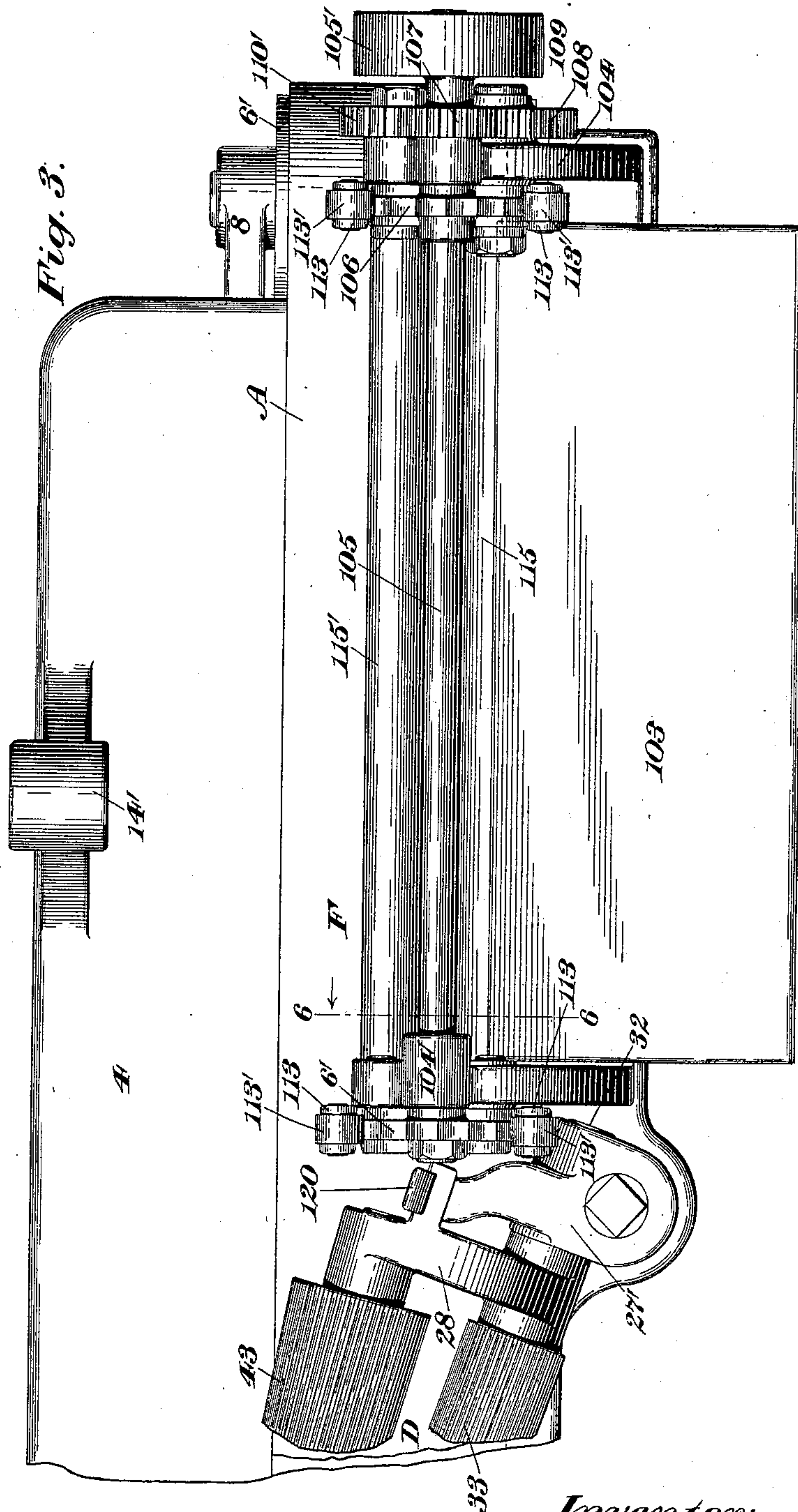
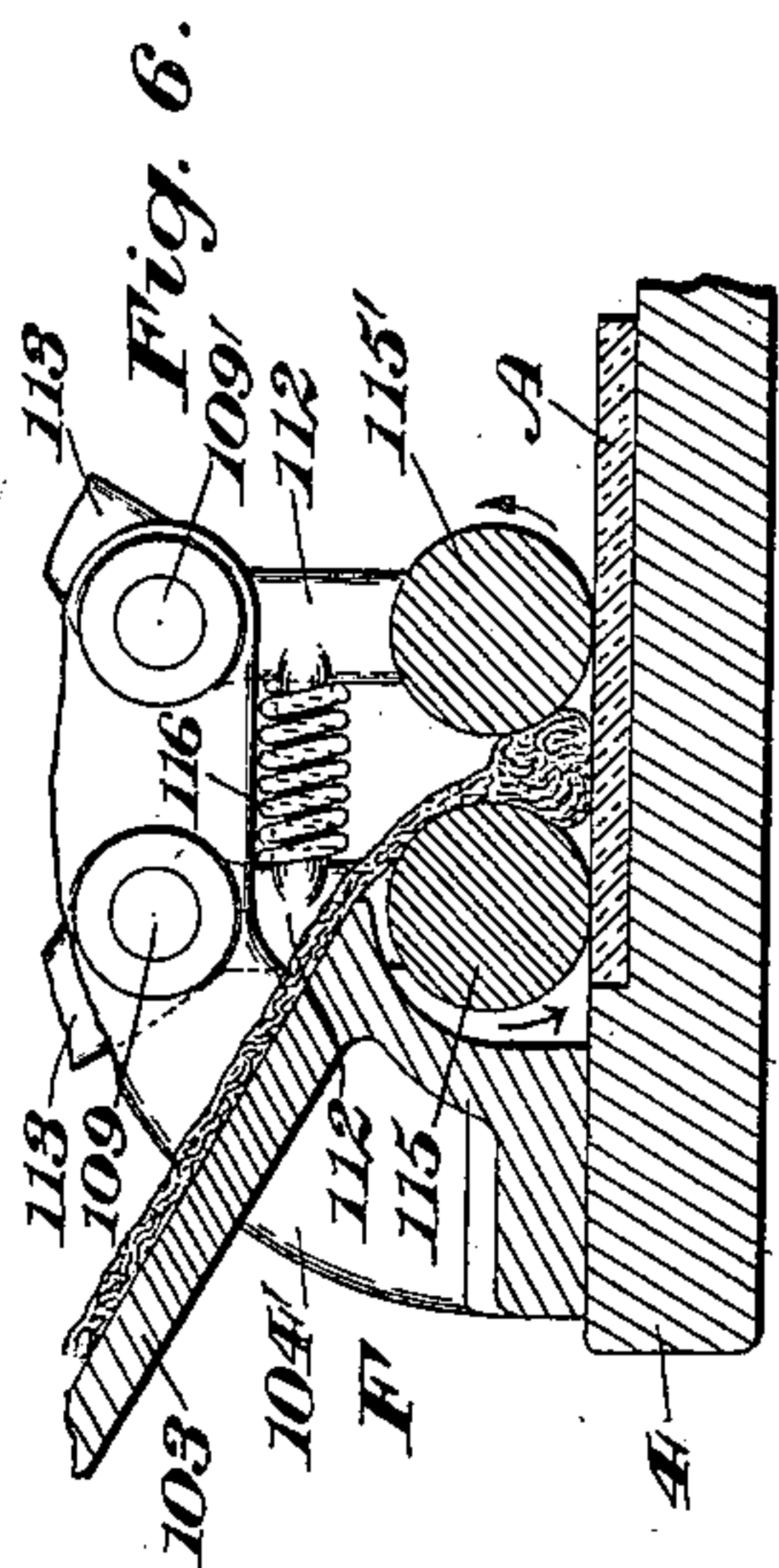
(No Model.)

10 Sheets—Sheet 3.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:  
H. L. Edwards Jr.  
Fred. J. Dole.

Inventor:  
F. H. Richards.

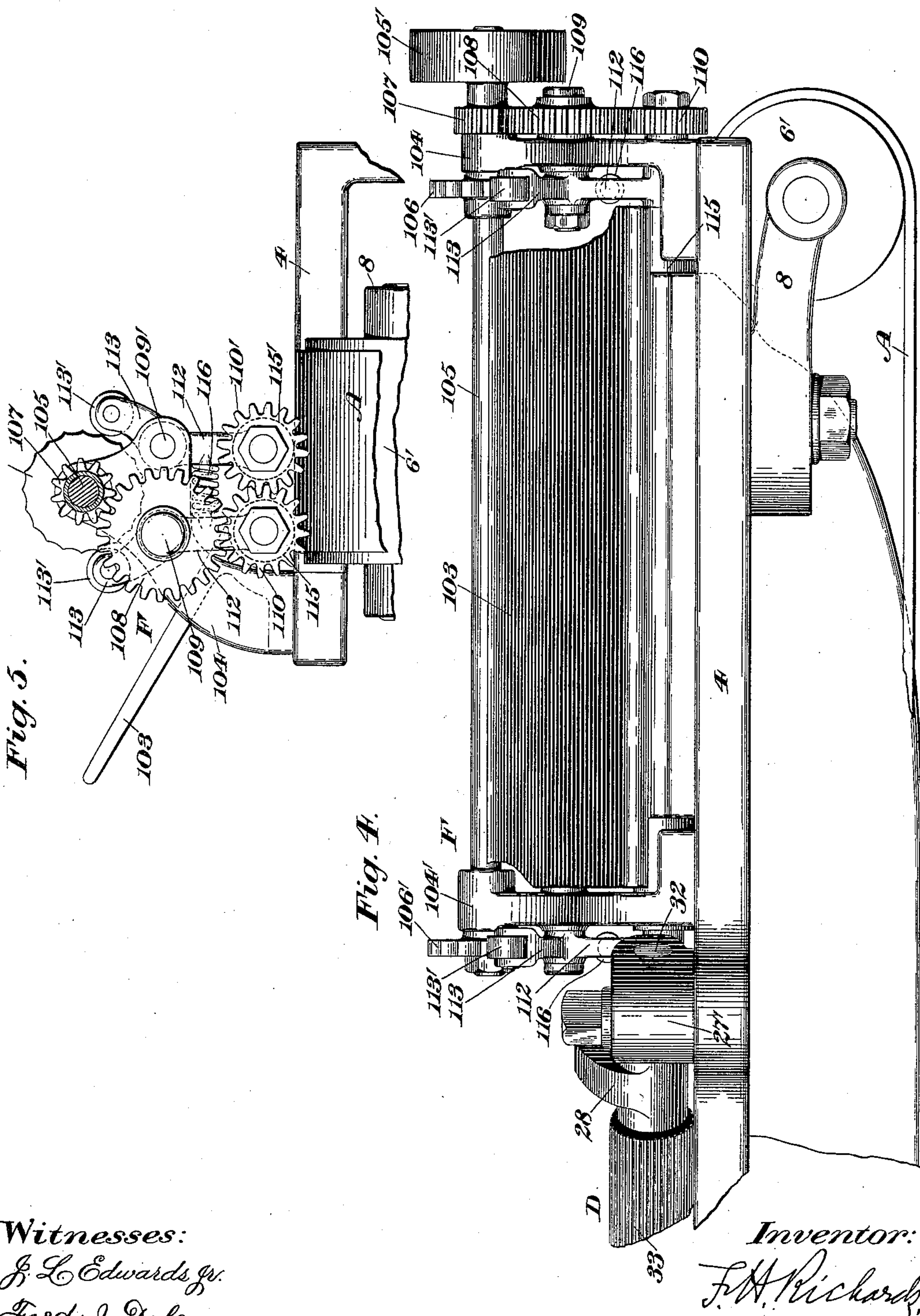
(No Model.)

10 Sheets—Sheet 4.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:  
J. L. Edwards Jr.  
Fred. J. Gole.

Inventor:  
F. H. Richards.



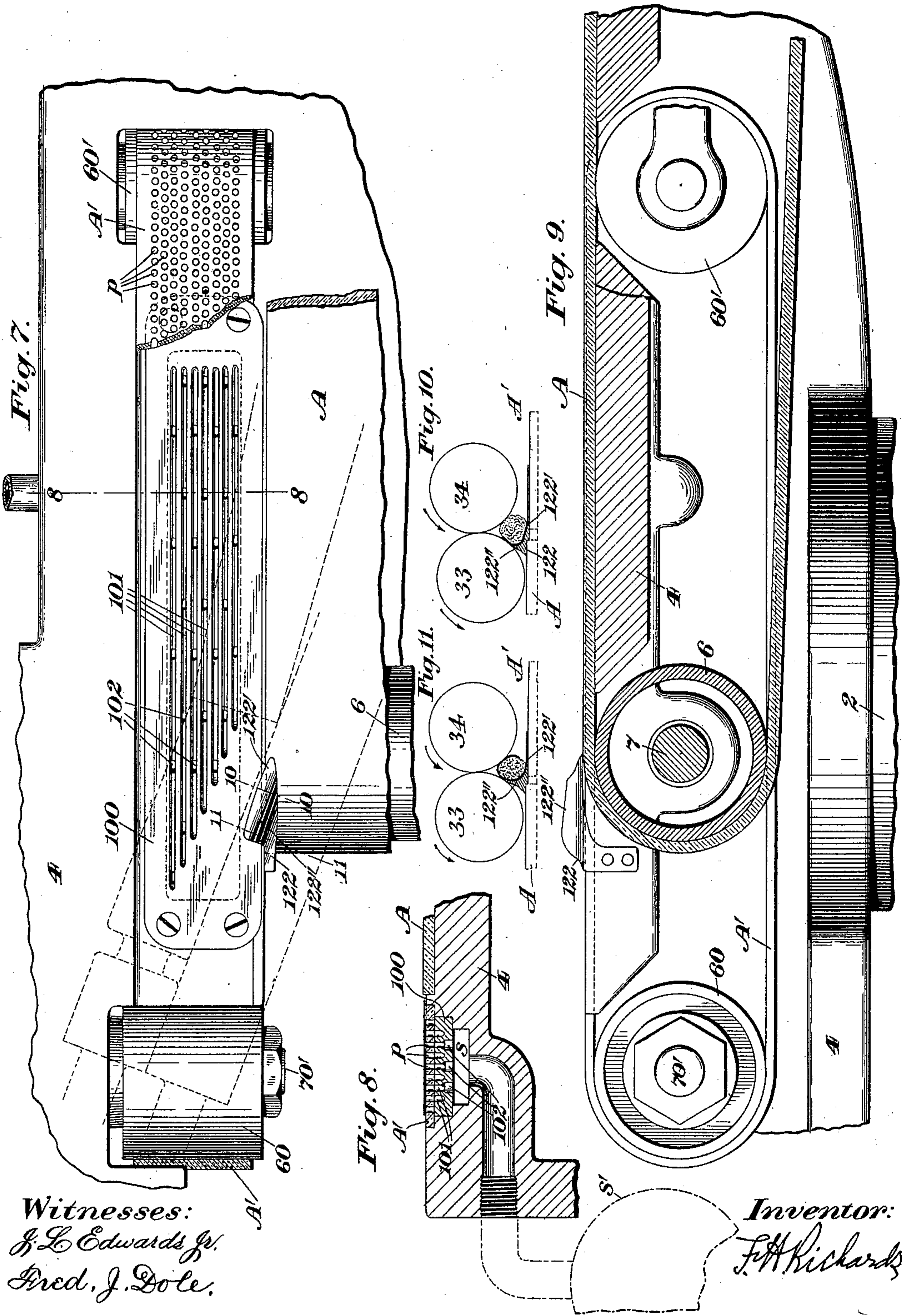
(No Model.)

