

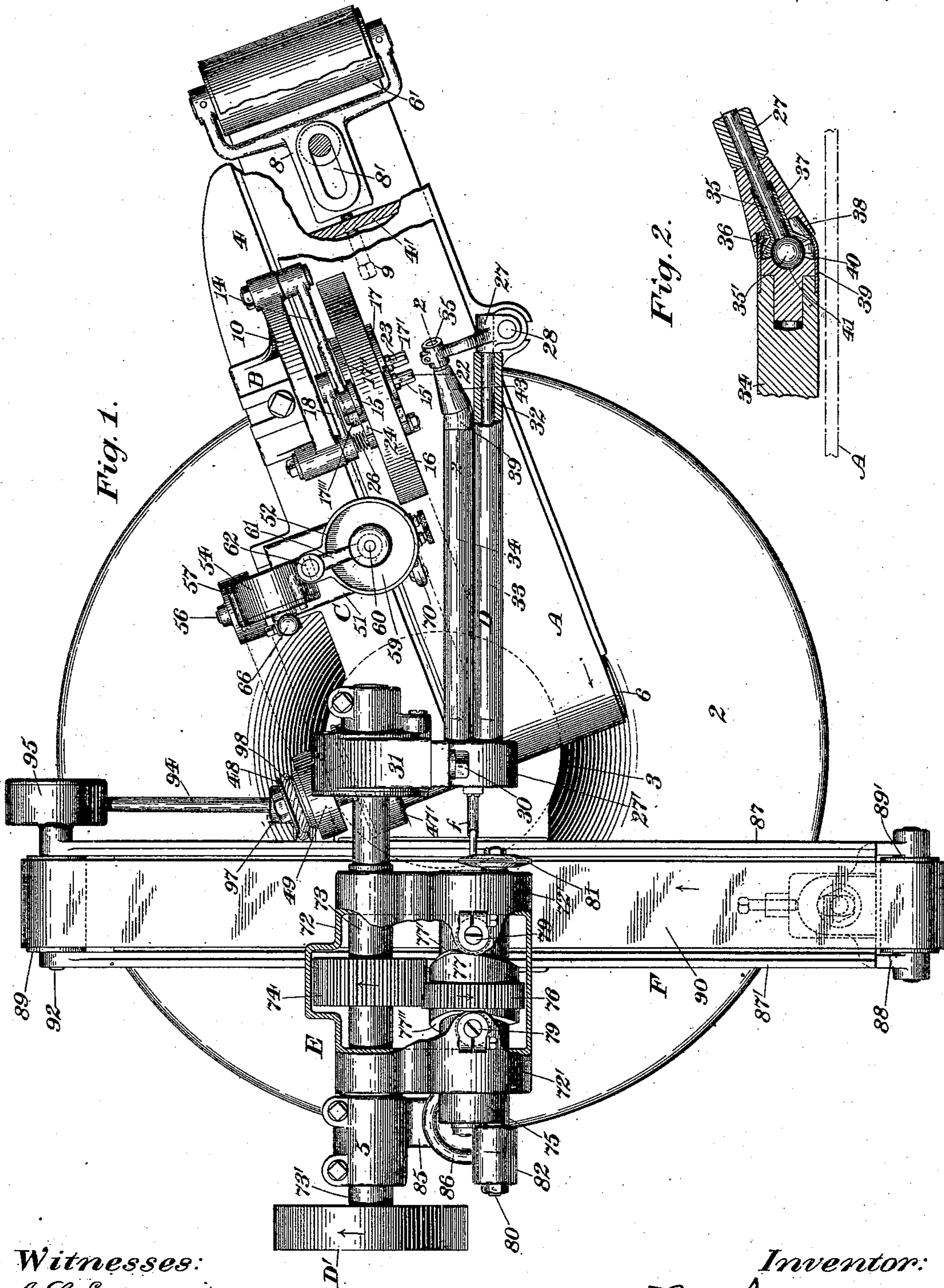
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7 Sheets—Sheet 1.

F. H. RICHARDS.
CIGARETTE MACHINE.

No. 572,375.

Patented Dec. 1, 1896.



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

Inventor:
F. H. Richards.

(No Model.)

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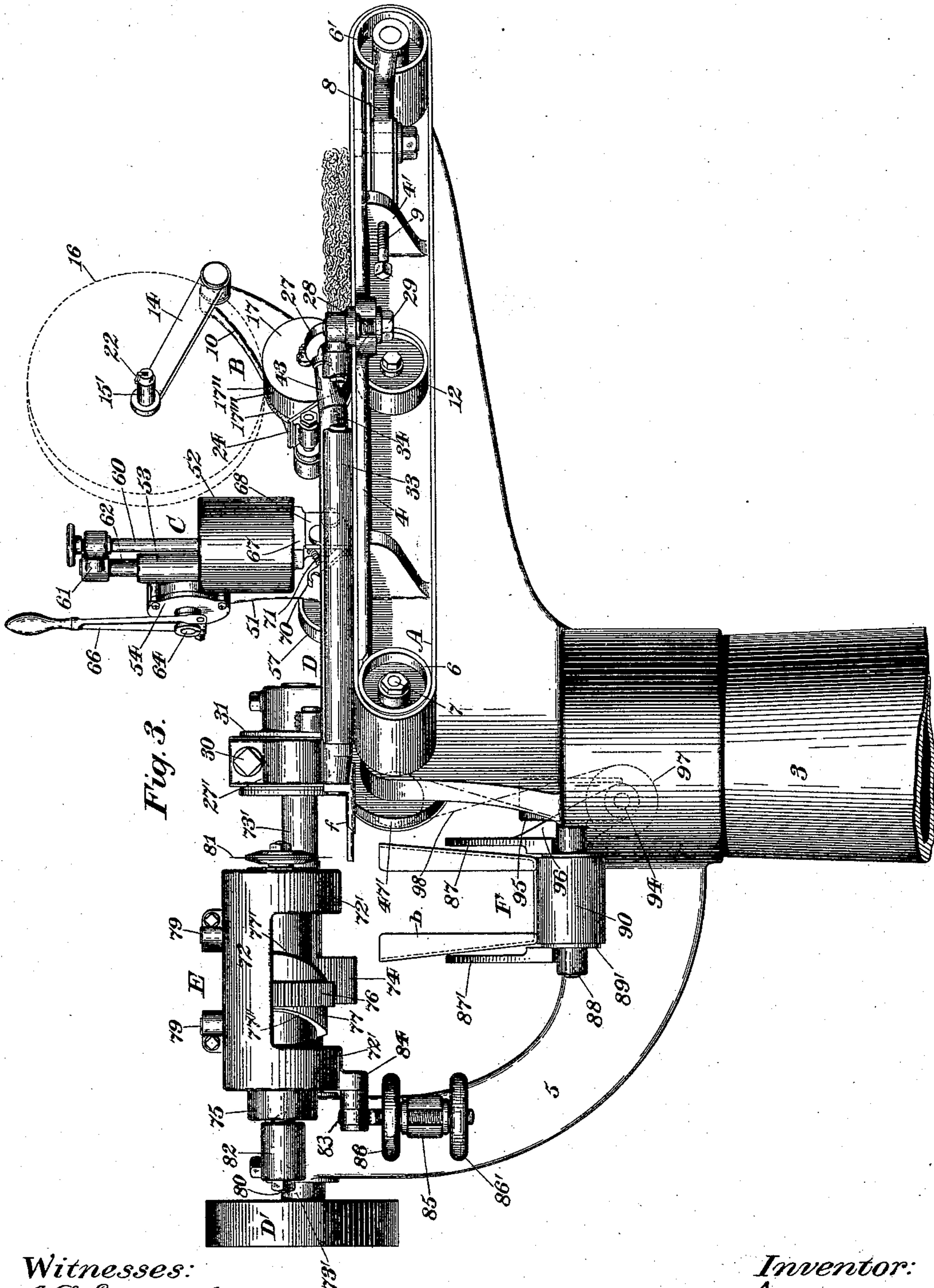


Fig. 3.