10 Sheets—Sheet 5.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:  
J. L. Edwards Jr.  
Fred. J. Dole.

Inventor:  
F. H. Richards.

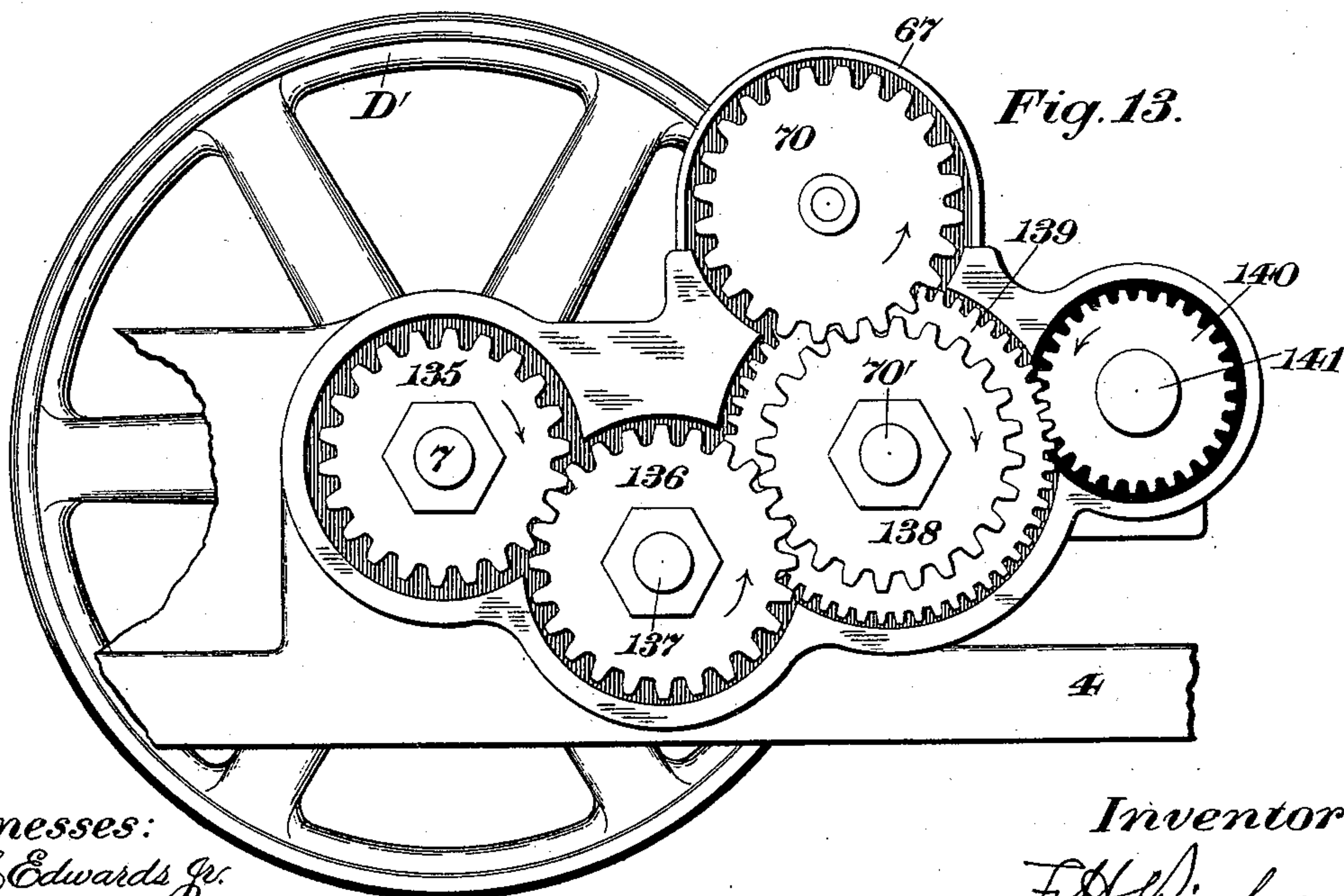
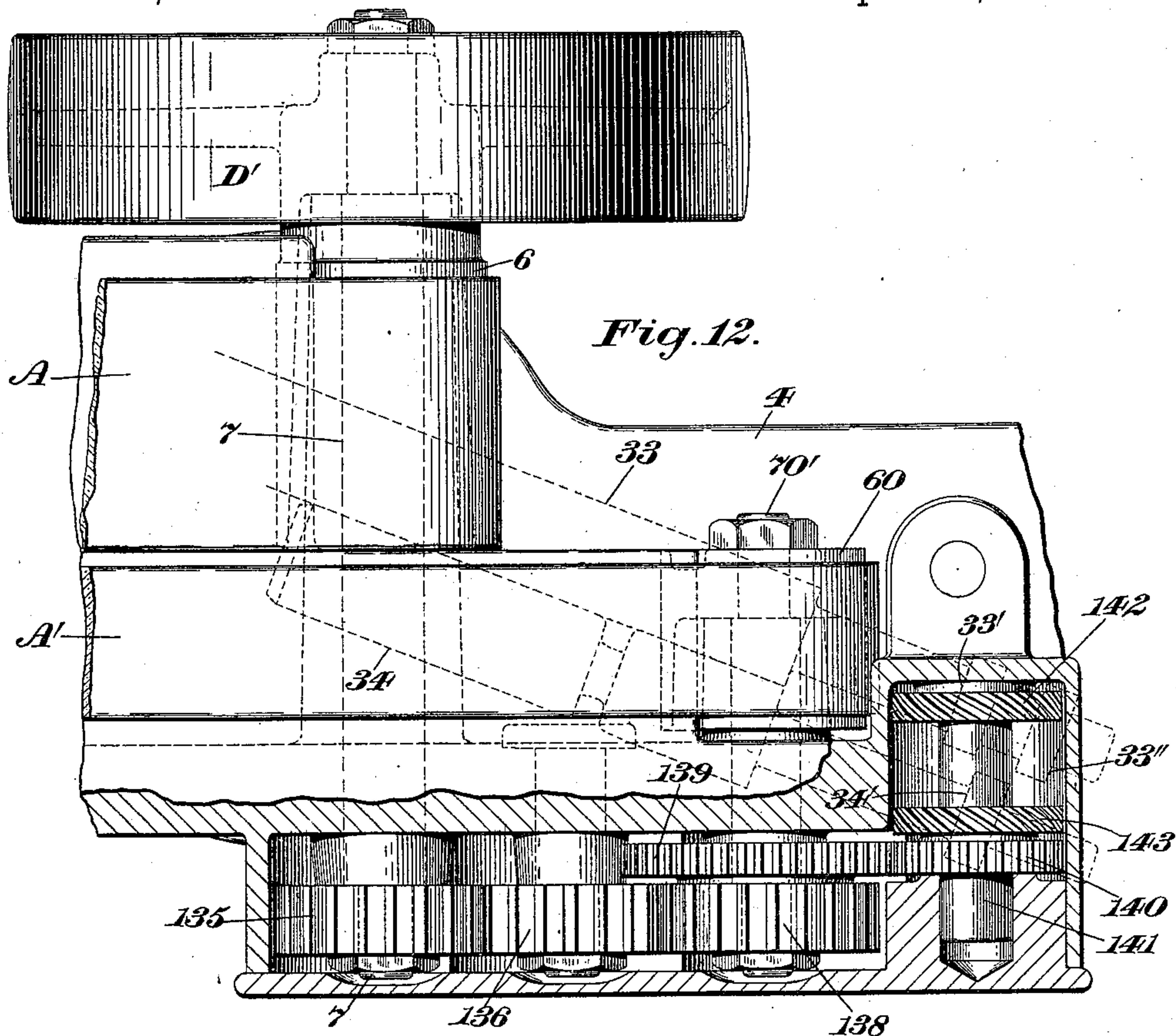
(No Model.)

10 Sheets—Sheet 6.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:

J. L. Edwards Jr.  
Fred. J. Dole.

Inventor:

F. H. Richards.



(No Model.)

10 Sheets—Sheet 7.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897

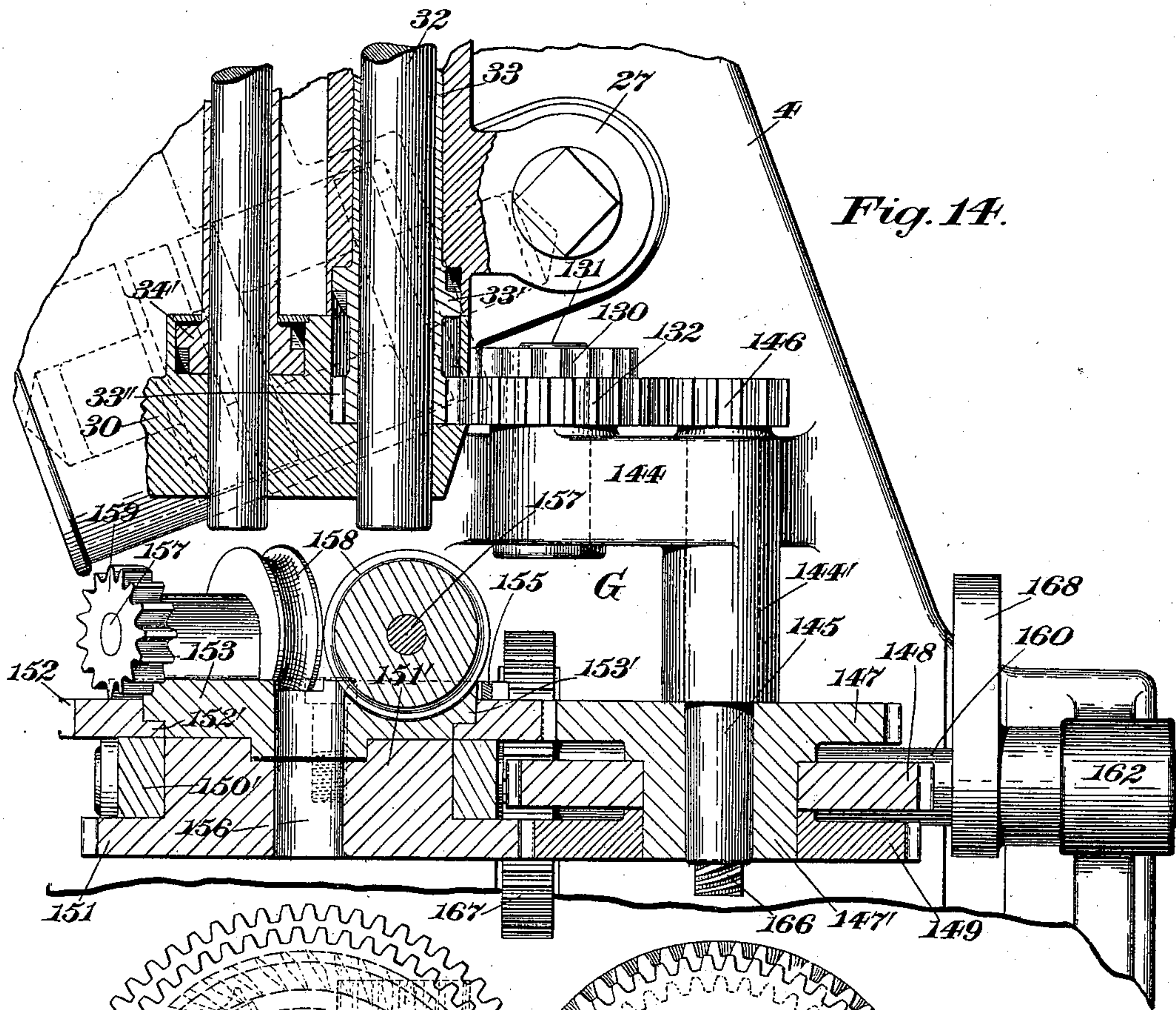


Fig. 14.