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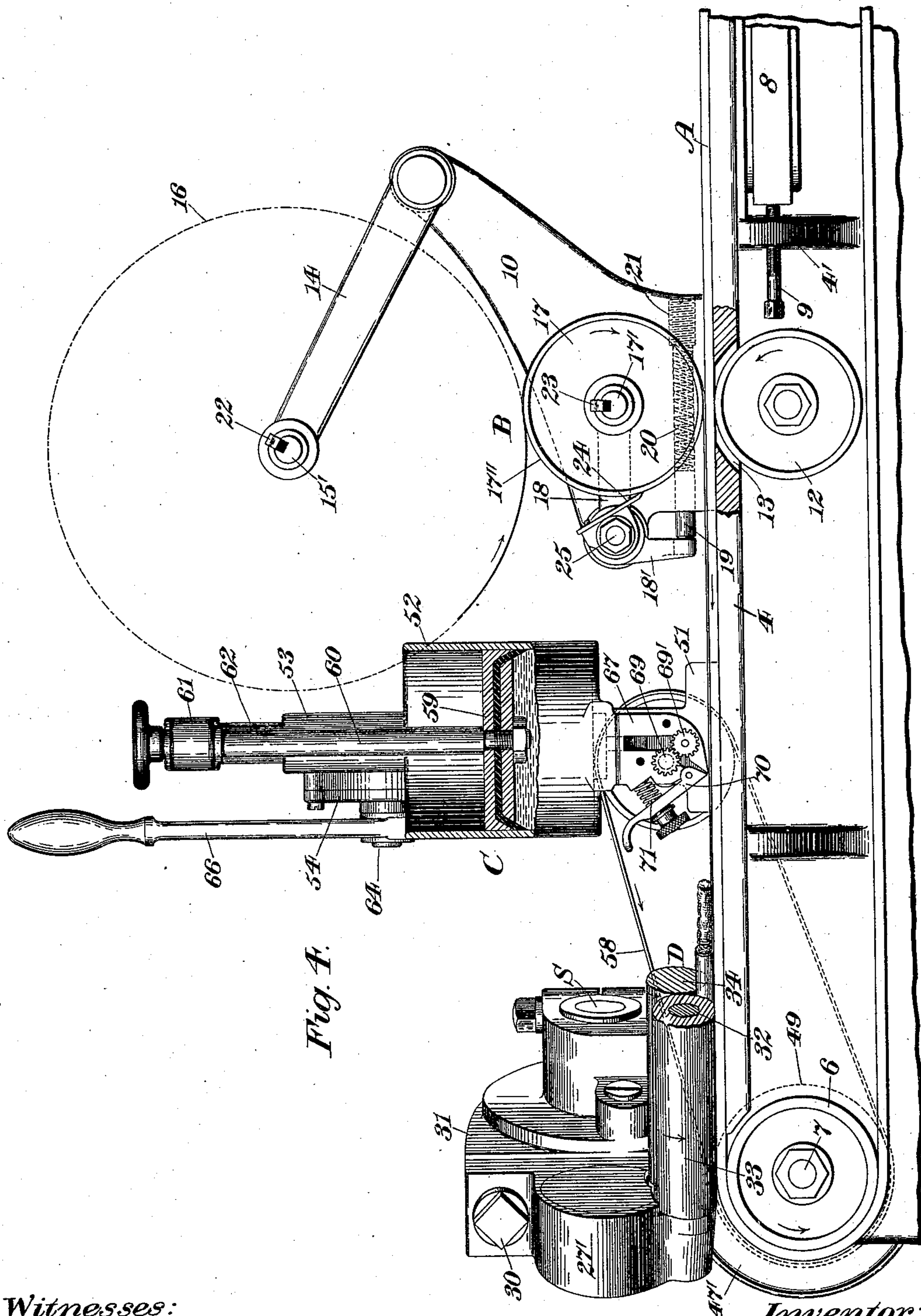


Fig. 4.

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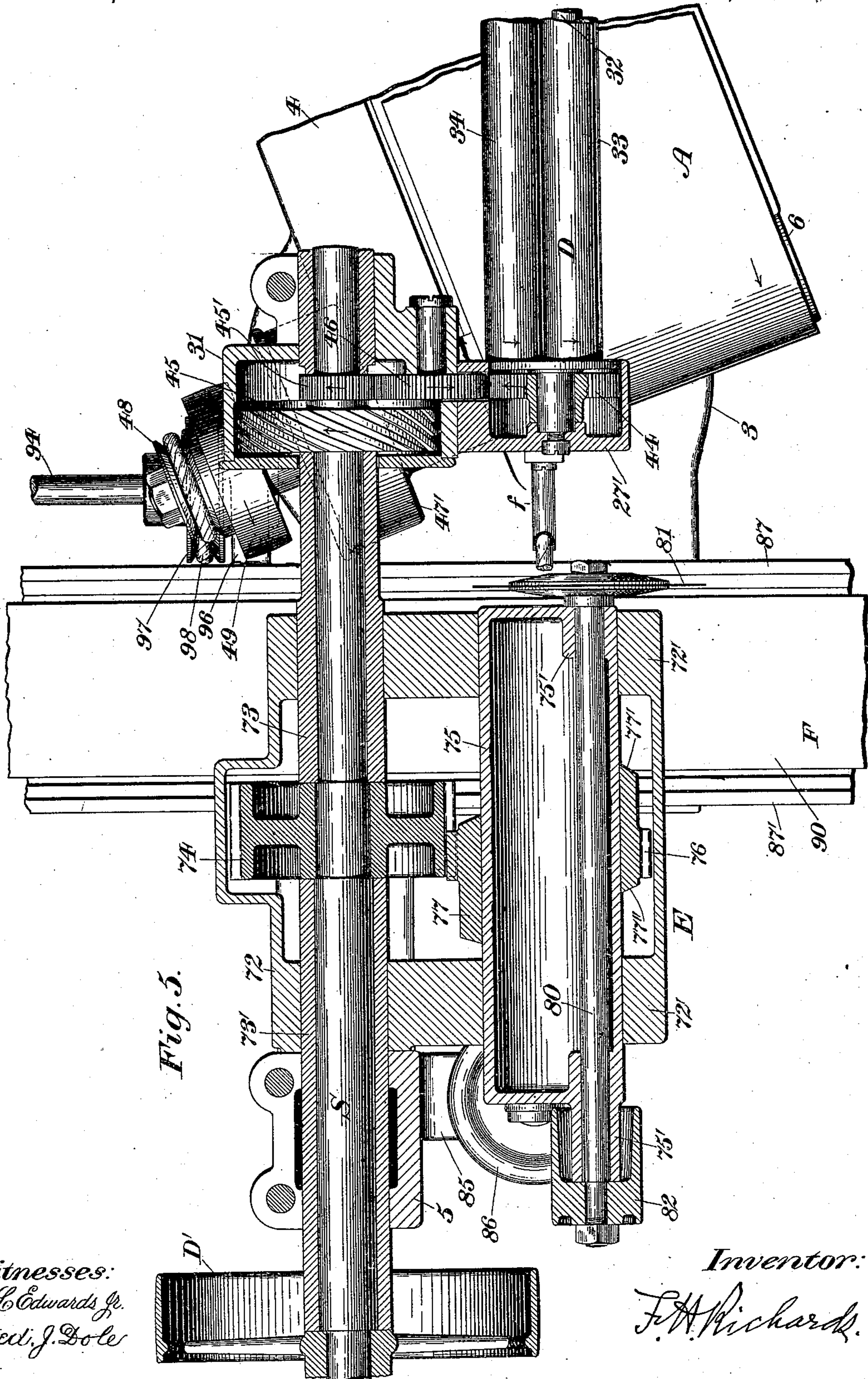
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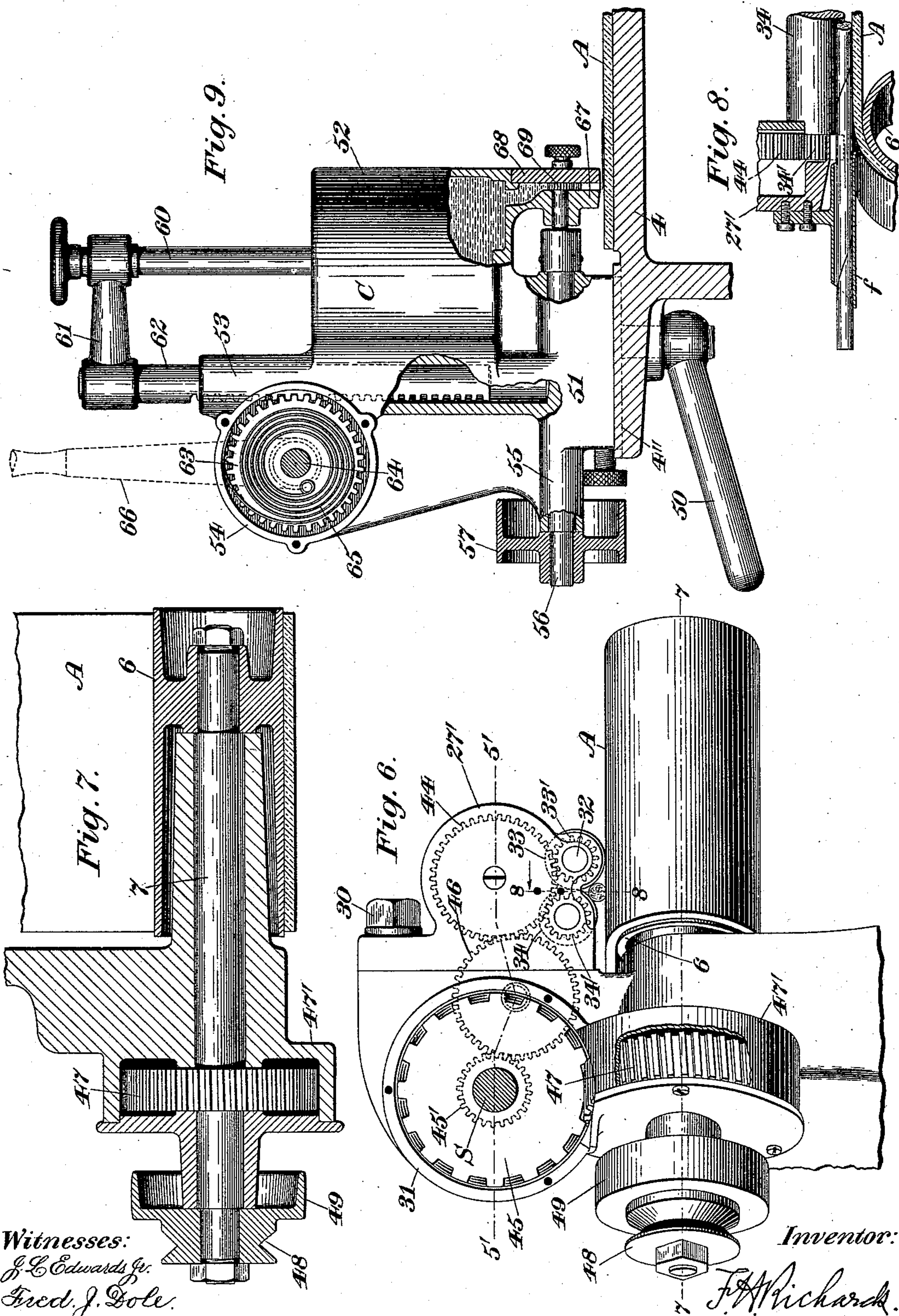
(No Model.)

7 Sheets—Sheet 5.

F. H. RICHARDS.
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No. 572,375.

Patented Dec. 1, 1896.



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(No Model.)

7 Sheets—Sheet 6.

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Patented Dec. 1, 1896

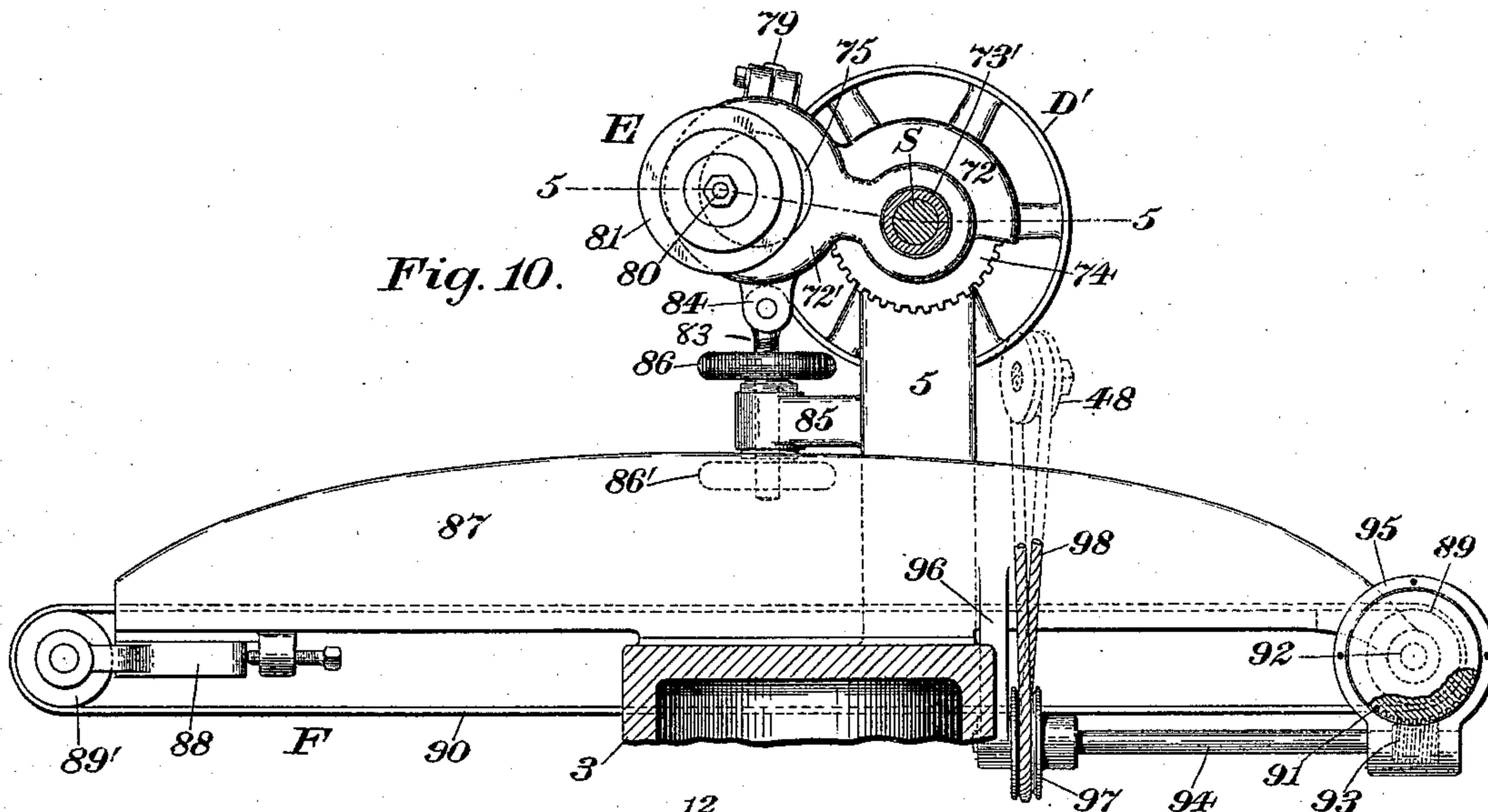


Fig. 10.

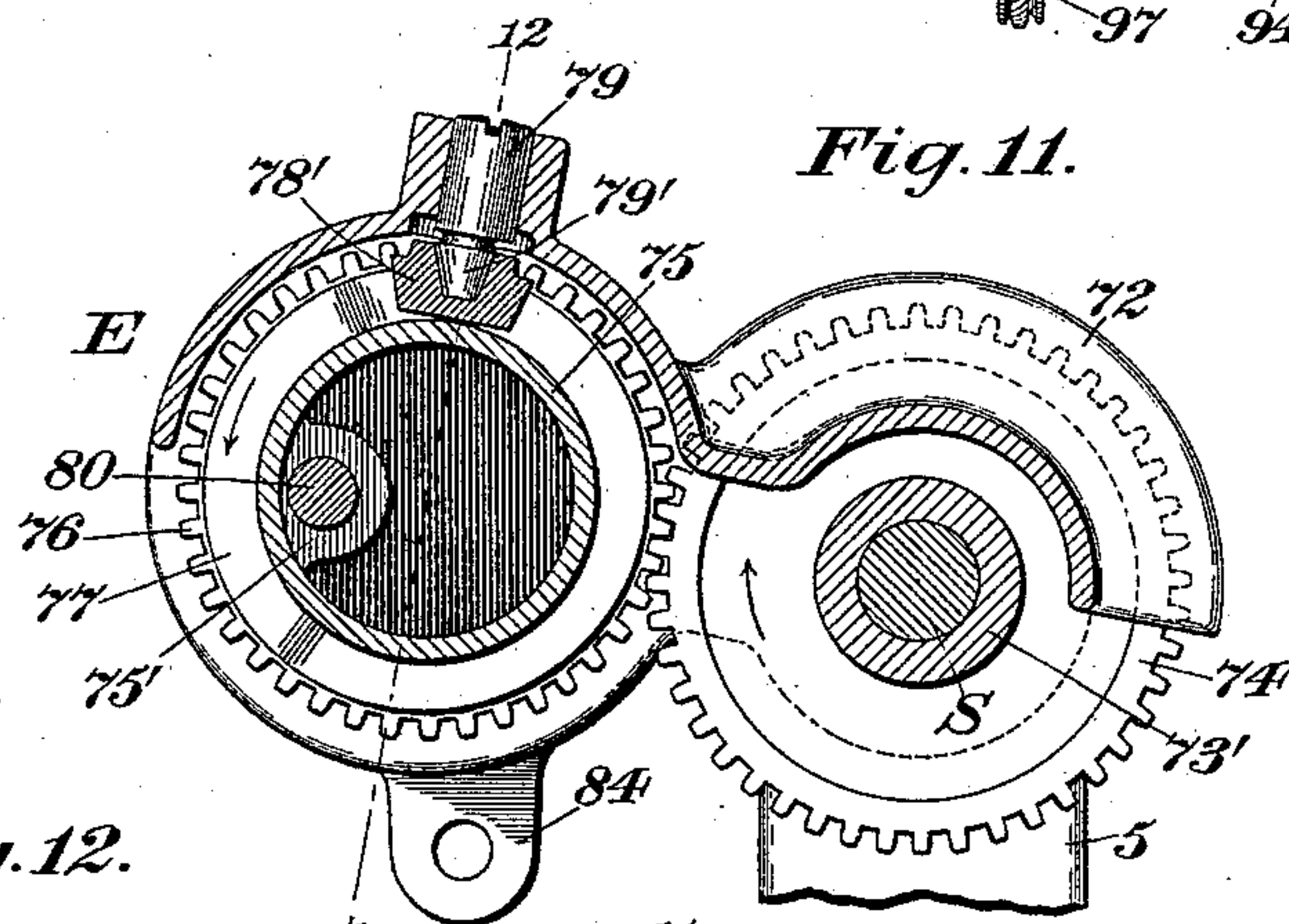
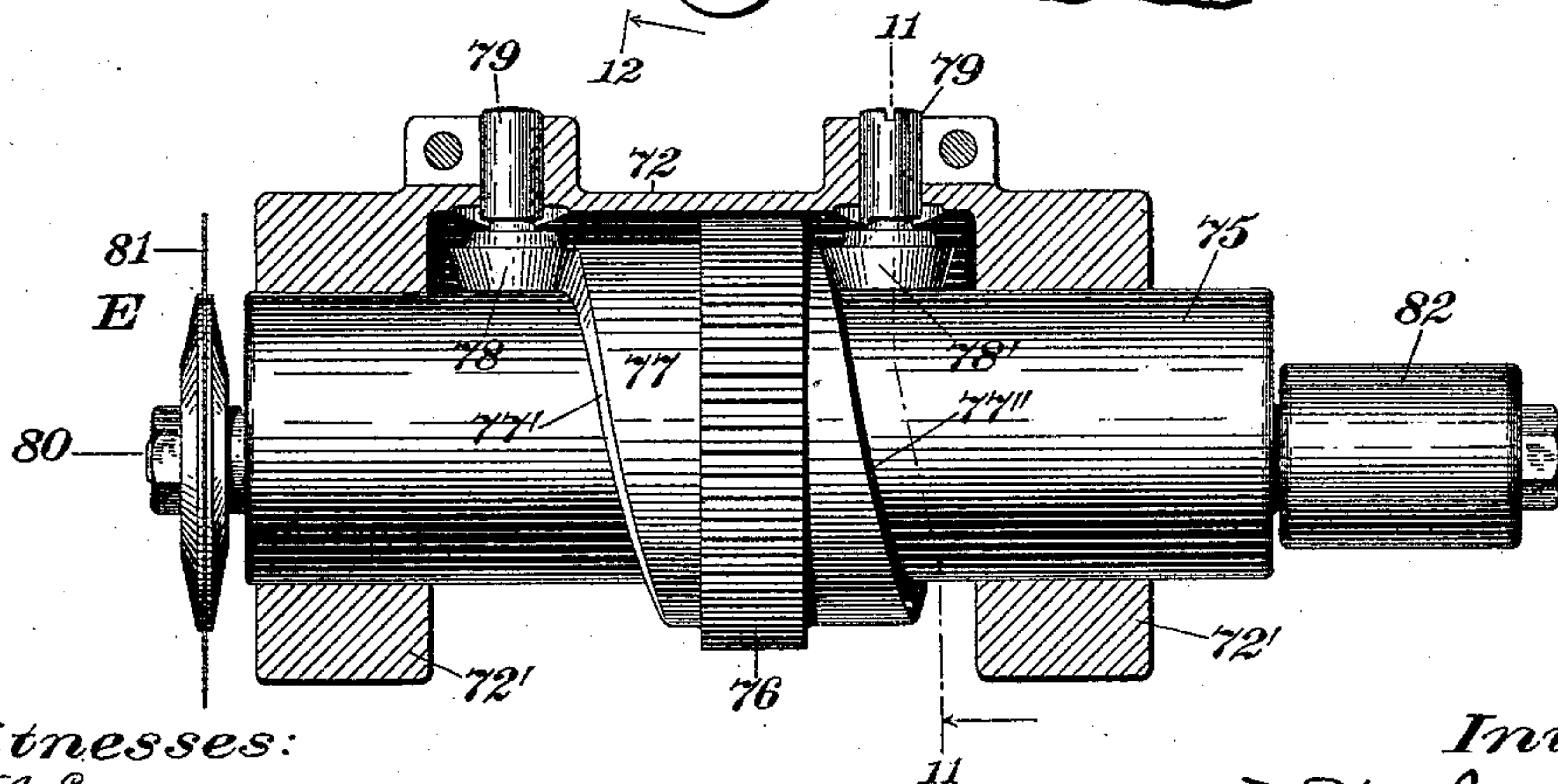