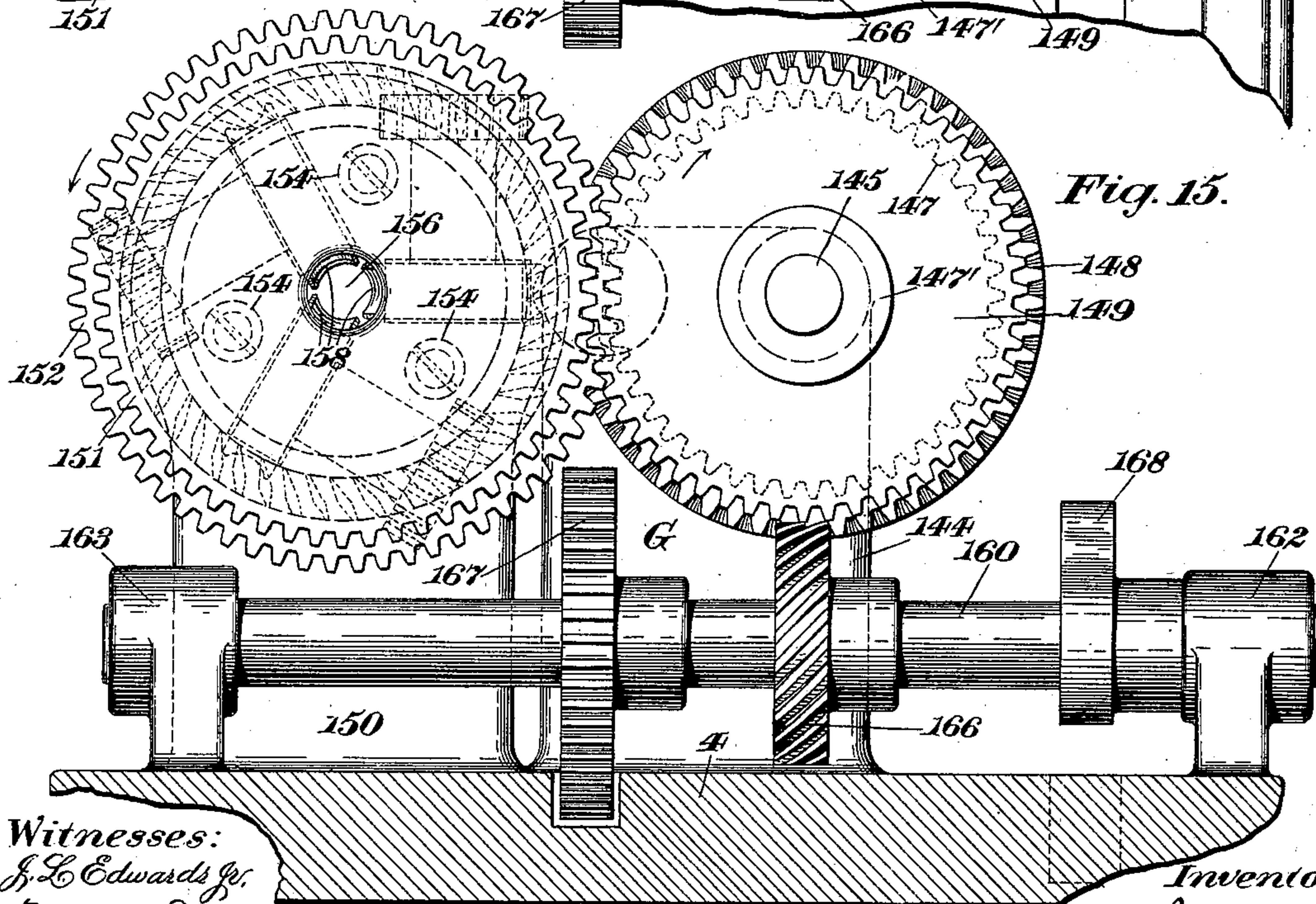


Fig. 15.

Witnesses:  
J. L. Edwards Jr.  
Fred. J. Dole.

Inventor:  
F. H. Richards.



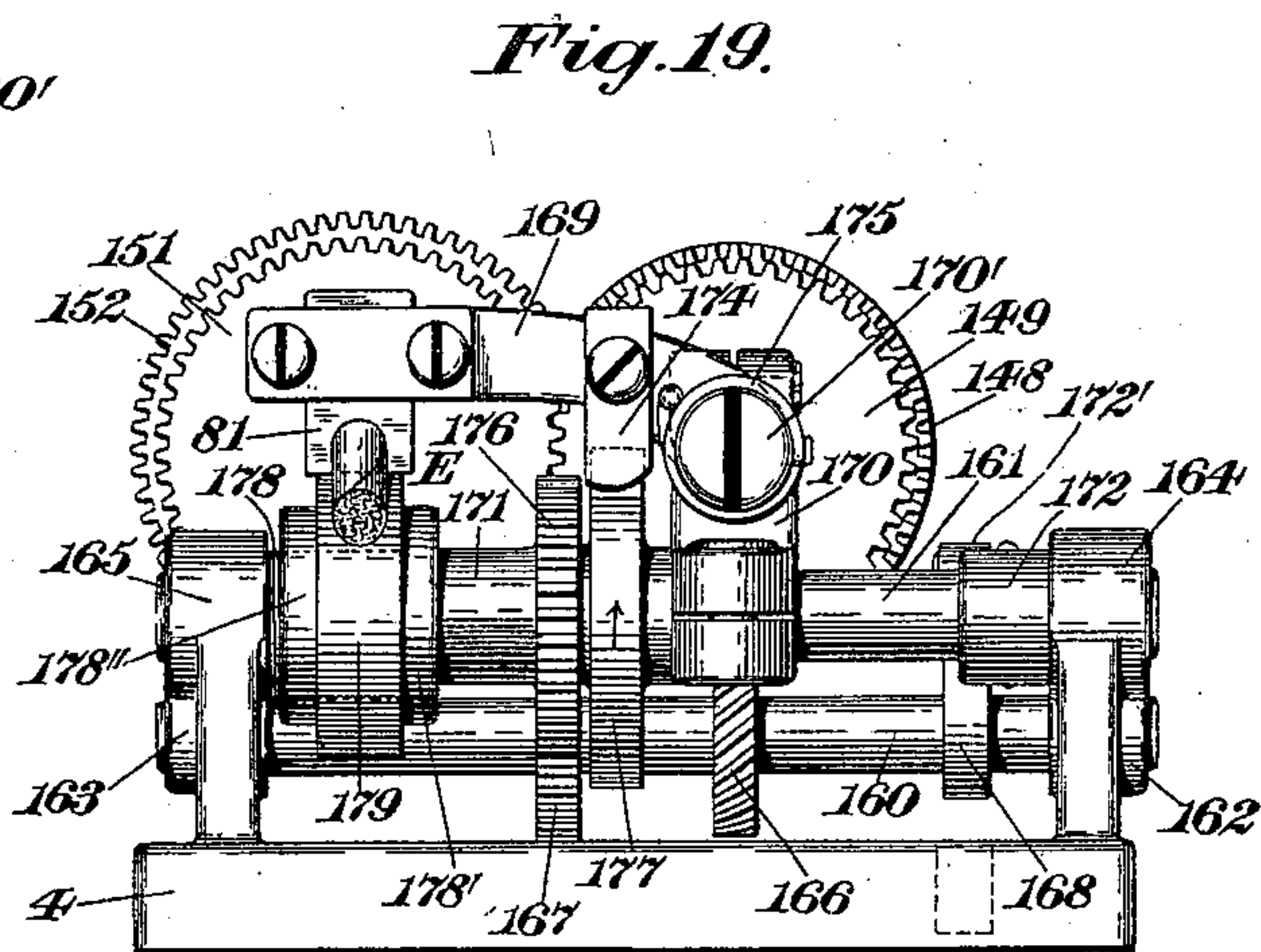
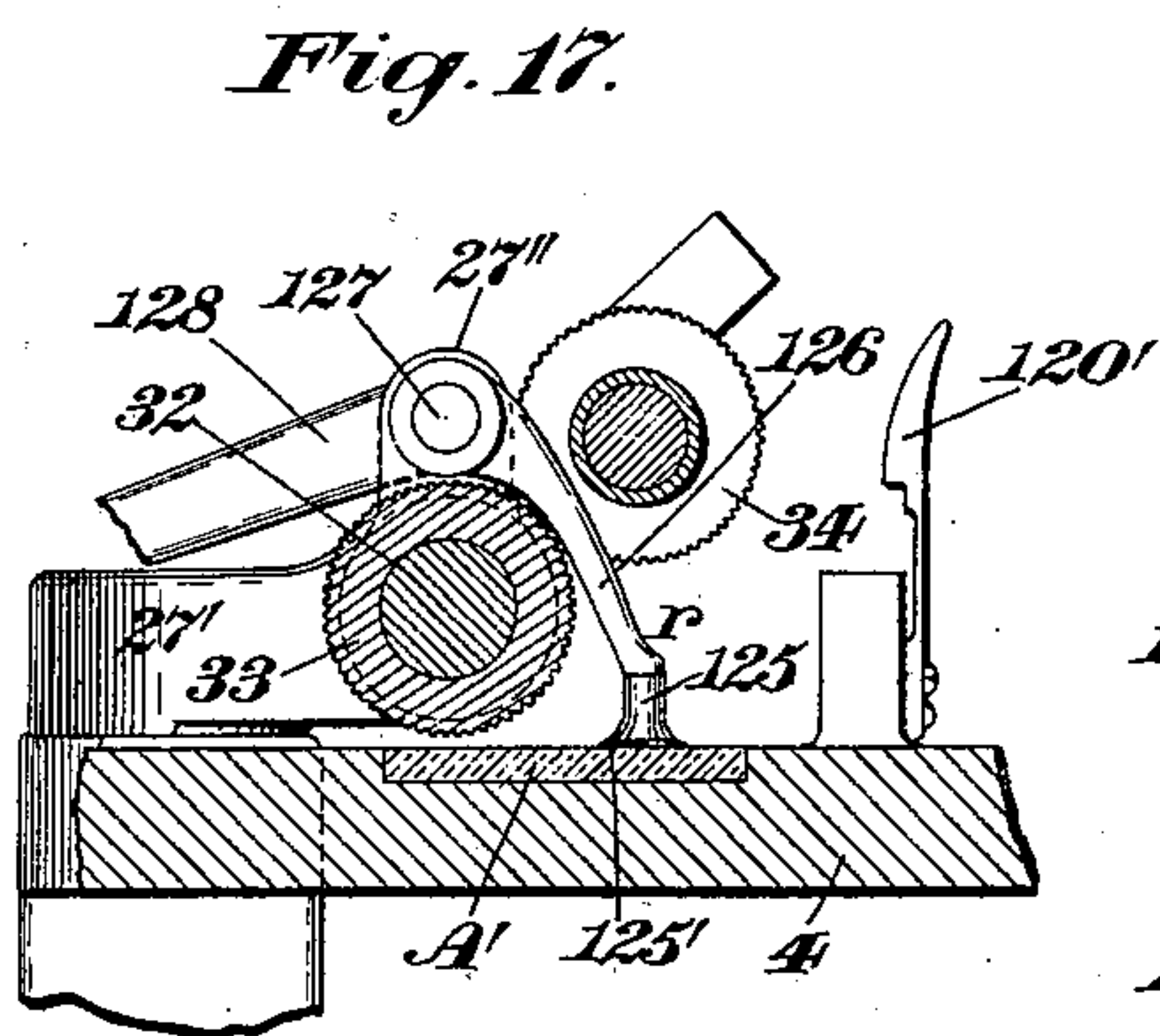
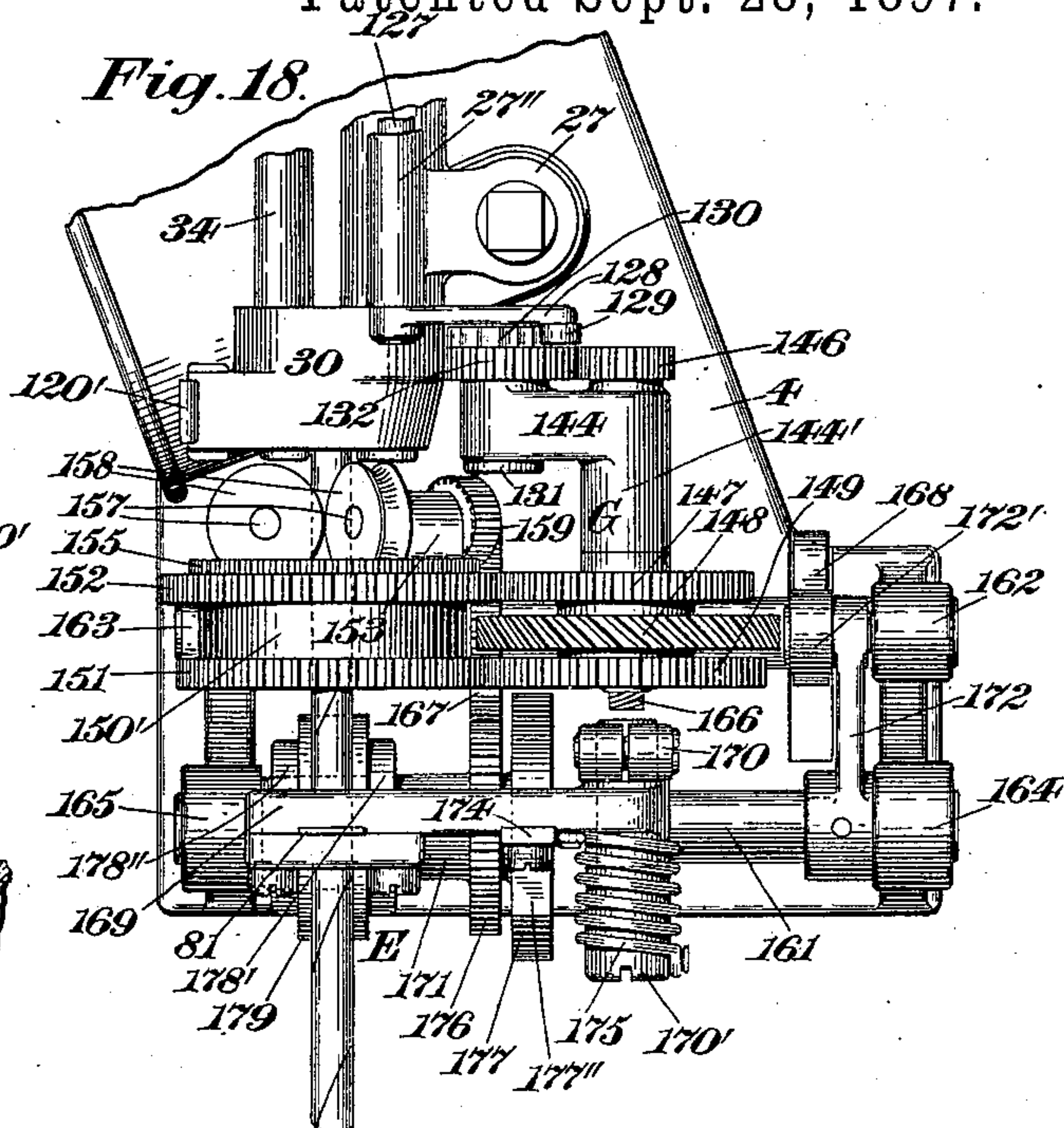
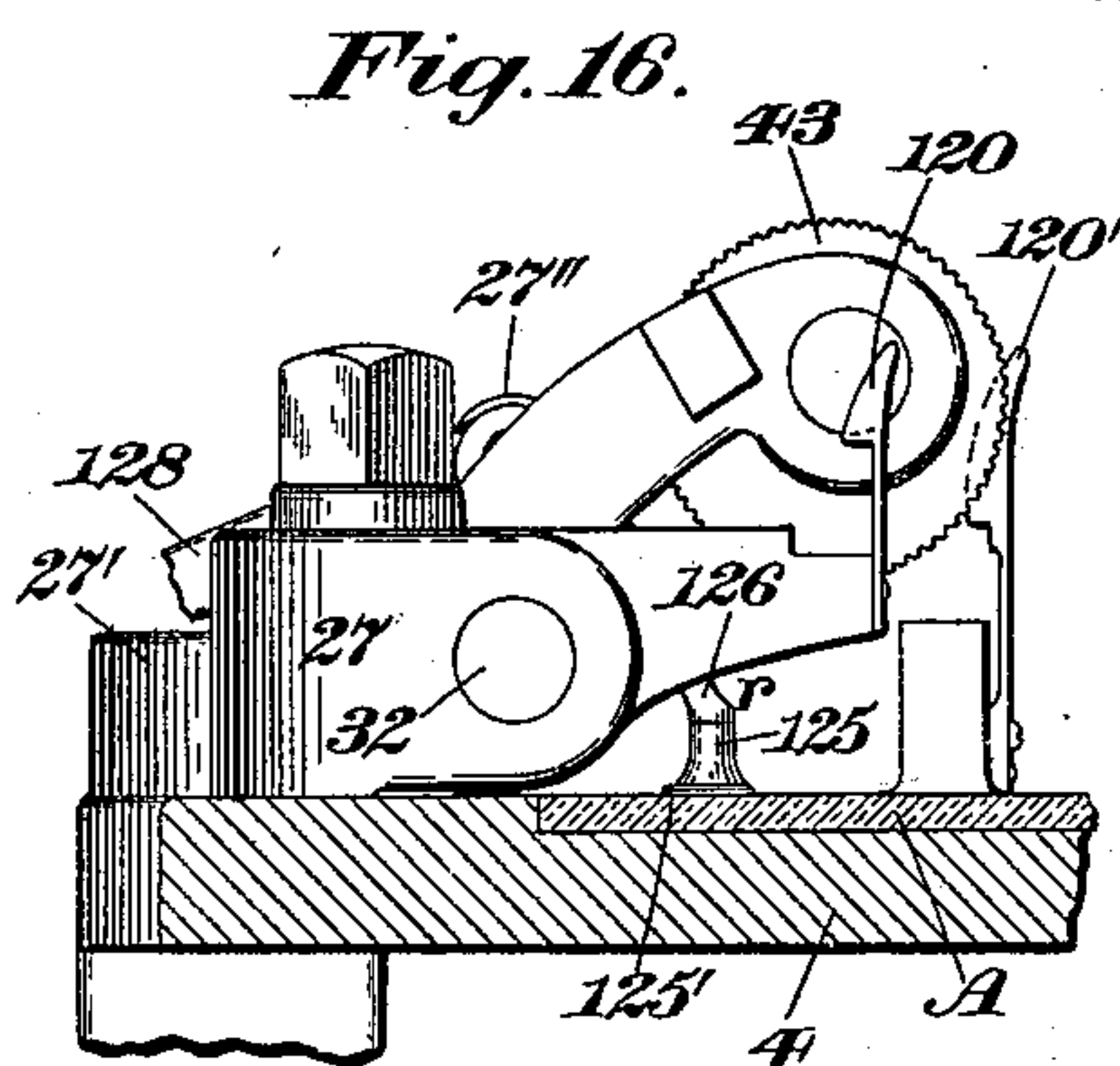
(No Model.)