Fig. 11.

Fig. 12.



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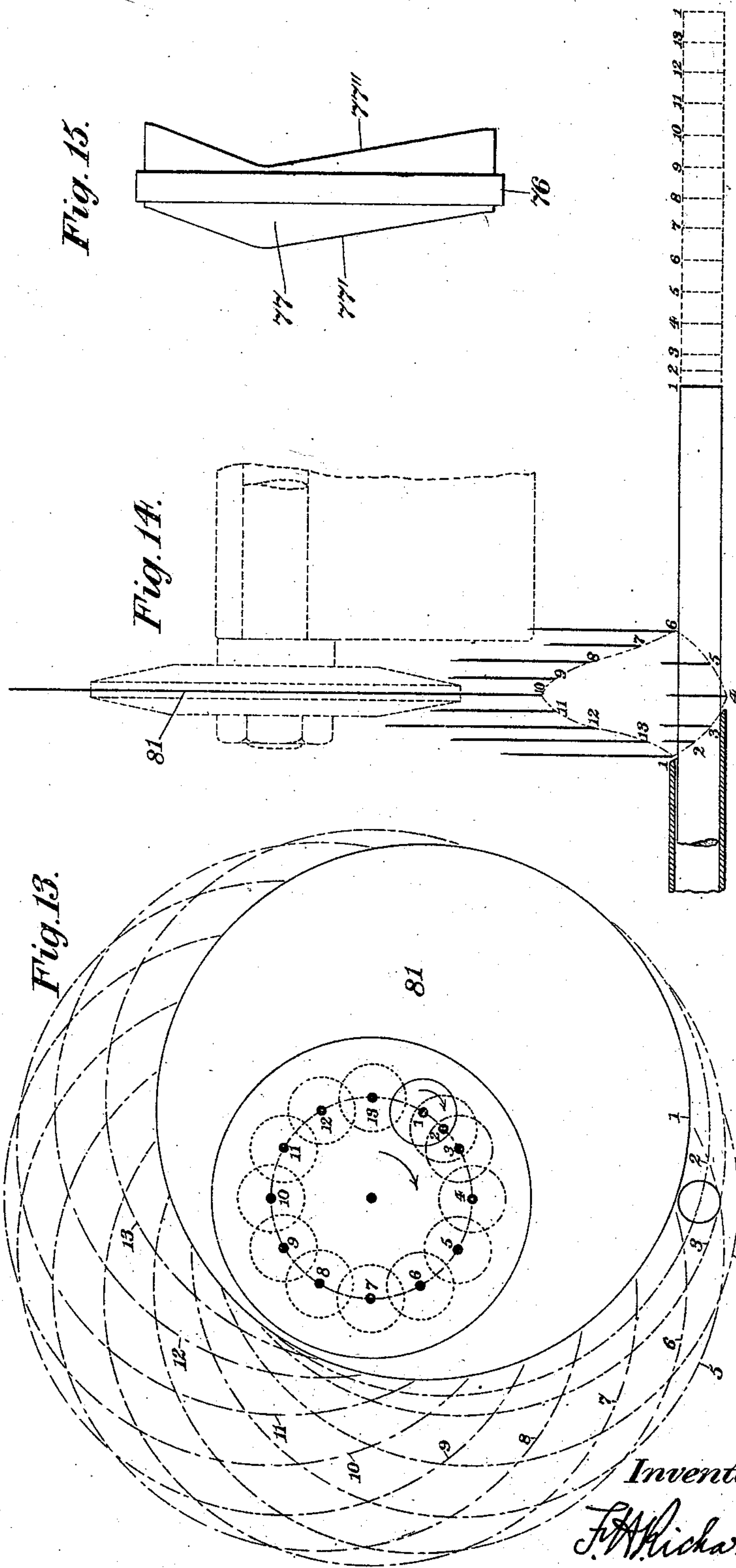
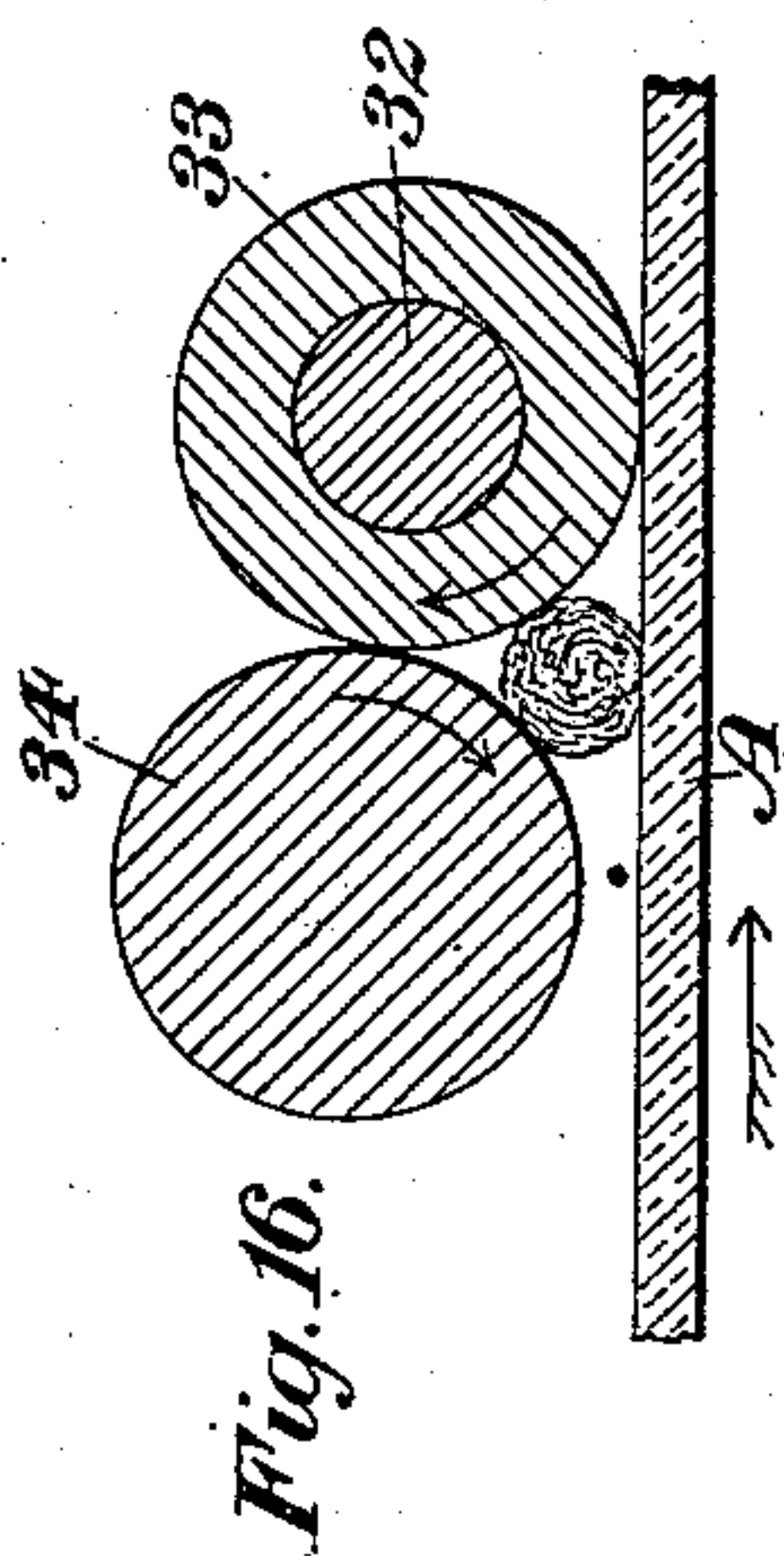
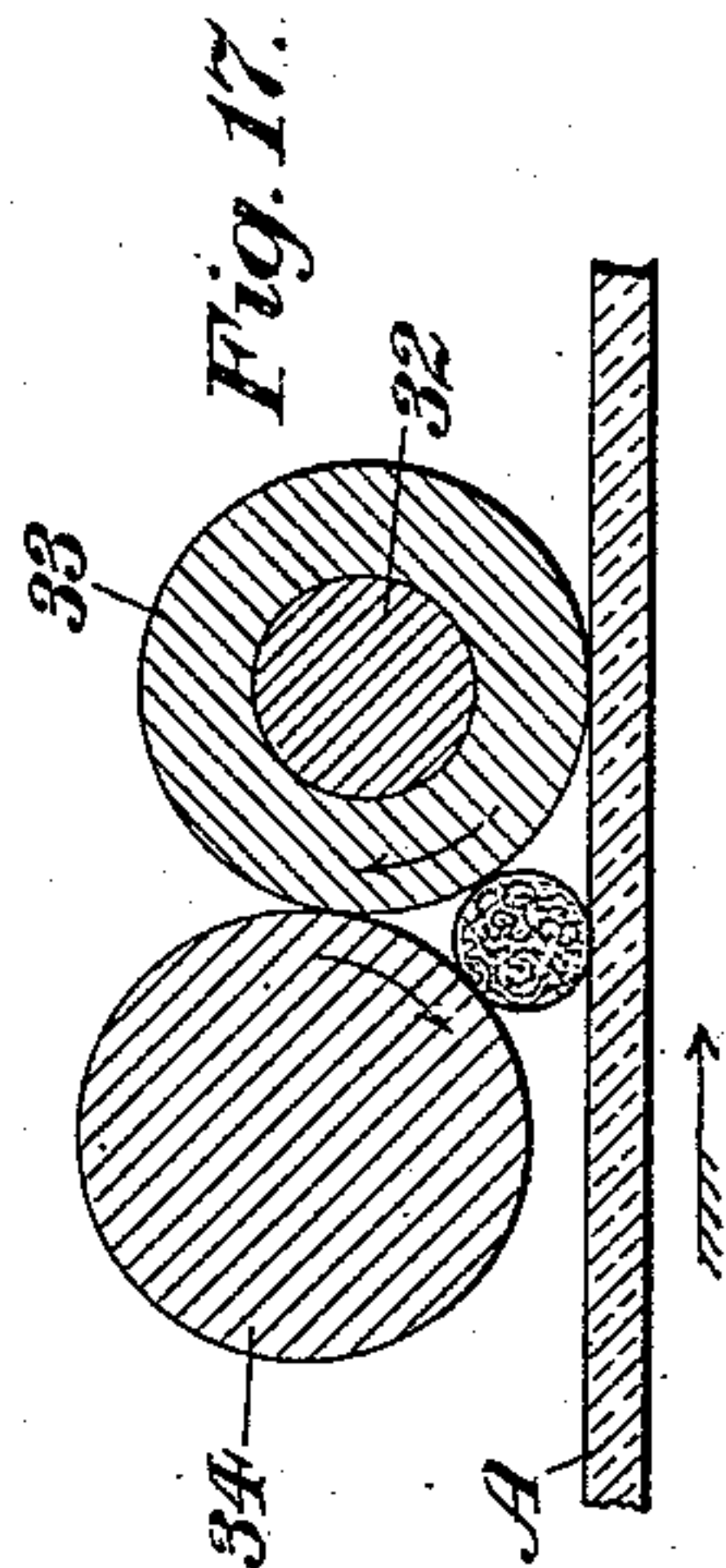
(No Model.)