10 Sheets—Sheet 8.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



***Witnesses:***

J. L. Edwards Jr.

Fred. J. Dole.

*Inventor:*

F. H. Richards.



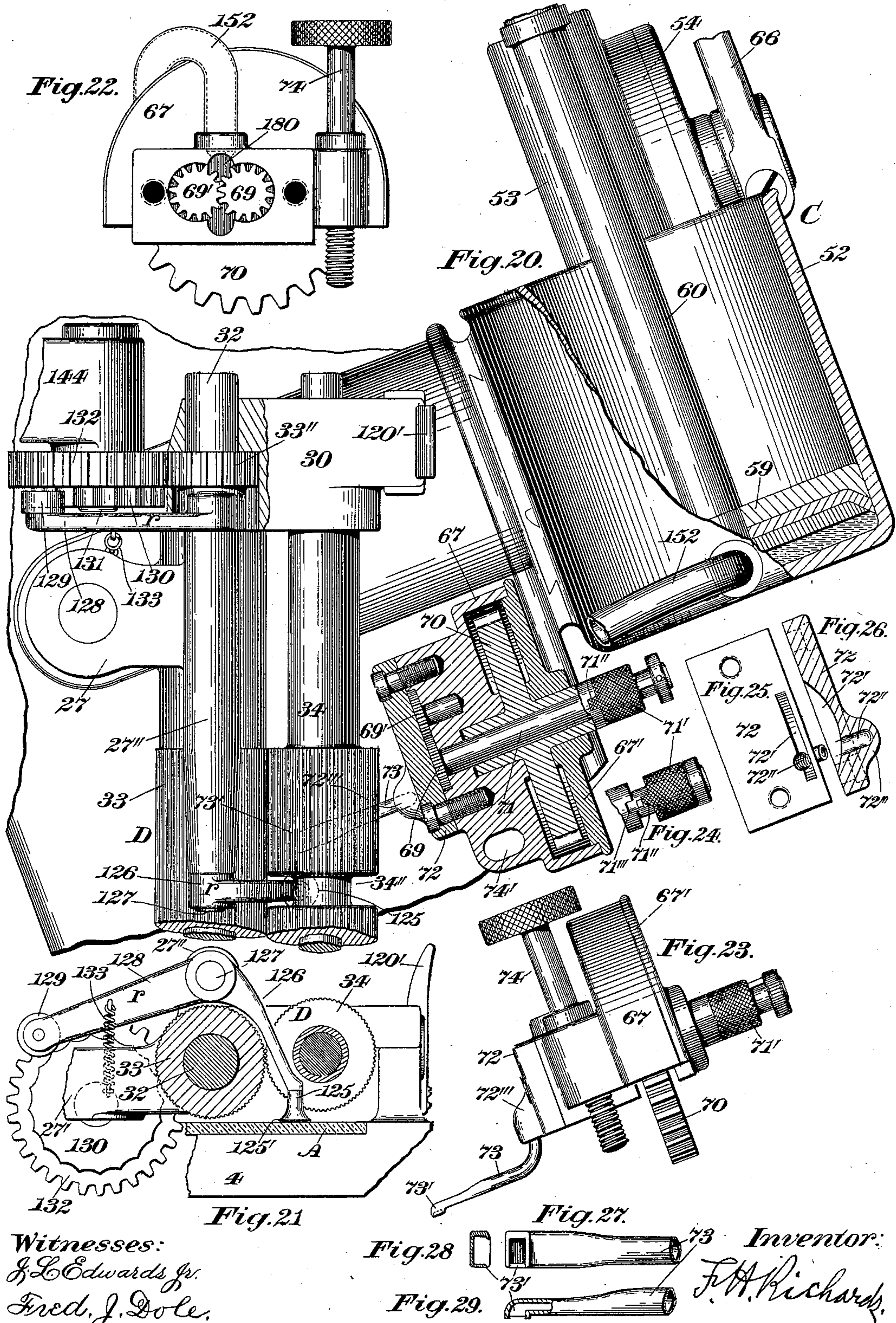
(No Model.)

10 Sheets—Sheet 9.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



Witnesses:  
J. L. Edwards, Jr.  
Fred. J. Dole.

Inventor:

F. H. Richards.



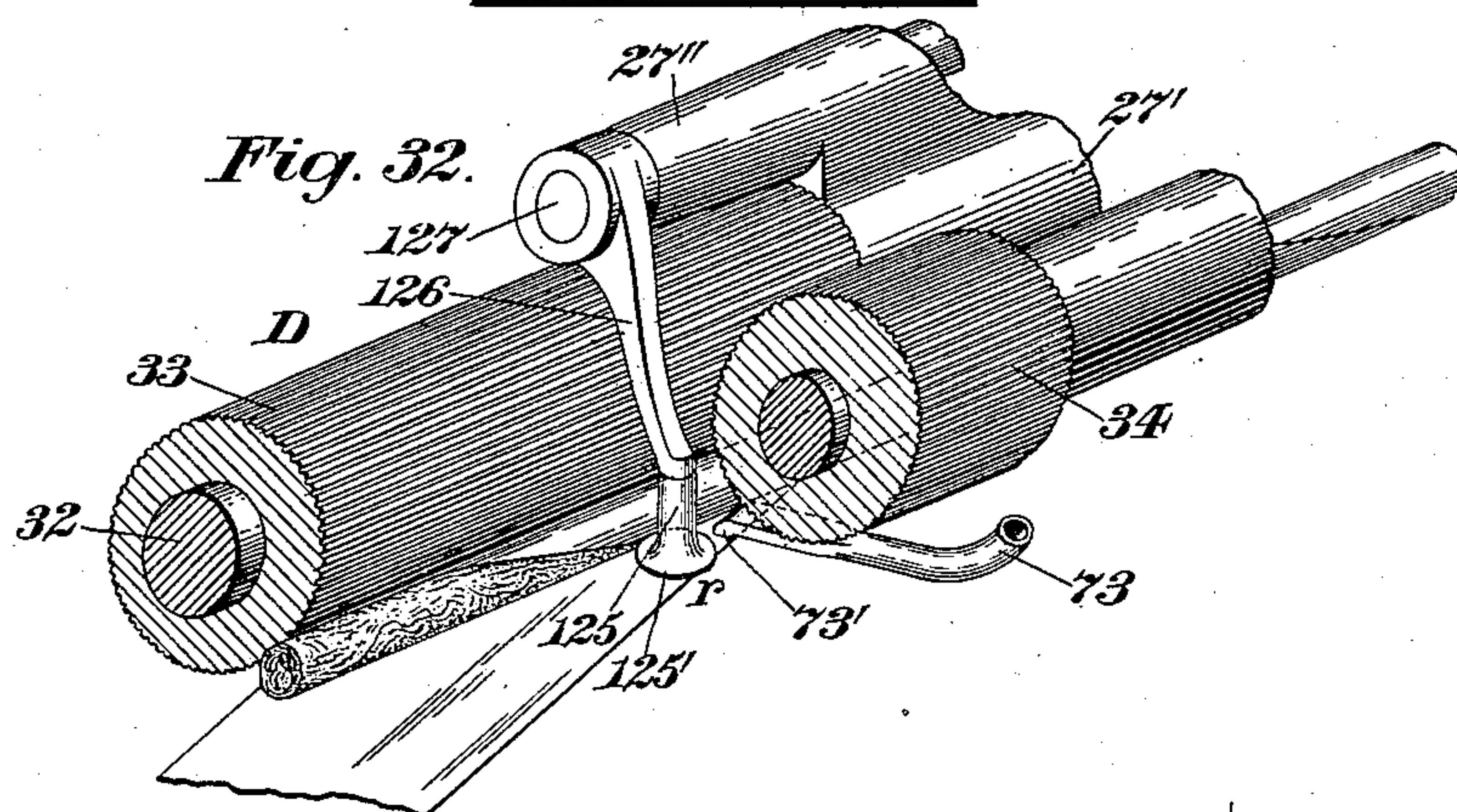
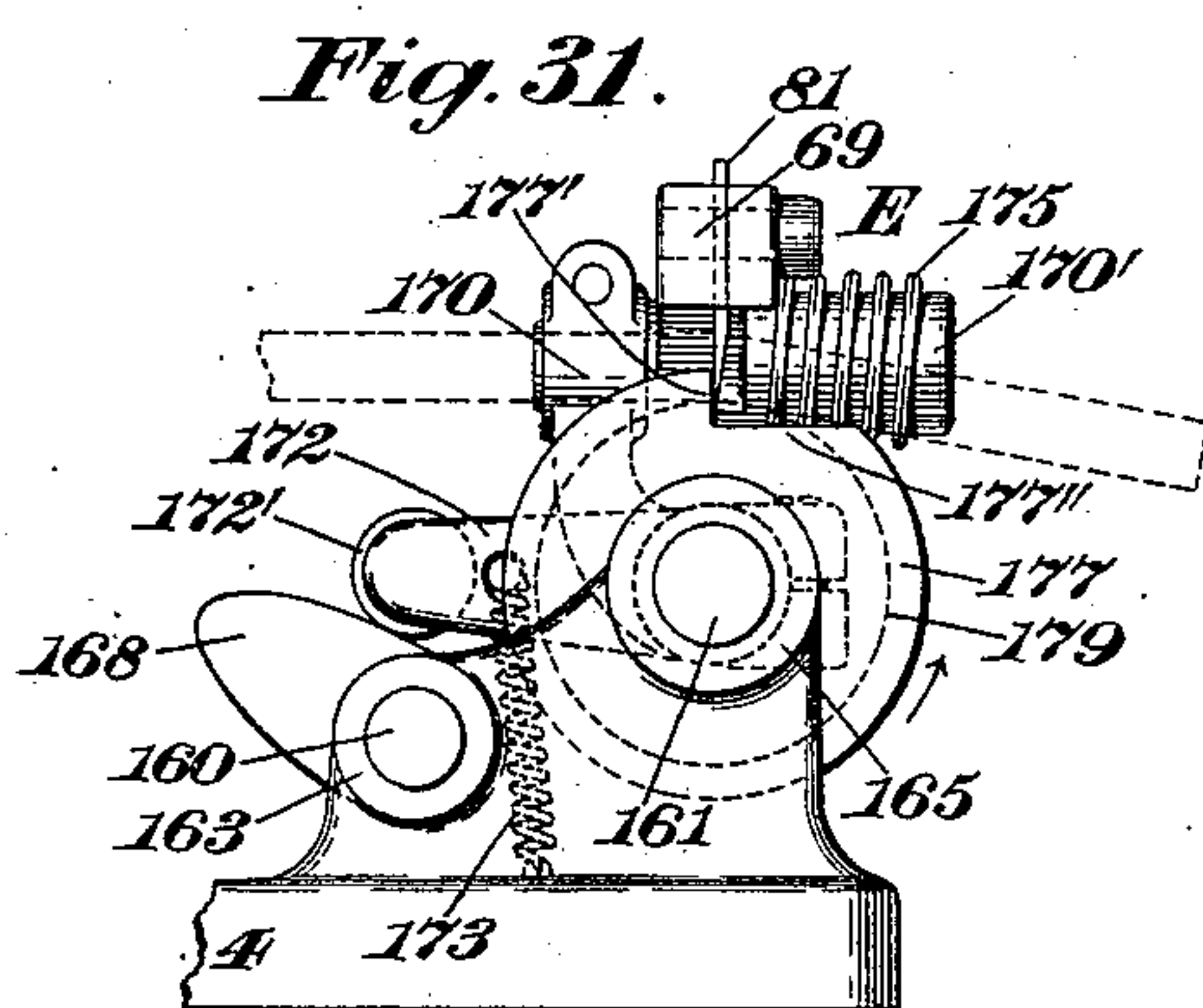
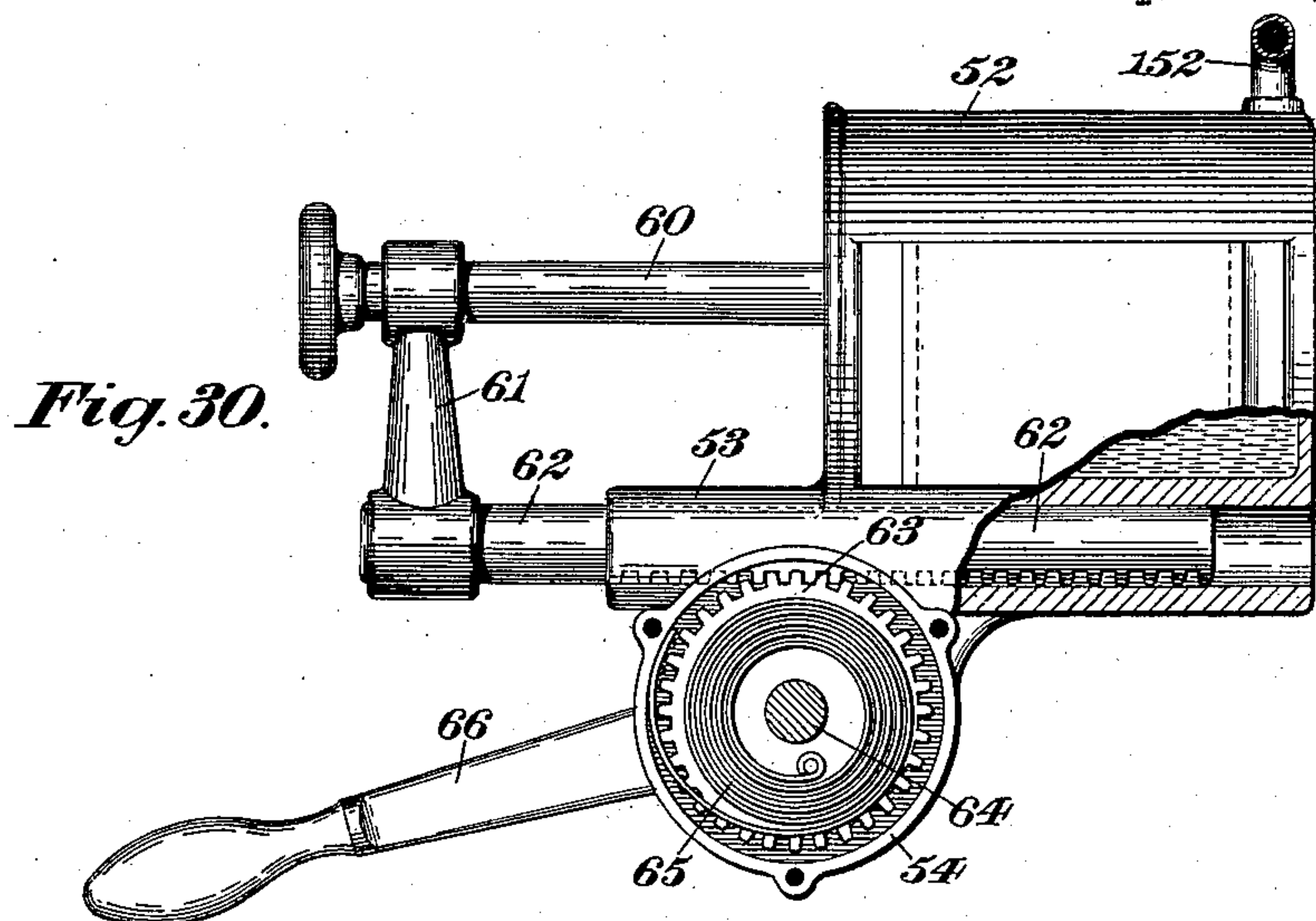
(No Model.)