7 Sheets—Sheet 7.

F. H. RICHARDS.
ROD CUTTING APPARATUS.

No. 572,375.

Patented Dec. 1, 1896.



UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

CIGARETTE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 572,375, dated December 1, 1896.

Application filed June 1, 1896. Serial No. 593,692. (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 and for severing said body into short lengths to produce cigarettes.

It is one of the main objects of my invention to construct a machine of this type which shall be especially adapted for the manufacture of cigarettes having each a filler of tobacco and also a wrapper of suitable material; and for the purpose of accomplishing this object my invention contemplates the provision of means so constructed and organized that a continuous wrapper may be fed into the machine and wrapped around a continuous filler or tobacco rod, shaped in the usual manner by suitable former-rolls or their equivalents, this operation being effected without creating an undue strain upon the moving wrapper-strip and while the same is positively advanced and controlled during its feed movement.

Another important object of my invention is the provision of suitable filler-forming and wrapper-applying means especially adapted to cooperate with feeding devices suitable for controlling a continuous strip or wrapper.

As it is obvious that during the advancing movement of a continuous cigarette-body the completed cigarettes are liable to be damaged when severed from the continuous body, unless the same is properly supported during the cutting operation, I find that the best results may be obtained by imparting to a suitable cutter during the cutting period an advancing movement in unison with the advance of the completed cigarette-body; and hence it is another object of my invention to provide a cutting device which shall cut off the cigarettes by a movement transversely to a completed cigarette-body while the cutter is advancing in unison with the movement of the said body.

A machine suitable for forming a continu-

ous cigarette-body in the manner before described embodies as its essential features means for feeding tobacco to the conveyer; 55 a conveyer for carrying the tobacco to the filler-forming means or former-rolls; wrapper-holding means, such as a reel, of suitable construction for supplying a continuous strip or wrapper to the wrapper-applying 60 means; means for applying a suitable adhesive or paste to one edge of the continuous wrapper; filler-forming and wrapper-applying means, such as former-rolls, for forming a continuous filler as the tobacco is presented 65 to said rolls by the action of the conveyer and for wrapping the continuous strip or wrapper around the filler as the latter is formed; a former-tube having its delivery end shaped so as to support the cigarette-body during 70 the operation of severing a cigarette therefrom; a cutter movable transversely to the continuous cigarette-body and having an advancing movement in unison therewith, and a cigarette-conveyer in position for receiving 75 and removing the severed cigarettes as they are cut from the said stock or body.

In the drawings accompanying and forming part of this application, Figure 1 is a plan view of a cigarette-machine constructed in 80 accordance with my present invention, parts being broken away to illustrate more clearly the details thereof. Fig. 2 is an enlarged detail sectional view of a portion of the filler-forming means, the section being taken in 85 line 2 2, Fig. 1. Fig. 3 is a view, partly in side elevation and partly in perspective, of the machine shown in Fig. 1 with parts broken away. Fig. 4 is an enlarged detail side elevation of the several mechanisms shown in 90 perspective in Fig. 3 with parts broken away to illustrate more clearly the details thereof. Fig. 5 is a substantially horizontal longitudinal section, on an enlarged scale, of a portion of the machine, the section being taken in 95 line 5 5, Fig. 10, and 5' 5', Fig. 6. Fig. 6 is an enlarged detail view, partly in perspective and partly in elevation, illustrating the gear-train for actuating the tobacco-conveyer and the former-rolls, (hereinafter more particularly referred to.) Fig. 7 is a horizontal section of a portion of the same, the section being taken in line 7 7, Fig. 6. Fig. 8 is a detail sectional view illustrating the former- 100

tube and adjacent parts, the section being taken in line 8 8, Fig. 6, looking in the direction of the arrow. Fig. 9 is a broken sectional side elevation of the paste-applying means for applying an adhesive or paste to one edge of a wrapper-strip. Fig. 10 is a broken sectional elevation of the cigarette-conveyer and its coöperative parts as seen from the right in Fig. 1. Fig. 11 is a transverse section of the cutter mechanism, the section being taken in line 11 11, Fig. 12, looking in the direction of the arrow. Fig. 12 is a longitudinal section of a portion of the same, the section being taken in line 12 12, Fig. 11, looking in the direction of the arrow. Fig. 13 is a diagrammatic view illustrating a series of positions of a revoluble rotary cutter for cutting cigarettes from the continuous stock or body. Fig. 14 is a corresponding edge view showing the cutter in its successive positions relatively to the cigarette-body and the former-tube during a complete revolution of the cutter. Fig. 15 is a view of the cutter-actuating cam developed. Figs. 16 and 17 are detail sectional views illustrating successive steps in the formation of a continuous cigarette-body.

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 is represented comprising a base 2, supporting a hollow column on which are carried a table 4 and a bracket or extension 5, on which table and bracket the principal operating mechanisms are supported.

The machine which is illustrated in the drawings of the present case is represented embodying a plurality of coördinate devices or mechanisms, the main portions of the machine being a tobacco-conveyer, such as 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 cigarette-conveying mechanism, such as F.

The table 4 is illustrated disposed substantially obliquely relatively to the main driving-shaft, hereinafter described, and forming a carrier for the upper run of the endless conveyer A. This conveyer is preferably in the form of an endless belt, and is shown herein carried at its opposite ends around a pair of rollers or drums 6 and 6', the former being represented as carried for rotation with a shaft 7, while the latter is illustrated journaled in an adjustable yoke 8, this yoke being shown adjustable by means of a screw 9, working in a bracket 4' of the table 4, the yoke being represented as clamped in place when adjusted by means of a clamping-bolt passed through a slot 8' in the yoke and held in place in a well-known manner.

The wrapper-feeding means (designated in a general way by B) is shown in the drawings supported by a frame 10, rising from the table 4, adjacent to the yoke 8, and adjustably

secured to said table, as by means of a clamping bolt and nut (see Fig. 1) and as also partially sustained by a conveyer-supporting roll 12, carried for rotation by the table 4 immediately beneath an opening 13 in said table, the conveyer-supporting portion of this roll being represented in Fig. 4 as flush with the top of said table. The wrapper-carrier proper is preferably in the form of a roll-carrier, such as the arm 14, and this arm is shown having at its free end a gravitating wrapper-reel 15, adapted for carrying a continuous wrapper-roll 16 and for causing said wrapper-roll to rest against and be supported by a feed-roll hereinafter described.