10 Sheets—Sheet 10.

F. H. RICHARDS.  
CIGARETTE MACHINE.

No. 590,629.

Patented Sept. 28, 1897.



*Witnesses:*  
*J. L. Edwards Jr.*  
*Fred. J. Dole.*

*Inventor:*  
*F. H. Richards.*



# UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

## CIGARETTE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 590,629, dated September 23, 1897.

Application filed September 5, 1896. Serial No. 604,992. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Cigarette-Machines, of which the following is a specification.

This invention relates to cigarette-machines, and especially to machines of this class adapted for forming a continuous cigarette-body from a suitably-wrapped continuous filler-rod and for severing said body into short lengths to produce cigarettes.

My present invention is especially designed and intended as an improvement upon that shown and described in Patent No. 572,375, granted to me December 1, 1896, and many of the features disclosed therein are embodied in the machine which will be herein described and illustrated.

The machine described in my patent above referred to and that represented in my present application are both provided with means for forming a continuous filler-rod or tobacco rod from loose tobacco, which may be fed into the machine in any desired manner, and for subsequently wrapping around the filler-rod a suitable endless wrapper-strip while the filler-rod and the wrapper are continuously advancing through the machine, and both also have means for pasting the outer edge of the wrapper before it is wound around the filler-rod and cutting means for severing the cigarette-body into single cigarette lengths.

One of the objects of my present invention is to provide improved feeding devices for supplying loose tobacco to the machine and for shaping the same into a tobacco rod of approximately cylindrical form before the latter is acted upon by the former-rolls, with which the filler and wrapper conveyers, usually in the form of an endless belt or belts, cooperate.

Another object of the invention is to provide a pair of belts by means of which the movements of the filler and the wrapper may be separately controlled and whereby also the filler may be fed to the former-rolls somewhat faster than the wrapper is supplied for wrapping around the tobacco rod, this organization of the parts permitting the wrapper to be wound much more tightly around the filler-

rod than it is possible to do with a single belt for controlling the movements of both the filler and the wrapper-strip. In connection with a pair of separately-operative belts, one controlling the movements of the filler and the other of the wrapper, I also find it advantageous to employ a wrapper-guide and a filler-shaper between the two belts and at the point where the tobacco rod passes off from its belt and onto the wrapper carried by the wrapper-belt, these devices being preferably combined and so formed as to not only guide the filler and the wrapper in their movements, but also to shape the same into a perfect cylindrical form as the wrapper goes onto the tobacco rod.

Another important object of this invention is to furnish improved and simple means for feeding the wrapper-strip and holding the same firmly against the wrapper-conveying belt, so as to prevent slipping of the strip in advancing toward the filler, a suction apparatus, comprising in the preferred form thereof a suction-box located beneath the wrapper-conveying run of the belt and cooperating with this run, which has transverse openings or perforations therethrough, being illustrated herein for holding the strip firmly onto the belt. As I have found in practice that the inner edge of a continuous wrapper-strip is liable to slip out over the outer edge of the strip in winding the latter around the tobacco rod unless the inner edge is held firmly in place, I deem it an important feature of my improved machine to provide a presser device, located between the former-rolls and the belt by which the wrapper is fed, for holding and pressing such inner edge of the strip firmly in position as the pasted outer edge of the strip comes into position for breaking joint therewith, and I prefer to employ for this purpose a vibratory presser-roll having a rapid movement for pressing or tucking in the inner edge of the continuous wrapper and a flared end so shaped as to aid in giving to the finished continuous cigarette its cylindrical conformation.

Another feature of my present invention relates to winding means whereby after the finished cigarette-body passes beyond the former-rolls its movements both in rotative and longitudinal direction will be slightly ac-



celerated, so as to cause a slight stretching of the finished cigarette and to give thereto an additional twist for setting the paste on the outer edge of the wrapper and at the same time giving this outer pasted edge a slightly-firmer hold upon the inner edge of the wrapper that is wound around the filler-rod in substantially the same manner that a finished cigarette is stretched and wrapped or twisted by hand.

Another feature of my invention is the provision of a swinging former device shiftable from a working position to a non-working position in which the operation of shaping the tobacco rod and applying thereto the wrapper may be observed by the attendant at any stage in the formation of the continuous cigarette; and still another feature is an improved paste-applying device disposed below the plane of the wrapper-belt, out of the way of the operator, having means for adjusting the position of the discharge-nozzle thereof with respect to the outer edge of the wrapper-strip and also for positively controlling the feed of the paste to said wrapper.

In the drawings accompanying and forming part of this specification, Figure 1 is a plan of a cigarette-machine constructed in accordance with my present improvements, showing certain portions of the former-rolls broken away to illustrate the manner of connecting the same. Fig. 2 is a side elevation of said machine. Fig. 3 is an enlarged plan of a portion of the receiving end of the machine, showing the filler-feeding device for supplying loose filler material onto a filler-conveying belt. Fig. 4 is a side elevation of the same. Fig. 5 is a detail sectional end elevation of the feed-board and the feed-rolls for feeding and partially shaping into a tobacco rod the loose material, the view being taken looking from the right hand in Fig. 4. Fig. 6 is a detail sectional view of said device, the section being taken in line 6 6, Fig. 3, looking in the direction of the arrow. Fig. 7 is an enlarged sectional detail plan illustrating the wrapper-belt and the suction apparatus cooperative therewith. Fig. 8 is a detail transverse section of the same, the section being taken in line 8 8, Fig. 7. Fig. 9 is an enlarged side elevation of a portion of the machine, showing the filler-conveying and wrapper-conveying belts and the wrapper-guide and filler-shaper between and cooperating with said belts. Figs. 10 and 11 are detail transverse sections illustrating the operation of the combined wrapper-guide and filler-shaper, the sections being taken, respectively, in lines 10 10 and 11 11, Fig. 7. Fig. 12 is an enlarged plan of a portion of the machine, illustrating the manner of driving from the main shaft the filler-conveying and wrapper-conveying belts and the former-rolls disposed obliquely to the belts, portions of the framing being broken away to illustrate the construction more clearly. Fig. 13 is an enlarged detail side elevation illustrating the connecting-gearing

for said device. Fig. 14 is an enlarged horizontal longitudinal section, with parts broken away, of a portion of the machine, illustrating winding mechanism for accelerating the rotation and advance of the finished continuous cigarette and also showing connecting driving-gearing for actuating the same from the filler-forming device. Fig. 15 is a detail end elevation of the same portions of the machine, the view being taken looking from the under side in Fig. 14. Figs. 16 and 17 are respectively an end elevation and a transverse section of the filler-forming device, the section being taken in line 17 17, Fig. 1, the views illustrating the shiftable former-roll and the presser device or tucking-roll cooperative with the former-roll, the coacting belts and the supporting-table being shown also in section. Fig. 18 is a plan of the delivery end of the machine, illustrating the winding mechanism and the cutter for severing the cigarette-body into single cigarette lengths. Fig. 19 is an end view of the same, looking from the under side in Fig. 18. Fig. 20 is an enlarged detail sectional plan of the paste apparatus, a portion of the filler-forming device, and the presser device cooperative with the former-rolls. Fig. 21 is a detail sectional end elevation of a portion of the mechanism shown in Fig. 20 and illustrates the former-rolls and the presser device coacting therewith. Fig. 22 is a detail side elevation of a portion of the paste apparatus. Fig. 23 is an edge view of the same with the paste-nozzle attached. Fig. 24 is a detail of a coupling-sleeve for connecting the rotary paste-feeder hereinafter described with the driving-gear therefor. Figs. 25 and 26 are respectively an elevation and a longitudinal section of the cap or cover for closing the paste-outlet from the paste apparatus. Figs. 27, 28, and 29 are details of the paste-nozzle for supplying paste to the outer edge of the wrapper-strip. Fig. 30 is an elevation of the paste-reservoir and feed mechanism, parts being broken away to show the construction. Fig. 31 is a detail side elevation illustrating the cutter mechanism for severing the cigarettes from the finished continuous cigarette, and Fig. 32 is a perspective view illustrating the operation of the presser-roll in holding the inner edge of the wrapper-strip in place.

Similar characters designate like parts in all the figures of the drawings.

The several operative parts of my machine may be carried by any suitable framework, that shown herein comprising a hollow column 2, rising from a suitable base, (not shown,) on which column is supported a table 4, by which the principal operative mechanisms are carried.

The machine illustrated in the drawings of my present application embodies a plurality of coordinate devices or mechanisms, the main portions of the machine being filler-feeding means, such as F; a pair of conveyers or endless belts, such as A A'; wrapper-feeding



means, such as B; paste-applying means, such as C; filler-forming and wrapper-applying means, such as D; cutter mechanism, such as E, and winding mechanism, such as G, for finishing a continuous cigarette.

The table 4 forms in the present instance a carrier for supporting the upper runs of the belts A A', which constitute, respectively, filler-conveying and wrapper-conveying belts. The filler-belt is carried at one end on a band-wheel 6, secured to the main shaft 7 of the machine, and at its other end on a band-wheel 6', supported on an adjustable yoke 8, carried at the under side of the receiving end of the machine. The wrapper-conveying belt A' may be supported at its delivery end on a band-wheel 60, carried by a short shaft 70' (see Fig. 12) beyond the main shaft 7 and parallel therewith, while the receiving end of said belt may be carried by a band-wheel 60' beneath the table 4 in a manner substantially similar to that in which the receiving end of the filler-conveying belt is supported. It will be noticed that the two endless conveyers are disposed side by side with their carrying-runs in substantially the same plane and their inner edges in juxtaposition, the surface of the filler-carrying belt being slightly above that of the wrapper-belt, so that the filler when formed into a continuous tobacco rod may pass off onto the wrapper fed by the wrapper-belt without being interfered with by the inner edge of said belt A'.

The wrapper-feeding means employed in this instance comprises a wrapper-carrying reel, which may be carried for rotation in a swinging frame or arm in such a manner that its weight will hold the wrapper-strip firmly against the wrapper-belt at the point where the wrapper leaves the reel. This wrapper-reel is shown at 16 and is preferably supported loosely on a cylindrical carrier 15', projecting laterally from the free end of an arm 14, supported for swinging movement by a bearing 14' on the table 4. This wrapper-reel, however, does not form the sole means for controlling the advancing movement of the wrapper-strip, but in connection with this reel I also make use of a suction apparatus for holding the wrapper-strip firmly onto the belt from the point where it leaves the reel to that at which it is wound around the filler. This suction apparatus is organized to cooperate with the upper run of the wrapper-conveying belt in such a manner as to constantly draw the wrapper-strip against the face of said run, and hence it will be obvious that this belt should have openings therethrough to permit the suction or exhaust apparatus to act upon the wrapper-strip. These openings are represented herein as perforations *p*, and are preferably arranged in parallel circuits around the wrapper-belt, the rows of perforations being close together for the purpose of permitting the suction or exhaust apparatus to act upon the wrapper-strip at a multiplicity of adjacent points.

The suction apparatus may be of any suitable construction and preferably comprises a suction-box (designated in a general way by *s*) communicating with a suitable exhaust fan or pump, (indicated by dotted lines at *s'*, Fig. 8,) an exhaust-pipe of ordinary construction being shown as the connecting medium. This suction-box is in this instance formed as a chambered portion of the table 4 of the machine and preferably has a lid or plate 100 set into the face of the table and formed with a series of openings adapted to communicate with the perforations in the belt A'. Moreover, these openings are preferably formed as parallel slots 101, having the same intervals between them as between corresponding runs of perforations in the wrapper-belt, and in addition to this said belt is located in lateral direction by guides which may be formed by properly channeling the face of the table 4, as shown in Figs. 7 and 8, so that the belt will have its upper face substantially flush with the surface of the table 4. The slots 101 do not in this case extend entirely through the plate 100, but connect at intervals with openings formed by transverse bores 102 passing through the inner side of the plate 100.

For the purpose of feeding loose filler material to the filler-conveying belt and partially shaping the same to form a tobacco rod I prefer to employ the filler-feeding device illustrated at F. This may embody an inclined feed-board or feed-table 103, fixed on the main table 4 and preferably between a pair of uprights 104 and 104', in which is journaled a driving-shaft 105 for actuating a pair of coacting rolls cooperative with the feed-table. This shaft carries in the present instance a band-wheel 105', which may be driven by a belt from any suitable source of power, and said shaft also has fixed thereon for rotation therewith a pair of cam-wheels 106 and 106' and a driving-pinion 107. This pinion may mesh with the teeth of a gear-wheel 108, carried loosely on a rock-shaft 109, supported in an upright 104, which gear-wheel 108 serves as an idler for driving the gear-wheel 110, fixed on the outer end of one of the rolls just described and driving in turn a similar gear-wheel 110' on the end of the other of said rolls. These rolls will in the present construction be mounted in the manner shown in Fig. 5 in the ends of rock-arms 112, secured to the rock-shafts 109 and 109', it being understood that these parts are duplicated at the inner end of the filler-feeding device.

Antifriction-rolls are represented at 113' on the upper ends of rock-arms 113, rising from the rock-shafts 109 and 109', these parts being also duplicated at the inner end of the filler device. The cam-wheels 106 and 106' cooperate with these antifriction-rolls to actuate the rock-arms and thereby the gears 110 and 110' toward and from each other, these causing the rolls which are shown at 115 and 115', Fig. 6, to move in the same



manner, substantially in parallelism with the filler-conveying belt, and thereby pack the loose filler material as it is fed between said rolls and the latter are oscillated back and forth. The cam-wheels and the friction-rolls are only operative for actuating the feed-rolls in one direction—viz., toward each other—while suitable springs 116 at opposite ends of the filler-feeding device may be employed for normally holding the rolls away from each other. It will be obvious, of course, that in order to enable the gear-wheels 110 and 110' to mesh without binding while they are oscillated back and forth by the action of the cam-wheels and springs the teeth of said gear-wheels should be considerably longer than those ordinarily used.

The rotation of the feed-rolls by their pinions serves to partially shape the filler material to a cylindrical form as it is fed between and beneath the rolls, so that when the filler-rod is delivered from between the inner ends of these rolls its cross-section will be substantially as shown in Fig. 6—that is to say, it will be approximately cylindrical and will be shaped into a perfect cylinder by the action of the former-rolls of the former device, which will now be described.

As the wrapper is fed off from the wrapper-roll the free end of the strip passes through the filler-forming and wrapper-applying means D, which constitutes a former device for shaping the tobacco rod into a cylindrical body as it emerges from the rolls 115 and 115', and also serves to apply the strip to the filler-rod for forming a continuous cigarette. The filler-forming device is preferably a unitary structure removable bodily from and similarly insertible into its working position, and comprises a carrier supporting a plurality of former-rolls divergent from a determined point in one direction and parallel from such point in the opposite direction, one of said former-rolls 33 extending obliquely across both the filler-conveying and wrapper-conveying belts, while the second former-roll 34 extends across the wrapper-belt only and parallel with the roll 33, the third roll 43 being rotatively connected with the roll 34 at the inner end thereof and passing across the filler-conveying belt obliquely to the roll 33. The carrier represented herein comprises a pair of end pieces in which the outer ends of the former-roll 33 are journaled for rotation, these end pieces (designated, respectively, by 27 and 27') being preferably bolted to the table 4 and the rolls being supported thereby in such a manner that the filler-forming device as a whole may be removed from the table by withdrawing such bolts.

The rolls 34 and 43 may be rotatively connected in any suitable manner. In Fig. 1 the roll 43 is mounted for rotation on a spindle 35 and has a bevel-gear 36 carried at the end of a sleeve seated in the bore or journal of said former-roll, said sleeve forming a bush-

ing around the spindle and the spindle having on the end thereof a spherical bearing 35', seated in a corresponding socket in the bevel-gear 36. The roll 34 has a similar bevel-gear 40 secured in the end thereof and within a cap 39, secured to the end of said former-roll and projecting therefrom, the end of this bevel-gear also having a socket for receiving the spherical bearing 35'. This organization of devices forms both a universal connection and a driving connection between said rolls, as will be evident when the parts are properly held in position, and this is accomplished by means of a cap 39, which is engaged between the bevel-gear 36 and the flared end 38 of the roll 43, surrounding such gear.

In order to permit the attendant to inspect the operation as the filler-rod is formed and the wrapper-strip is wound therearound, I prefer to so construct the filler-forming device that the rolls 34 and 43 may be swung up and away from the endless conveyers and the product observed as the material thereof passes through the machine. Hence I have provided at 28 and 30 a pair of swinging arms, preferably loosely mounted on the spindle 32 of the former-roll 33, between the respective ends of said roll and the end pieces 27 and 27', and the outer ends of the rolls 34 and 43, respectively, are supported in the free ends of said arms 28 and 30, so as to rotate freely therebetween.

Any suitable means may be employed for holding the filler-forming device in its normal position, latches 120 and 120' being illustrated for this purpose, these latches being secured to any suitable fixed portions of the apparatus.

In order that the material may be fed forward and the filler-rod shaped between the former-rolls in the best possible manner, I have found that it is desirable to provide obliquely-disposed rolls with faces so roughened that the filler material will advance along the same and on its conveying-belt, but will be held between the same and kept from slipping out in lateral direction. Hence the former-rolls shown in this case have their peripheral surfaces longitudinally grooved or flanged, so that they will grasp the tobacco, and this, in connection with the oblique disposition of such rolls with respect to the filler-conveying belt, will cause the tobacco to be advanced positively by the rotation of such rolls and the forward movement of the belt.

As herein stated, the delivery end of the filler-conveying belt is considerably in the rear of that of the wrapper-conveying belt, and I make use of this organization of the conveyers to locate between the belts at the delivery end of the filler-belt a wrapper-guide and a filler-shaper disposed obliquely to the conveyers and substantially in alignment with and between the former-rolls, the receiving end of this guide being substantially



at the point where the filler passes off from the filler-belt onto the wrapper on the wrapper-belt and the wrapper is applied to the filler.

Preferably the guide and the filler-shaper are combined in a single device, which is represented at 122 and is secured to one edge of the table 4 and has its receiving edge in contact with the carrying-faces of the two belts, while the filler-shaper is formed by the grooved wall extending from the receiving edge 122', Figs. 7, 10, and 11, to the former-roll 33, said grooved wall being designated by 122". It will be noticed by reference to Figs. 7, 10, and 11 that the under side of this device is so shaped as to accommodate itself to the positions of the belts and that the outlines of the guide and the shaper vary from the point to the heel of the device, this being substantially plow-shaped and having its receiving edge somewhat convex, so as to throw the inner edge of the wrapper-strip away from the face of the belt and prevent its catching on the point of the guide, while the filler-shaper, which at its receiving end has its wall defined by a curve only approximating the true curve of the finished cigarette, has a curved wall at its delivery end which is an exact circle defining the periphery of the finished cigarette, and hence serves to shape the latter to a proper cylindrical form before the continuous cigarette passes beyond the shaping device.

In applying the wrapper-strip to a continuous filler-rod the wrapper is usually presented to the filler-rod at a very acute angle with respect to the longitudinal axis of the filler-rod, and as the strip is comparatively narrow the inner edge thereof is very liable to slip out from the outer edge of the wrapper as this is wound around the filler-rod unless the inner edge is positively positioned during the wrapping operation.

For the purpose of maintaining the inner edge of the strip in its proper position I prefer to employ, in connection with the former-rolls and the belt on which the wrapper travels, a presser device between these rolls and the belt which will press the inner edge of such wrapper firmly against the filler-rod during the winding operation. This presser device (designated in a general way by *r*) is preferably in the nature of a presser-roll 125, mounted between the former-rolls and the belt so as to be capable of movement toward and from the roll 33, this presser-roll having a flared end 125', so shaped as to hold the inner edge of the wrapper-strip positively in position and at the same time aid in giving a cylindrical contour to the continuous cigarette. This presser-roll may be loosely mounted on one end of a rock-arm 126, secured to a rock-shaft 127, journaled in a projection 27", rising from the carrier 27', said rock-shaft also having secured thereto a second rock-arm 128, carrying an antifriction-roll 129, adapted to be actuated by a cam-wheel 130, having a plurality of cam-faces,

which cam-wheel is secured to a spindle 131, carrying a spur-gear 132 in mesh with the pinion 33" on the former-roll 33. A suitable spring, such as 133, may be employed for operating the rock-arms, and hence the presser-roll, in one direction—viz., away from the inner edge of the wrapper-strip—while the cam-wheel will serve to positively actuate said presser-roll toward said edge of the wrapper, it being understood that this presser-roll will have a rapid vibratory movement, so that it will be substantially constantly in engagement with the edge of the wrapper-strip, the roll 125 of course turning as the continuous cigarette advances, and hence offering no obstruction to the feed of the same.

In order that the presser-roll may be brought into position for operating upon the cigarette, it is desirable to reduce one of the former-rolls—as, for example, the roll 34—as shown at 34", to form a space or opening between the rolls, through which the rock-arm carrying the presser-roll may be passed and in which it and said presser-roll may be vibrated.

It will be obvious, of course, that the portion 34" of the roll 34 should be reduced sufficiently to enable the rock-arm 126 to vibrate freely in the space between the former-rolls without striking or interfering with the operation of either of said rolls.

In connection with the mechanisms and instrumentalities hereinbefore particularly described any suitable paste apparatus may be employed for applying an adhesive, which will herein be referred to as "paste," to the inner edge of the wrapper-strip, that herein represented consisting of two main parts—viz., a main paste-reservoir and a paste-feeding mechanism yieldingly connected therewith and detachable therefrom. This yielding action permits adjustment of the paste-feeding mechanism, so as to bring the supply-nozzle to any desired position relatively to the outer edge of the wrapper without moving the paste-reservoir, and by making the parts detachable from each other the reservoir may be removed and refilled without changing the position of the paste-feeding mechanism. The main paste-reservoir is preferably secured to the frame by a key-and-slot connection, as shown in Fig. 20, so that it may be removed readily from the machine for replenishing the supply of paste therein, and this reservoir or can, which is designated by 52, has suitable means for maintaining an uninterrupted flow of paste from the reservoir to the discharge-nozzle of the paste-feeding device. In the present instance the reservoir 52 carries a plunger 59, attached to a stem 60, carried in the end of an arm 61, secured to a rack-bar 62, mounted for reciprocation in a hollow stem 53, which may be formed integral with the reservoir 52. The teeth of this rack-bar mesh with the teeth of a spur-gear 63, supported on a spindle 64 within a gear-case 54, a coil-spring being shown at 65 fastened at one end to said gear-case and at its



other end to said gear-wheel for the purpose of forcing the plunger 59 gradually inward as the supply of paste or glue in the reservoir is reduced. A hand-lever 66 is preferably carried on the end of the spindle 64 for winding up the spring.

A suitable pipe 152, preferably flexible, may connect the reservoir 52 with the paste-feeding mechanism shown herein. This paste-feeding device comprises as its essential features a casing 67, closed at one end by a cap 67', these two parts being bored in alinement with each other to receive the journals of a gear-wheel 70, which gear-wheel in turn has its hub longitudinally bored to receive a spindle 71, which constitutes a rotary feeder for positively supplying paste to the discharge-nozzle of the paste apparatus. At one end of this spindle a feed-pinion 69 is fixed, and this in turn drives a second pinion 69', rotatively mounted in the face of the casing 67.

For the purpose of connecting the feed-spindle 71 with the gear-wheel 70 a coupling-sleeve, such as 71', may be splined on the spindle in the manner shown in Fig. 20, so that it may be reciprocated freely, but will be held against rotation relatively thereto, a projecting lip, such as 71'', being represented for the purpose of engaging the walls of a corresponding recess 71''' in the end of the hub of the gear 70, it being understood, of course, that this gear-wheel constitutes a driver for the feed-spindle and feed-pinions.

Another cap or plate is shown at 72 for covering the opening 180 and the gears 69 and 69' and forming a pocket into which paste may be fed through the pipe 152 to said opening, and from which pocket the paste may pass in any suitable manner, as through a short delivery-pipe 73, to a discharge-nozzle 73'. This cap 72 may be secured in position by screws and is preferably formed with a channel 72', communicating with a passage 72'' through a boss 72''' into which the delivery-pipe 73 is inserted. It will be noticed by reference to Figs. 27 to 29, inclusive, that the discharge-nozzle of this delivery-pipe is substantially rectangular and has three of its edges in a common plane, so that they will lie flat against the wrapper-strip, and the paste will be delivered from one side of the discharge-nozzle. Moreover, the position of this discharge-nozzle with respect to the edge of the wrapper may be exactly determined, the adjustment of the same being effected in this case by means of an adjusting-screw, such as 74, working freely in a bore 74' in the casing 67 and having its lower end in position to be received in a correspondingly-threaded bore in a fixed portion of the framework. It will be noticed also that the discharge-nozzle of the paste apparatus is located substantially at the point where the edges of the wrapper meet in folding, so that the paste will be applied to the outer edge of

the wrapper just before the latter is folded over onto the inner edge of the strip.