Directly beneath the wrapper-reel I have illustrated at 17 a wrapper feed-roll supported for rotation in the free end of an arm, such as 18, carried for oscillation at the end of the frame 10 opposite that at which the arm 14 is supported, and this arm is represented as forming part of an angle-lever, the other arm of which is indicated at 18', extending in a downward direction toward the table 4, said feed-roll being driven by the conveyer-belt hereinafter described.

For the purpose of maintaining a normal minimum pressure of the wrapper feed-roll 17 against the upper face of the tobacco-conveyer A with which it coöperates, I prefer to employ a tension-regulating device, and this is illustrated herein (see Fig. 4) as comprising a sliding bolt 19, normally held in engagement with the end of the arm 18' of the angle-lever by means of a helical spring 20, controlled by an adjusting and retaining screw 21, the construction being such that any desired minimum tension may be exerted by this regulating device and a positive feeding action at all times thus assured, it being understood that this minimum pressure is increased by an amount equal to the gravitating action of the wrapper reel and the feed-roll 17.

The wrapper reel and feed-roll are preferably carried so as to be readily removable from the machine, and in the present case these are represented as mounted, respectively, on studs 15' and 17', secured, respectively, to the respective carrier-arms 14 and 18, the roll and the reel being also illustrated normally held in position by spring-catches 22 and 23, working in slots in the ends of said studs. (See Figs. 1 and 4.)

As before stated, it is one of the main objects of my present invention to provide feeding means suitable for controlling the movement of a continuous wrapper, and I have found it necessary to employ, in connection with the wrapper feed-roll, special devices for yieldingly, though positively, holding the continuous wrapper during its advancing movement and for preventing adhesion thereof to the surface of the roll. The wrapper feed-roll which I prefer to employ has yielding and rigid surfaces, respectively, encircling the same, the rigid surface being repre-

gear 44, and as having also a worm 45 for actuating the worm-gear on the shaft 7. It will be observed that the roll 34 is placed higher than the roll 33 in order that the wrapper may pass freely under said roll 34 and come into contact with the rotating surface of the lower roll 33, by which it is turned up and thereby caused to be wrapped spirally around the continuous filler or tobacco rod by the conjoint action of said rolls.

The conveyer A has been described as deriving its movement from the carrier 6, secured to the shaft 7, and this shaft is represented in the drawings (see Figs. 6 and 7) carrying a worm-gear 47, inclosed by a suitable case 47', which is preferably formed integral with the gear-case 31. This shaft 7 is also illustrated as operative for actuating the cigarette-conveyer F and the paste-applying means C, a driving-pulley being shown at 48 for imparting traveling movements to said conveyer, and a band-wheel being represented at 49 as operatively connected with the pasting mechanism.

The pasting mechanism represented at C is preferably removably and adjustably connected with the table 4, it being shown herein (see Fig. 9) as adjustable transversely to said table in a guideway 4'' and clamped in position by means of the lever-nut 50. The body portion of this pasting mechanism is designated in a general way by 51, and is illustrated embodying a paste reservoir or receptacle 52, a hollow stem 53, a gear-case 54, and a long bearing 55, having a journal therein for a driving-shaft. This shaft is represented at 56 carrying a band-wheel 57, operative for the band-wheel 49 on the shaft 7 by means of a belt 58. (See Fig. 4.) The paste-reservoir 52 is represented closed by a cap or plunger 59, attached to a stem 60, carried in the end of an arm 61, secured to a rack bar or rod 62, mounted for vertical reciprocation in the hollow stem 53. The teeth of this rack-bar are represented as meshing with the teeth of the spur-gear 63, supported on a spindle, such as 64, within the gear-case 54, a coil-spring being shown at 65, fastened at one end to the inner side of said gear-case and at its other end to said gear-wheel, for the purpose of gradually forcing the plunger 59 downward as the level of the paste or glue in the reservoir 52 is lowered. At the end of the spindle 64 a hand-lever 66 is illustrated for winding up said spring. As shown herein, this handle will swing through an arc of about one hundred and eighty degrees during the movement of the rack 62 from its uppermost to its lowermost position, and vice versa. The reservoir 52 is represented having a contracted outlet for the paste adjacent to one edge of the moving wrapper-strip, this outlet being shown formed by a depending lip 67 of the casing or frame 51, and a cap or plate 68 closing the side of said opening.

The shaft 56 is illustrated reduced at the end thereof opposite that which carries the

band-wheel 57 and having such reduced portion passed through the depending lip 67 and carrying at its end a pinion 69, which is shown in Figs. 4 and 9 as in mesh with a second pinion also rotatively carried by the lip 67, these two pinions being disposed in the outlet or passage from the reservoir 52 and serving as a rotary pump to force the paste down on the edge of the wrapper. For the purpose of regulating the thin stream of paste which is supplied to the edge of the wrapper I have shown at 70, as controlling the forward side of the mouth of the paste-outlet, a pivoted adjustable lip normally held in position by means of a spring-pressed adjusting device 71, which is represented as a spindle having a helical spring coiled therearound and also having a screw-threaded end carrying an adjusting-nut.

The cutter mechanism represented at E is illustrated as driven from the main shaft S and embodying a rotary cutter mounted for revolution on a rotary carrier deriving its movement from said shaft, the cutter also having an axial movement relatively to the former-tube with which it coöperates. In the present case the cutter is represented fixed against axial movement relatively to the rotary carrier on which it is mounted, while said carrier is shown supported for axial movement relatively to the frame in which it rotates. This frame is illustrated in the drawings (see Figs. 3 and 5) as a casing carried by the main shaft S, so as to have a swinging movement, the frame being designated herein by 72. This frame is not mounted directly on the shaft, but on the long sleeves 73 and 73', a main driving spur-wheel, such as 74, having a wide face, being secured directly to said shaft between such sleeves. The rotary carrier on which the cutter is mounted is illustrated herein as a hollow cylinder or drum, such as 75, carried for rotation in journal-openings in the arms 72' of the frame 72 and having a spur-gear 76, adapted to mesh with the teeth of the driving-gear 74. This drum 75 is adapted to reciprocate axially in parallelism with the shaft S, and is represented in the present case (see Figs. 3, 5, 12, and 15) having a cam 77 extending therearound, the cam-surfaces of which are shown at 77' and 77'', Fig. 12, substantially parallel and in constant contact with a pair of anti-friction-rolls 78 and 78', rotatively carried on pins 79', eccentrically located on a pair of studs 79, adjustably mounted in the top of the casing 72, (see Figs. 1 and 11,) so as to maintain said rolls in engagement with the working faces of the cam and permit adjustment of the rolls within the casing. It will be obvious that on the rotation of the gear 76 by the driving spur-gear 74 the drum 75 will be reciprocated back and forth during the rotation of said gear. At one side of the axis thereof the cylinder 75 is shown carrying at its opposite ends bearings 75', alined with each other and parallel with said axis, and in these bear-

sented at 17" (see Fig. 3) as extending almost entirely across the feed-roll, while the yielding surface is represented at 17'" as occupying but a narrow portion at one edge of the same. This yielding portion is advantageously formed by a rubber ring or band of comparatively soft rubber, which may be secured to the body of the roll in any suitable manner, as, for example, by grooving the periphery of the roll a sufficient depth to permit the insertion of said band and assure the retention thereof in its working position. Preferably this band will not be flush with the rigid surface of the roll, but will extend slightly beyond the same, so that when the wrapper-strip is between the wrapper-roll and the feed-roll it will be yieldingly engaged by the rubber band and less pressure will be exerted upon the major portion of the width of said wrapper, which is in contact with the rigid surface of said feed-roll, than upon the narrow portion of the edge of the strip, which is in contact with the rubber band. A very sensitive and positive feeding action results from this organization of the several wrapper-controlling feed members, as the strip is held yieldingly at one edge thereof and the tension upon the greater portion of the width of the wrapper is comparatively slight.

If a tobacco-wrapper, which is always of an adhesive character, is employed, it has a tendency to stick to the surface of the feed-roll and to deposit thereon a coating of viscous or gummy material, and for the purpose of removing this coating as fast as it may be applied and for preventing the sticking of the wrapper-strip to the surface of the feed-roll I have illustrated at 24 a scraper supported on a stud 25, on which the wrapper feed-roll carried by the angle-lever is represented as mounted for oscillation, this scraper being shown as normally held with its scraping edge in contact with the rigid surface of the feed-roll by means of a torsion or other suitable spring 26, encircling the stud 25. As the wrapper is paid off from the roll 16 by the feed-roll 17 the free end of the strip passes over and beneath said feed-roll and is advanced through the filler-forming and wrapper-applying means D, which is represented in the present case as comprising a device for forming the filler or tobacco rod and for applying the wrapper thereto and a supporting device for the cigarette-body. The filler-forming device is preferably a unitary structure removable bodily from and similarly insertible in its working position, and is shown comprising a carrier supporting a pair of rotary former-rolls, one of which is rotatively connected at one end with a conical roll, the free end of which is supported by said carrier. In the present case this carrier is represented as comprising a pair of end pieces, one of which is illustrated at 27 as a bracket removably clamped to the table, as by means of the clamping nut and bolt 28 and 29, while the opposite end piece is shown at 27' as an

auxiliary gear-case secured by means of a bolt 30 to a second or main gear-case 31. (See Fig. 4.)

A spindle or rod is represented at 32, supported at its opposite ends by the bracket 27 and the gear-case 27' and as carrying for rotation thereon a tubular former-roll 33. A second former-roll is shown at 34, carried at one end of said gear-case 31 and rotatively connected at its opposite end with a conical roll supported on a second spindle 35, (see Fig. 2,) carried at one end in the extreme upper end of the bracket 27, and having at its opposite end a spherical bearing, such as 35', adapted to form with suitable sockets in the coöperating ends of the conical roll and the former-roll 34 a universal connection between said rolls.