As has been hereinbefore stated, the filler-conveying and wrapper-conveying belts are carried on different driving-shafts, the former being driven by the main shaft 7 and the latter by the shaft 70', so that the belts may be enabled to travel independently of each other. I employ this organization for the purpose of advancing one of the belts at a different rate of speed from that at which the other travels and especially for actuating the carrying-run of the wrapper-conveying belt at a slower rate of speed than that of the filler-conveying belt, the object being to feed the filler-rod forward somewhat faster than the wrapper-strip, and thus while winding the wrapper tightly around the filler-rod also causing the latter to be compressed tightly by the pull of the wrapper-strip as it passes around said filler-rod. I prefer to operate the belts A and A' in such a manner that whether or not each one runs at a constant rate of speed the difference between the movements of the carrying-runs of the two conveyers will be the same at all times, and hence in the drawings I have illustrated a gear-train for forming a positive driving connection between the shafts 7 and 70', (see Figs. 12, 13, and 14,) this gearing being of the nature of a reducing gear-train, by means of which the shaft 70' is caused to revolve somewhat more slowly than the main shaft 7. This train of gearing in the present instance comprises a gear 135, secured to one end of the shaft 7 at the end opposite the main driving-wheel, (designated by D',) and an idler (shown at 136) supported on a carrying-pin 137 and meshing with the teeth of a gear 138, secured to the short shaft 70', the gears 136 and 138 having each two teeth more than that represented at 135.

The former-rolls hereinbefore particularly described are also preferably driven from the shaft 70', a second gear being represented at 139 on such shaft in mesh with a pinion 140 on the spindle 141, this spindle having fixed thereon worm-gears 142 and 143, meshing, respectively, with corresponding worm-gears 33' and 34' on the extended delivery ends of the former-rolls 33 and 34, it being understood that the former-rolls will be rotated in the same direction at a relatively rapid rate of speed with respect to the rotation of the shaft 70'. The former-roll 33 also carries, as before stated, a pinion 33'', which meshes with the teeth of the wheel 132 on the spindle 131, from which power is transmitted to the winding and cutting mechanisms G and E. This spindle is supported for rotation in a journal in the upper end of an upright 144, (see Figs. 14 and 15,) and this upright also has a long bearing 144', in which is journaled for rotation a spindle 145, carrying at one end thereof a pinion 146 in mesh with



the gear 132 and having secured to its other end a spur-gear 147 of large diameter having a long hub 147', on which are fixed a large worm-gear 148 and a spur-gear 149 of somewhat larger diameter than the gear 147.

Between the upright 144 and the delivery end of the machine is another standard 150, shaped to form an annular support or ring 150', in which is mounted for rotation the hub 151' of another large gear 151 in mesh with the teeth of the spur-gear 149.

The gear 151 is held in place in the annulus 150' by a spur-gear 152 and a circular rotary carrier 153, said carrier being secured to the hub 151' of the spur-gear 151 in any suitable manner—as, for instance, by means of the bolts 154. The spur-gear 152 is not fastened, however, to the rotary carrier 153, but is in the form of an annulus having a circular flange or rim 152', on which rests a corresponding circular flange or rim 153' of the rotary carrier, the construction being such that while all of the parts are held securely against axial movement the gear 151 and the carrier 153 will be free to turn together in the annular support 150', while the annular spur-gear 152 will turn freely on the carrier 153. This gear 152 also has secured thereto or integral therewith an annular spiral crown-gear 155, and as the teeth of the spur-gear 152 mesh with the teeth of the spur-gear 147 it will be obvious that said gear 152 will rotate somewhat more slowly than the gear 151 and the rotary carrier 153.

The gears supported by the annulus 150' are so positioned that their common axes are substantially in alinement with the continuous cigarette as the latter emerges from between the former-rolls; and, for the purpose of permitting said continuous cigarette to pass beyond, and be operated upon by, the winding mechanism, of which these gears form a part, the rotary carrier 153 and the spur-gear 151 are axially bored, as shown at 156, the diameter of the bore being somewhat larger than that of the cigarette. The carrier 153 is also preferably formed with a plurality of journal-bearings—in the present instance three in number—having their longitudinal axes equidistant from one another and intersecting the axis of the gear 151 and the carrier 153. Moreover, these journals are so positioned as to support spindles 157, carrying feed-rolls 158, in such a manner that the faces of the feed-rolls form a substantially complete circle somewhat smaller than that defining the periphery of the cigarette. (See Fig. 15.) These feed-rolls are driven in the present instance by pinions 159, secured to the ends of the spindles 157 opposite to the feed-rolls, the pinions being so disposed that their teeth mesh with the teeth of the spiral crown-gear. It should be understood that all of these parts are so organized relatively to one another that the feed-rolls will receive the finished continuous cigarette, and, firmly engaging the same, will tend to carry the cigarette along

with a slightly-accelerated advancing movement; also, that the rotation of the rotary carrier is at such a rate as will cause the feed-rolls to be revolved orbitally at a speed sufficient to accelerate slightly the rotation of the cigarette which they surround. The combined movements of these feed-rolls are effective, therefore, to slightly stretch the continuous cigarette during the last stages of the process of manufacture and at the same time to give a slight additional twist to the wrapper to tighten the hold of the outer edge of the wrapper-strip upon the inner edge of such wrapper and thus cause the paste applied to the outer edge to set and adhere firmly to the body of the wrapper-strip, the appearance and quality of the cigarette being very much improved by the action of this winding or finishing mechanism.

The cutter mechanism E for cutting or separating the cigarette from the continuous rod is operated from the pair of shafts 160 and 161, the former being supported in bearings 162 and 163, (see Fig. 14,) rising from the table 4, while the latter is disposed in parallelism with the shaft 160, and considerably above the same, and is supported by corresponding bearings 164 and 165, (see Figs. 18 and 19,) also integral with the framework.

To the shaft 160 is secured a pair of gears, one of which, a spiral gear 166, is in mesh with the large spiral gear 148 and is driven thereby, while the other gear 167 is in the nature of a spur-gear for transmitting the movements of the shaft 160 to the shaft 161 for imparting certain movements to the cutter devices. The shaft 160 has also secured thereto a cam 168, in the nature of a wiper, for oscillating the cutting-knife in the direction of and in unison with the advance of the continuous cigarette as it passes beyond the winding mechanism hereinbefore described.

The knife itself, which is designated by 81, will preferably be removably carried on the free end of a swinging arm 169, pivotally supported on the upper end of a rock-arm 170, (see Figs. 18, 19, and 31,) secured to the shaft 161 for oscillation therewith.

The oscillation of the knife-carrier or knife-frame in the direction of movement of the cigarette is effected, as before stated, by the wiper 168, a rock-arm 172, fixedly secured to the shaft 161 and carrying at its outer end an antifriction-roll 172' in contact with the cam 168, being employed for this purpose. A spring, such as 173, preferably connects the rock-arm 172 with the table 4 for returning the knife-frame to its normal position after the roll 172' has been raised to the top of the cam 168.

The knife 81 is intended to sever the cigarettes by substantially vertical movements of the swinging arm 169, this being constructed to oscillate in a vertical plane, it being preferably raised to an extreme upper position by a quick let-off cam-wheel and drawn down with a rapid movement by a strong spring.



This swinging arm may be provided with a projecting vertical arm 174, having a thin edge for a purpose hereinafter to be specified. The arm 169 is mounted in this instance  
 5 on a stud 170', preferably screw-threaded into the free end of the rock-arm 170, one end of a torsion-spring 175 being secured to the arm 169, while the other end of said spring is fastened to the stud (see Fig. 18) for the pur-  
 10 pose of vertically actuating the knife-carrying arm.

On the shaft 161 is supported loosely for rotation a sleeve 171, having fixed thereon or integral therewith a gear-wheel 176 in mesh  
 15 with the gear 167, and said sleeve also carries a cam-wheel 177, coöperative with the arm 174, for actuating the knife vertically. It will be noticed that this cam has a substantially circular periphery, except at one point, where it  
 20 is cut away to form a cam-face 177', (see Fig. 31,) having a straight radial drop sufficient to permit the knife to pass entirely through the continuous cigarette and sever the same, a second cam-face 177'' connecting the cam-  
 25 face 177' with the circular periphery of the cam-wheel.

Between the sleeve 171 and the bearing 165 a second sleeve 178, preferably externally screw-threaded at its outer end and flanged  
 30 at its inner end, is represented, while on this sleeve and between the flange 178' and a threaded washer or nut 178'' an annulus 179, preferably a wooden ring, is mounted, so as to turn loosely on the sleeve 178 and support  
 35 the cigarette at the point where the cutter severs the same from the continuous rod, this point being, as will be obvious, substantially in a radius drawn from the axis of the shaft 161 and in which radial line the cutting-knife  
 40 operates.

As successive cigarettes are cut from the continuous body by the chopping action of the knife the annulus or cutter-block 179 will turn freely in the plane of the cigarette-body,  
 45 successive portions of the periphery of said block being presented to the knife as the block is turned by the advancing continuous cigarette.

The operation of a machine constructed in  
 50 accordance with my present improvements as herein set forth is as follows: It being understood that the main driving-wheel D' will be rotated continuously from some suitable source of power in the direction indicated by  
 55 the arrow in Fig. 1 and that the band-wheel 105' will be rotated independently it will be seen that the filler-conveying belt will start traveling, that the wrapper-conveying belt will be actuated in the same direction at  
 60 a somewhat slower rate of speed, that the former-rolls will be driven from the driving-shaft 70' through the gear-train shown in Figs. 12 and 13, and that the winding and finishing mechanism will be actuated from the former-  
 65 roll 33 through the gear-train illustrated in Fig. 14, while the cutter mechanism will in turn be controlled in its movements by such

winding mechanism, and the driving-gear 70 will be actuated by the gear-wheel 138, Fig. 13, for feeding the paste to the wrapper-strip.  
 70 It being understood that loose tobacco will be fed onto the feed-board F in any suitable manner, it will be seen that the filler material will be partially shaped into a filler-rod  
 75 (see Fig. 6) between the rolls 115 and 115' by the conjoint action of the traveling filler-belt and the rotary vibratory rolls, the partially-formed filler-rod being delivered then by the filler-conveying belt to the former-rolls,  
 80 between which it is shaped to a substantially cylindrical form, it being carried then off from the filler-belt and onto the receiving edge of the combined wrapper-guide and filler-shaper 122. Here the wrapper-strip, which has just  
 85 been paid out from the wrapper-roll and is held closely against the carrying-run of the belt by the action of the suction or exhaust apparatus, (represented in Figs. 7 and 8,) passes onto the receiving edge of the wrap-  
 90 per-guide and is wound around the filler-rod, between the latter and the curved wall of the filler-shaper, the slower advance of the wrapper-strip serving to wind the same tightly  
 95 around the filler-rod. As the wrapper is wound the filler-rod passes beyond the filler-shaper, the presser device engages the inner edge of the wrapper-strip, and, vibrating rapidly, acts to tuck in such edge and hold the  
 100 same firmly in place as the outer edge of the strip is wound spirally over that portion of the wrapper which is adjacent to the inner edge thereof. The rapid vibration of the presser-roll also acts to partially shape the filler-rod while keeping the inner edge of the wrapper-strip in place.  
 105

The discharge-nozzle of the paste apparatus is located directly beyond the presser-roll, as will be clear by reference to Fig. 1, so that the paste is applied to the outer edge of the wrapper-strip immediately beyond the point  
 110 at which the outer edge of the wrapper is engaged by said roll, and just before the continuous cigarette emerges from the former-rolls the latter press the opposite edge of the strip firmly upon the previously-wound por-  
 115 tion of the wrapper. The endless cigarette-body now passes between the feed-rolls 158 of the winding mechanism, and its rotation and advance are slightly accelerated, thus drawing the continuous cigarette toward the  
 120 delivery end of the machine and stretching the same longitudinally, while giving an additional twist to the same in circumferential direction for setting the paste and giving a finished appearance to the completed cigarette.  
 125

As the cigarette-body passes beyond the opening 156 in the winding mechanism it is received on the upper face of the circular block 179 and at the proper moment—that is,  
 130 when the arm 174 reaches the top of the cam-face 177'—it is forced off from the same by the spring 175, and a rapid cutting movement is imparted to the knife 81, such as will carry the cutting edge thereof through the endless



cigarette with a sharp blow and sever and separate a cigarette of proper length from the endless cigarette-body, the knife advancing, of course, in unison with the continuous cigarette during the cutting operation and until it is clear of the cigarette, when said knife is returned to its normal position by the wiper 168, acting upon the rocker 172.

By means of the combined devices and mechanisms hereinbefore described I am enabled to form cigarettes with great precision and without injuring the wrapper, the finished cigarette-body, or the separate cigarettes at any stage in the process of manufacture.

Having described my invention, I claim—

1. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; and means for moving one of said rolls toward and from the other.

2. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; and means for moving one of said rolls toward and from the other, substantially in parallelism with the belt.

3. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls in opposite directions; and means for moving one of said rolls toward and from the other.

4. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; and means for moving said rolls toward and from each other.

5. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt and disposed in the line of movement thereof; means for rotating said rolls; and means for moving said rolls toward and from each other.

6. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; and means for oscillating said rolls toward and from each other.

7. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; means for moving said rolls toward and from each other; and filler-feeding means above said rolls for delivering loose filler material between the rolls and onto the belt.

8. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of coacting rolls coöperative with said belt; means for rotating said rolls; means for moving said rolls toward and from each other; and an inclined feed-board above said rolls, for delivering loose filler material between the rolls and onto the belt.

9. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of rotary rolls coöperative with said belt; a pair of meshing pinions secured, respectively, to said respective rolls; a spring between said rolls, for holding the latter separated; and a cam-wheel for moving said rolls simultaneously toward each other.

10. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of rotary rolls coöperative with said belt; a pair of meshing pinions secured, respectively, to said respective rolls; a pair of rock-arms carrying said rolls; an idle-gear mounted on one of said rock-arms concentric with the axis thereof and meshing with the pinion on the roll carried by said rock-arm; a spring between said rock-arms, for holding said rolls separated; a cam-wheel between said rock-arms, for simultaneously moving said rolls toward each other; and a pinion concentric with said cam-wheel and in mesh with said idle-gear.