As before stated, the conical roll is mounted for rotation on the spindle 35 and is illustrated herein having a bevel-gear 36, carried at the end of a sleeve 37, seated in the journal-opening of the conical roll and forming a bushing. This conical roll also has a flared end, as shown at 38, adapted to inclose a corresponding cap 39 of the former-roll 34, which cap is shown having a contracted opening therein and secured to the end of said former-roll. The former-roll 34 is also illustrated having a bevel-gear 40, secured to the end thereof within the cap 39, the end of the former-roll being also represented as having a socket 41, encircled by the bevel-gear 40 and adapted to receive the spherical bearing 35'. The conical roll is also shown having a complementary socket for said spherical bearing, this socket being encircled by the flared end of said roll. It will be apparent that when the former-roll 34 is rotated the meshing bevel-gears will transmit the movement of said roll to the conical roll 43 and that the latter rotating in the direction of the arrow (see Fig. 1) will act upon the loose tobacco on the conveyer-belt as it is carried forward by the same and will, in connection with the companion roll 33, roll it over and over and form it into a continuous filler or tobacco rod.

The former device is shown in the drawings disposed obliquely to the path of movement of the conveyer A, and for the purpose of imparting rotative movements to the rolls of said device and thereby causing the shaping of the filler and the wrapping of the wrapper-strip around said filler these former-rolls are illustrated having secured thereto at the ends thereof remote from the conical roll and within the gear-case 27' a pair of pinions 33' and 34', operative in the same direction, as by means of a spur-gear 44. This spur-gear is represented as driven from a driving worm-shaft or main driving-shaft S, which is illustrated (see Fig. 5) journaled at its opposite ends in bearings in the extension or bracket 5 of the framework and in the gear-case 31, and as having a pinion 45', meshing with the teeth of an idler 46, which transmits the movement of said driving-shaft to the spur-

ings a cutter-shaft is illustrated at 80, carried for independent rotative movement while revolving with said cylinder. At the end of said shaft adjacent to the former-tube a rotary cutter is shown at 81, secured so as to be held against axial movement relatively to the cylinder 75, while the opposite end of said shaft is illustrated carrying a driving-pulley or band-wheel 82 for rotating said cutter and shaft independently of the revolution thereof. It should be understood that as this band-wheel is thus carried eccentrically relatively to the axis of rotation of the cylinder 75 it will usually be driven by a belt having a take-up device (not shown) controlling the same, so as to keep the belt in constant driving engagement with said band-wheel.

The relation of the movements of the cigarette-body and the cutter is clearly shown in Figs. 13 and 14. When the axis of the cutter is in any one of the orbital positions designated in Fig. 13 by 1 to 14, respectively, the lowermost point of the edge of the cutter will be in the corresponding one of the orbital positions designated at the left in Fig. 14 by 1 to 14, respectively, and at the same moment the extreme end of the cigarette-body will be in the corresponding one of the longitudinal positions designated at the right in Fig. 14 by 1 to 14, respectively.

As before stated, the frame 72 is adapted to swing about the shaft S, and this movement is illustrated herein (see Figs. 3 and 10) as controlled by an adjusting device 83, which in the form thereof herein shown comprises an eyebolt, the eye of which encircles a stud carried by a hanger 84, depending from the frame 72, the threaded portion of the bolt being represented as passed through a suitable opening in a bracket or arm 85, extending laterally from the main bracket 5, and as having a pair of adjusting-wheels 86 and 86' for raising and lowering said bolt, and thereby the frame, and for locking the bolt in its adjusted position. It will be evident that by means of this adjustment of said frame the cutter 81 may be brought to any desired position vertically relatively to the former-tube.

The former-tube which I prefer to employ is represented herein at f, constituting a supporting device for the continuous cigarette-body and as a part of the filler-forming and wrapper-applying mechanism, this former-tube being positioned so as to receive and confine the cigarette-body as it emerges from the former-rolls. (See Fig. 8.)

Owing to the fact that the cutter is especially designed and intended, as hereinbefore stated, to have an advancing movement in unison with the advance of the cigarette-body during the operation of severing each cigarette from the continuous stock this former-tube is shown having an inclined delivery end, the incline of which is coincident with the cutting path of the cutter, so that the cigarette will emerge from the delivery end of said former-tube in unison with the cut-

ting movement of the cutter 81—that is to say, when the cutter begins to sever the stock all that portion of such stock not actually being operated upon by the cutting-tool will be inclosed and supported by the walls of the former-tube, and the successive portions so inclosed and supported will be projected from the delivery end of said tube only when the cutter is in position to operate upon the stock at such successive points.

As the cigarettes are cut from the cigarette-body they fall, and, being received by the cigarette-conveyer F, are removed from the machine. This conveyer is shown herein embodying a pair of parallel frame-pieces or side guides, such as 87 and 87', supported at one side of and above the column or standard 3, (see Fig. 1,) said frame-pieces having at one end thereof an adjustable yoke, such as 88, serving the same purpose as and substantially similar to and adjustable like the yoke 8 of the tobacco-conveyer, said yoke 88 being represented having a roller 89' for supporting an endless traveling belt or conveyer 90, while at the opposite ends of said frame-pieces a driving-roller is represented at 89 rotatively mounted.

A worm-gear is represented at 91, Figs. 1 and 10, secured to the end of the shaft 92, supporting the roller 89, and a worm is illustrated at 93 as in mesh with the worm-gear 91 and as carried by a worm-shaft 94, journaled in a gear-casing 95 on the end of the frame-piece 87. The worm-shaft 94 is also shown journaled in a bracket 96, (see Fig. 10,) supported by the column 3, and as carrying a pulley 97, having a rope connection 98 with the pulley 48 on the shaft 7, so that on the rotation of said shaft 7 the conveyer will be caused to travel in the direction indicated by the arrow in Fig. 1.

It will be noticed that the guides 87 and 87' are quite high, and they are so constructed for the purpose of receiving and holding in proper position boxes or receptacles, such as b, (see Fig. 3,) into which the cigarettes will fall as they are cut off by the rotary knife.

The operation of a machine constructed in accordance with my invention, as herein set forth, is as follows: It being understood that the main driving-wheel D' will be continuously rotated from some suitable source of power in the direction indicated by the arrow in Fig. 1 and that the band-wheel 82 will be independently rotated in the opposite direction it will be seen that the tobacco-conveyer and the cigarette-conveyer will start traveling, that the cutter will begin to move in its orbit, and that the former-rolls will commence rotating, paste being fed from the pasting mechanism at the same time by the rotation of the pinions 69 and 69'. As shown by Fig. 3, loose tobacco will be fed on the outer end of the conveyer A by some suitable feeding apparatus. (Not illustrated herein.) As the loose tobacco is carried between and under the former-rolls a continuous tobacco

rod or cigarette-filler will be formed, as shown in Fig. 16, by the combined action of the former-rolls and the tobacco-conveyer. Just before this filler reaches the former-tube the wrapper, the end of which has been inserted beneath the filler, is wrapped spirally around said filler, (see Figs. 8 and 17,) paste being continuously applied to one edge of the wrapper-strip before said strip is wrapped around the filler. As the finished continuous cigarette-body emerges from the delivery end of the former-tube and when a sufficient length has been fed out for the production of a single cigarette the rotary cutter, traveling as indicated in Figs. 13 and 14, cuts through the stock by a movement transversely thereto and in unison with the advance thereof, the successive positions of the cutter throughout its cycle of movement being shown in these figures. The cutting operation is so timed that the cigarettes will be of uniform length, as is obvious. As fast as the cigarettes are cut off by the rotary knife they will fall into the traveling boxes *b*, which, it should be understood, will be placed in position upon the cigarette-conveyer as fast as may be necessary, and the filled boxes will be carried off by the conveyer and away from the machine.

It will be apparent from the foregoing that during the cutting operation the rotary, revoluble, and axial movements of the cutter will be synchronous, and that such axial movements will take place longitudinally of the cigarette-body and in unison with the advance of the same, while such rotary and revoluble movements will of course be transverse to the cigarette-body.

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

The paste-supplying device and the rod-cutting means are not separately claimed herein, as they constitute, respectively, the subjects of applications filed by me in the United States Patent Office April 23, 1896, Serial No. 588,790, and May 7, 1896, Serial No. 590,583.

It is obvious that the elements of this machine may be variously modified without departing from the spirit of my invention, and, not limiting myself to the specific details shown and described,

What I claim, and desire to secure by Letters Patent, is—

1. The combination with a tobacco-conveyer, of filler-forming and wrapper-applying means for forming a cigarette-body; a stationary former-tube having an inclined delivery end, and having such incline coincident with the cutting path of the cutter; a cutter having synchronous cutting movements transversely to, and longitudinally of, the cigarette-body, and having such longitudi-

nal movement in unison with the advance of said cigarette-body; and means for actuating said cutter.

2. The combination with a tobacco-conveyer, of filler-forming and wrapper-applying means for forming a cigarette-body; a stationary former-tube having an inclined delivery end, and having such incline coincident with the cutting path of the cutter; a cutter having synchronous, rotary, revoluble, and axial movements, and having said rotary and revoluble movements transversely to the cigarette-body, and having said axial movement longitudinally of said cigarette-body and in unison with the advance of said body; and means for actuating said cutter.

3. The combination with a tobacco-conveyer, of filler-forming and wrapper-applying means for making a cigarette-body; a stationary former-tube having an inclined delivery end, and having such incline coincident with the cutting path of the cutter; an axially-reciprocatory cutter-carrier rotatable transversely to the cigarette-body and having its axis parallel with the plane of movement of said body, and having synchronous, rotary, and axial movements, and also having said axial movement in unison with the advance of the cigarette-body; and a rotary cutter mounted eccentrically on said cutter-carrier, and held against axial movement relatively to said carrier, and having its axis parallel with the axis of said carrier.