11. The combination with a filler-conveying belt movable lengthwise of the rolls, of a pair of rotary rolls coöperative with said belt; a pair of meshing gears secured, respectively, to said respective rolls; a cam-shaft operative with said rolls; a pair of cam-wheels at opposite ends, respectively, of said cam-shaft, for simultaneously moving said rolls toward each other; springs between said rolls at opposite ends thereof, for holding the rolls separated; and driving connections between the cam-shaft and one of said pinions.

12. The combination, with means for shaping and wrapping a continuous filler-rod, said means including separate filler-conveying and wrapper-conveying belts, of means for advancing the filler-conveying belt at a high rate, and the wrapper-conveying belt at a lower rate, of speed.

13. The combination, with means for shaping and wrapping a continuous filler-rod, said means including a filler-conveying and a separate wrapper-conveying belt having its carrying-surface below that of the filler-conveying belt; of means for actuating said belts.

14. The combination, with means for shaping and wrapping a continuous filler-rod, said means including a filler-conveying and a separate wrapper-conveying belt having its carrying-run parallel to, and in juxtaposition with, the filler-conveying belt and having its carrying-surface below that of the latter belt; of means for actuating said belts.

15. The combination, with means for shaping and spirally wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having transverse openings and wrapper-winding means coöperative with said belt and adapted to wind the wrapper spirally around the filler-rod and located over the belt in the rear of the point at which the winding is effected; of an exhaust apparatus coöperative with the wrapper-carrying portion of said belt at a point immediately



in the rear of that at which the wrapper begins to wind around the filler-rod and adapted to maintain the wrapper in engagement with the belt.

- 5 16. The combination, with means for shaping and spirally wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having a circuit of transverse openings therethrough and wrapper-winding means coöperative with said belt and adapted to wind the wrapper spirally around the filler-rod and located over the belt in the rear of the point at which the winding is effected, of an exhaust apparatus coöperative with the upper run of the belt at a point immediately in the rear of that at which the wrapper begins to wind around the filler-rod and adapted to maintain the wrapper in engagement with said run.
- 10 17. The combination, with wrapper-carrying means, of means for shaping and spirally wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having a plurality of circuits of perforations and wrapper-winding means coöperative with said belt and adapted to wind the wrapper spirally around the filler-rod and located over the belt in the rear of the point at which the winding is effected; and an exhaust apparatus coöperative with the upper run of the belt at a point immediately in the rear of that at which the wrapper begins to wind around the filler-rod and adapted to maintain the wrapper in engagement with said run.
- 15 18. The combination, with means for shaping and wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having transverse openings therethrough; of a gravitating wrapper-reel and an exhaust apparatus, both coöperative with the upper run of the belt and adapted, respectively, to press and to draw the wrapper against the upper run of the belt to maintain the wrapper in engagement with said run.
- 20 19. The combination, with wrapper-carrying means, of means for shaping and spirally wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having transverse openings therethrough and wrapper-winding means coöperative with said belt and adapted to wind the wrapper spirally around the filler-rod and located over the belt in the rear of the point at which the winding is effected; and a suction-box supporting the upper run of the belt and having openings communicating with those in said belt at a point immediately in the rear of that at which the wrapper begins to wind around the filler-rod, for maintaining the wrapper in engagement with said run.
- 25 20. The combination, with wrapper-carrying means, of means for shaping and spirally wrapping a continuous filler-rod, said means including an endless wrapper-conveying belt having transverse openings therethrough and wrapper-winding means coöperative with said

belt and adapted to wind the wrapper spirally around the filler-rod and located over the belt in the rear of the point at which the winding is effected; and a suction-box supporting the upper run of the belt and having guides for preventing lateral movement of said run and also having openings communicating with those in said belt at a point immediately in the rear of that at which the wrapper begins to wind around the filler-rod, for maintaining the wrapper in engagement with said run.

21. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of former-rolls disposed obliquely to said belts; wrapper-feeding means; and a wrapper-guide between said rolls and belts and disposed obliquely across said belts.

22. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of former-rolls disposed obliquely to said belts; wrapper-feeding means; and a wrapper-guide between said rolls and belts and disposed obliquely across said belts and having its receiving end located substantially at the point where the wrapper is applied to the filler.

23. The combination with a wrapper-conveying belt, of a filler-conveying belt having its carrying-run in juxtaposition with the carrying-run of the wrapper-conveying belt and also having the end of its carrying-run in the rear of that of the wrapper-conveying belt; former-rolls disposed obliquely to said belts; wrapper-feeding means; and a wrapper-guide between said rolls and belts and disposed obliquely across said belts at the end of the carrying-run of the filler-conveying belt.

24. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of former-rolls disposed obliquely to said belts; filler-feeding means; and a filler-shaper between said rolls and belts and disposed obliquely across said belts.

25. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of former-rolls disposed obliquely to said belts; wrapper-feeding means; and a combined filler-shaper and wrapper-guide between said rolls and belts and disposed obliquely across said belts.

26. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of former-rolls disposed obliquely to said belts; wrapper-feeding means; and a combined filler-shaper and wrapper-guide between said rolls and belts and disposed obliquely across said belts and having a receiving edge in contact with said belts and a curved shaper extending from said receiving edge to one of the former-rolls.

27. The combination, with a filler-conveying belt movable lengthwise of the former-rolls, of a former device coöperative with said belt and embodying a carrier and a pair of



coacting rotary former-rolls mounted on said carrier, one of which rolls is shiftable toward and from said belt.

28. The combination, with a filler-conveying belt movable lengthwise of the former-rolls, of an oscillatory former device coöperative with said belt and embodying a carrier and a pair of coacting rotary former-rolls mounted on said carrier, one of which rolls is oscillatory toward and from said belt.

29. The combination, with a filler-conveying belt movable lengthwise of the former-rolls, of an oscillatory former device coöperative with said belt and embodying a carrier and a pair of coacting rotary former-rolls mounted on said carrier, one of which rolls is oscillatory toward and from said belt, and the other of which rolls has its axis coincident with the axis of oscillation of the former device.

30. The combination, with a filler-conveying belt movable lengthwise of the former-rolls, of a former device coöperative with said belt and embodying a carrier and a pair of coacting rotary former-rolls mounted on said carrier, one of which rolls is shiftable toward and from said belt; and a catch for holding said shiftable roll in its working position.

31. The combination, with a filler-conveying belt movable lengthwise of the former-rolls, of a former device coöperative with said belt and embodying a carrier and a pair of coacting rotary former-rolls mounted on said carrier, one of which rolls is shiftable toward and from said belt; and a pair of catches at opposite ends of said shiftable former-rolls, for holding the latter in its working position.

32. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and a presser device between said rolls and the belt and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

33. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and a presser-roll between said former-rolls and the belt and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

34. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and a presser-roll between said former-rolls and the belt and having a flared end adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

35. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and a presser device between said rolls and the belt and movable toward and from one of said rolls and adapted to press the inner edge of the wrapper against the filler dur-

ing the winding of the wrapper around the filler.

36. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and a vibratory presser device between said rolls and the belt and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

37. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt, one of said rolls having a reduced portion forming an opening between the rolls; and a vibratory presser device working in said opening and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

38. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt, one of said rolls having a reduced portion forming an opening between the rolls; a rock-arm working in said opening; and a presser-roll carried by said rock-arm between the former-rolls and the belt and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler.

39. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt, one of said rolls having a reduced portion forming an opening between the rolls; a presser device working in said opening and adapted to press the inner edge of the wrapper against the filler during the winding of the wrapper around the filler; and a cam-wheel and spring for vibrating said presser device toward and from one of the former-rolls.

40. The combination with an endless belt, of filler-feeding means; wrapper-feeding means; coacting former-rolls disposed obliquely to the belt; and paste-applying means having a discharge-nozzle substantially at the meeting-point of the edges of the wrapper.

41. The combination with a wrapper-conveying belt, of filler-feeding means; wrapper-feeding means; a paste-reservoir; and paste-feeding mechanism yieldingly connected with said paste-reservoir and having a discharge-nozzle for applying paste to the outer edge of the wrapper.

42. The combination with a wrapper-conveying belt, of filler-feeding means; wrapper-feeding means; a paste-reservoir; and paste-feeding mechanism yieldingly connected with said paste-reservoir and adjustable toward and from the wrapper to bring its discharge-nozzle into position for applying paste to the outer edge of said wrapper.

43. The combination, with a wrapper-feeding belt, of filler-feeding means; wrapper-feeding means; paste-feeding mechanism embodying a discharge-nozzle, for applying paste to the outer edge of the wrapper, and a ro-



tary toothed feeder immersed in the paste and operative for forcing the paste through said discharge-nozzle; a driver for said feeder; and means for coupling and uncoupling said feeder and driver.

44. The combination, with a wrapper-feeding belt, of filler-feeding means; wrapper-feeding means; a paste-reservoir; paste-feeding mechanism embodying a discharge-nozzle, for applying paste to the outer edge of the wrapper, and a rotary toothed feeder immersed in the paste and operative for forcing the paste through said discharge-nozzle; a driver mounted on said feeder; and a coupling member splined on said feeder and shiftable into and out of engagement with the driver.

45. The combination with a plurality of former-rolls divergent from a determined point in one direction and parallel from said point in the opposite direction, of filler-feeding means; wrapper-feeding means; and filler-conveying and wrapper-conveying belts having their carrying-runs side by side, the former running obliquely beneath the divergent rolls and the latter obliquely beneath the parallel rolls.

46. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of filler-feeding means; wrapper-feeding means; a former-roll extending obliquely across both of said belts; a second former-roll extending across the wrapper-conveying belt only, in parallelism with said first-mentioned roll; and a third former-roll extending from the receiving end of the second roll across the filler-conveying belt obliquely to the first-mentioned roll.

47. The combination with an oscillatory former device embodying a plurality of former-rolls divergent from a determined point in one direction and parallel from said point in the opposite direction, of filler-feeding means; wrapper-feeding means; and filler-conveying and wrapper-conveying belts having their carrying-runs side by side, the former running obliquely beneath the divergent rolls and the latter obliquely beneath the parallel rolls.

48. The combination with an endless belt, of filler-feeding means; and coacting, longitudinally-grooved rotary former-rolls coöperative with said belt, and disposed obliquely thereto.

49. The combination with filler-conveying and wrapper-conveying belts having their carrying-runs side by side, of a main driver carrying said filler-conveying belt; a driven shaft carrying the wrapper-conveying belt; a reducing-gear train between said driver and the driven shaft, for advancing the wrapper-conveying belt at a slower speed than the filler-conveying belt; a second driven shaft having its axis parallel with those of the driver and the first driven shaft; reducing-gearing between said driven shafts; a pair of

worm-gears on the second driven shaft; a pair of coacting former-rolls disposed obliquely to the belts and coöperative therewith; and worm-gears carried by said former-rolls and meshing with the worm-gears on the second shaft, for rotating said former-rolls in the same direction.

50. The combination with filler-feeding and wrapper-feeding means, of filler-forming and wrapper-applying means coöperative therewith for forming a continuous cigarette and rotating the same at a determined rate of speed; and winding mechanism for receiving the finished continuous cigarette and accelerating the rotation thereof.

51. The combination with filler-feeding and wrapper-feeding means, of filler-forming and wrapper-applying means coöperative therewith for forming a continuous cigarette and advancing the same at a determined rate of speed; and actuating means for receiving the finished continuous cigarette and accelerating the advance thereof.

52. The combination with filler-feeding and wrapper-feeding means, of filler-forming and wrapper-applying means coöperative therewith for forming a continuous cigarette and rotating and advancing the same at determined rates of speed; and winding mechanism for receiving the finished continuous cigarette and accelerating the rotation and the advance thereof.

53. The combination with filler-feeding and wrapper-feeding means, of filler-forming and wrapper-applying means coöperative therewith for forming a continuous cigarette and advancing the same at a determined rate of speed; and a plurality of rotary feed-rolls surrounding and engaging the finished continuous cigarette, and operative for accelerating the advance thereof.

54. The combination with filler-feeding and wrapper-feeding means, of filler-forming and wrapper-applying means coöperative therewith for forming a continuous cigarette and rotating and advancing the same at determined rates of speed; and orbitally-revoluble rotary feed-rolls surrounding and engaging the finished continuous cigarette, for accelerating the rotation and the advance thereof.

55. The combination with filler-feeding and wrapper-feeding means, of a former device coöperative therewith for forming a continuous cigarette and rotating the same at a determined rate of speed; a rotary carrier encircling the finished continuous cigarette; feed-rolls supported on said carrier and surrounding and engaging the continuous cigarette; and a gear-train connecting the rotary carrier with the former device, for revolving the feed-rolls to accelerate the rotation of the continuous cigarette.

56. The combination with filler-feeding and wrapper-feeding means, of a former device coöperative therewith for forming a continuous cigarette and rotating and advancing the



same at determined rates of speed; a rotary carrier encircling the finished continuous cigarette; feed-rolls supported on said carrier and surrounding and engaging the continuous cigarette; and a gear-train connecting the rotary carrier and the feed-rolls with the former device, for revolving and rotating said feed-rolls to accelerate the rotation and the advance of the continuous cigarette.

57. The combination with filler-feeding and wrapper-feeding means, of a former device coöperative therewith for forming a continuous cigarette and rotating and advancing the same at determined rates of speed; a rotary carrier encircling the finished cigarette; a spiral crown-gear concentric with said rotary carrier; feed-rolls supported on said carrier and surrounding and engaging the continuous cigarette; pinions carried by said rolls and in mesh with said crown-gear; and a gear-train connecting the crown-gear and the rotary carrier with the former device, for rotating said crown-gear at a slower rate of speed than the rotary carrier and for revolving and rotating the feed-rolls to accelerate

the rotation and the advance of the continuous cigarette.

58. The combination with filler-feeding and wrapper-feeding means, of a former device coöperative therewith for forming a continuous cigarette and rotating and advancing the same at determined rates of speed; a rotary carrier encircling the finished continuous cigarette; a spiral crown-gear concentric with, and supported by, the rotary carrier; feed-rolls supported on said carrier and surrounding and engaging the continuous cigarette; pinions carried by said rolls and in mesh with said crown-gear; and a gear-train connecting the crown-gear and the rotary carrier with the former device, for rotating said crown-gear at a slower rate of speed than the rotary carrier and for revolving and rotating the feed-rolls to accelerate the rotation and the advance of the continuous cigarette.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,  
GEO. A. HOFFMAN.