4. The combination with a conveyer for the filler material, of a gravitating wrapper feed-roll coöperative with said conveyer; and a superimposed wrapper-roll coöperative with and yieldingly held on said feed-roll.

5. The combination with a conveyer for the filler material, of a gravitating spring-pressed wrapper feed-roll coöperative with said conveyer; and a superposed gravitating wrapper-reel coöperative with said feed-roll.

6. The combination with a conveyer for the filler material, of a wrapper feed-roll coöperative with said conveyer and having yielding and rigid surfaces, respectively, encircling the said roll; and a wrapper-roll coöperative with and yieldingly held on said feed-roll.

7. The combination with a conveyer for the filler material, of a wrapper feed-roll coöperative with said conveyer and having yielding and rigid surfaces, respectively, encircling the said roll; a scraper coöperative with the rigid surface of the feed-roll; and a wrapper-roll coöperative with and yieldingly held on said feed-roll.

8. The combination with a conveyer for the filler material, of a feed-roll coöperative with said conveyer and having yielding and rigid surfaces, respectively, encircling the said roll; a spring-pressed scraper coöperative with the rigid surface of the feed-roll; and a wrapper-roll coöperative with and yieldingly held on said feed-roll.

9. The combination with a conveyer for the filler material, of a gravitating spring-pressed

feed-roll having yielding and rigid surfaces, respectively, encircling the said roll; a spring-pressed scraper coöperative with the rigid surface of the feed-roll; and a superimposed gravitating wrapper-roll coöperative with and yielding held on said feed-roll.

10. The combination with a conveyer for the filler material, of a wrapper feed-roll coöperative with said conveyer and having a rigid surface and also having a rubber ring encircling said feed-roll; and a wrapper-roll coöperative with and yielding held on said feed-roll.

11. The combination with a conveyer for the filler material, of an oscillatory feed-roll carrier adjacent to said conveyer; a gravitating wrapper feed-roll mounted for rotation on said carrier and coöperative with said conveyer; a tension-regulating device controlling said feed-roll carrier, for regulating the pressure of the feed-roll upon said conveyer; and a superposed gravitating wrapper-reel coöperative with said feed-roll.

12. The combination with a conveyer for the filler material, of an oscillatory feed-roll carrier adjacent to said conveyer; a gravitating wrapper feed-roll mounted for rotation on said carrier and coöperative with said conveyer; a tension-regulating device controlling said feed-roll carrier, for regulating the pressure of the feed-roll upon said conveyer; an oscillatory wrapper-reel carrier; and a superposed gravitating wrapper-reel mounted for rotation on said carrier and coöperative with said feed-roll.

13. The combination with a conveyer-table having an opening therein, of a conveyer for the filler material mounted for traveling movement on said table and over said opening; a conveyer-supporting roll mounted for rotation beneath said table and having its supporting-surface flush with the surface of said table; a gravitating feed-roll coöperative with said conveyer and superposed thereon over the conveyer-supporting roll; and a superposed gravitating wrapper-reel coöperative with said feed-roll.

14. The combination with a conveyer-belt for the filler material, of a former-roll; a conical roll carried at the end of said former-roll; a pair of meshing gears carried, respectively, by said respective rolls and rotatively connecting said rolls; and means coöperative with said former-roll and conveyer-belt for rolling the filler material into a continuous rod whereby provision is made for the entrance of material from said conveyer-belt between the conical roll and the other part of the rod-forming device.

15. The combination with a conveyer-belt for the filler material, of a former-roll; a conical roll at the end of said former-roll; a pair of meshing bevel-gears carried, respectively, by and rotatively connecting said rolls; and means coöperative with said former-roll and conveyer-belt and serving to form the filler material into a continuous rod whereby pro-

vision is made for the entrance of material from said conveyer-belt between the conical roll and the other part of the rod-forming device.

16. The combination with a conveyer-belt for the filler material, of a former-roll; a conical roll carried obliquely at the end of said former-roll; a pair of meshing bevel-gears carried, respectively, by and rotatively connecting said rolls; and means coöperative with said former-roll and conveyer-belt, for forming the filler material into a continuous rod whereby provision is made for the entrance of material from said conveyer-belt between the conical roll and the other part of the rod-forming device.

17. The combination with a conveyer-belt for the filler material, of a former-roll; a conical roll having a universal connection with the end of said former-roll; a pair of meshing bevel-gears carried, respectively, by and rotatively connecting said rolls; and means coöperative with the former-roll and conveyer-belt, for forming the filler material into a continuous rod whereby provision is made for the entrance of material from said conveyer-belt between the conical roll and the other part of the rod-forming device.

18. The combination with a conveyer-belt for the filler material, of a former-roll having a socket in one of its ends and also having a bevel-gear; a spindle having a spherical bearing seated in said socket; a conical roll rotatively mounted on said spindle and having a complementary socket for said spherical bearing and also having a bevel-gear meshing with the aforesaid bevel-gear and rotatively connecting said rolls; and means coöperative with said former-roll and conveyer-belt for forming the filler material into a continuous rod whereby provision is made for the entrance of material from said conveyer-belt between the conical roll and the other part of the rod-forming device.

19. The combination with a former-roll having a socket in one of its ends, of a bevel-gear encircling said socket; a cap encircling said bevel-gear and having a contracted opening and also inclosing a bevel-gear on the conical roll; a spindle having a spherical bearing seated in the socket on the former-roll; a conical roll rotatively mounted on said spindle and having a complementary socket for said spherical bearing and also having a flared end surrounding the socket in said conical roll and inclosing the cap of the former-roll; and a bevel-gear carried by said conical roll and encircling the socket therein.

20. In a cigarette-machine, the combination of a carrier, a pair of rotary former-rolls mounted on said carrier, and a separate conical roll geared at one end with one of said former-rolls and mounted at the other end in said carrier; of a belt for conveying filler material to said devices.

21. A former device comprising a pair of end pieces; a former-roll spindle carried at

its opposite ends by said end pieces; a pair of rotary former-rolls, one mounted on said spindle and the other supported at one of its ends by one of said end pieces; and a conical roll rotatively connected at one end with the free end of the last-mentioned former-roll and carried at its other end by the other end piece whereby provision is made for the entrance of material from the conveyer-belt between the conical roll and the other parts of the rod-forming device.

22. A former device comprising a pair of end pieces; a former-roll spindle carried at its opposite ends by said end pieces; a pair of rotary former-rolls, one mounted on said spindle and the other supported at one of its ends by one of said end pieces; a second spindle carried by the other end piece and having a universal connection with the free end of said last-mentioned former-roll; and a conical roll mounted on said second spindle and rotatively connected with said last-mentioned roll.

23. The combination with a former device comprising a carrier, a pair of rotary former-rolls mounted on said carrier, a separate conical roll geared at one end with one of said former-rolls and mounted at the other end in said carrier, and a pair of pinions carried, respectively, by said former-rolls at the ends thereof remote from said conical roll; of a belt for conveying filler material to said former device.

24. The combination with a conveyer for the filler material, of a pair of rotary former-rolls coöperative with said conveyer; and a conical roll rotatively connected at one of its ends with one of said former-rolls and disposed obliquely to said former-rolls whereby provision is made for the entrance of material from the conveyer-belt between the conical roll and the other parts of the rod-forming device.

25. The combination with a conveyer for the filler material, of wrapper-feeding means; and filler-forming and wrapper-applying means coöperative with said conveyer and with said wrapper-feeding means and embodying a pair of rotary former-rolls disposed obliquely to the paths of movement of said conveyer and the wrapper; and a conical roll rotatively connected at one of its ends with one of said former-rolls and disposed obliquely to such former-roll whereby provision is made for the entrance of material from the conveyer-belt between the conical roll and the other parts of the rod-forming device.

26. The combination with a conveyer for the filler material, of wrapper-feeding means; paste-applying means; and filler-forming and wrapper-applying means coöperative with said conveyer and with said wrapper-feeding

means and embodying a pair of rotary former-rolls disposed obliquely to the paths of movement of said conveyer and the wrapper; and a conical roll rotatively connected at one of its ends with one of said former-rolls and disposed obliquely to said former-roll whereby provision is made for the entrance of material from the conveyer-belt between the conical roll and the other parts of the rod-forming device.

27. The combination with a shaft and a rotary carrier secured thereto, of an endless conveyer mounted for traveling movement and operative by said carrier; a worm-gear secured to said shaft; a driving worm-shaft; a worm secured to said worm-shaft and meshing with said worm-gear; a pinion on said worm-shaft; a spur-gear operative by said pinion; a pair of rotary former-rolls coöperative with the conveyer and disposed obliquely thereto; a conical roll rotatively connected at one of its ends with one of said former-rolls and disposed obliquely to such former-roll; and a pair of pinions carried, respectively, by said respective former-rolls at the ends thereof remote from said conical roll and operative in the same direction by said spur-gear.

28. The combination with a shaft and with a rotary carrier secured thereto, of an endless tobacco-conveyer mounted for traveling movement and operative by said carrier; a cigarette-conveyer disposed at, and transversely to, the delivery end of the tobacco-conveyer; a worm-gear secured to said shaft; a driving worm-shaft; a worm secured to said worm-shaft and meshing with said worm-gear; a pinion on said worm-shaft; a spur-gear operative by said pinion; a pair of rotary former-rolls coöperative with the tobacco-conveyer and disposed obliquely thereto; a conical roll relatively connected at one of its ends with one of said former-rolls and disposed obliquely to such former-roll; a pair of pinions carried, respectively, by said respective former-rolls at the ends thereof remote from said conical roll and operative in the same direction by said spur-gear; and driving connections between said first-mentioned shaft and the cigarette-conveyer.

29. The combination with a belt for conveying filler material, of a former device and a separate conical roll coöperating with such former device and disposed obliquely thereto, said roll serving to act upon the material on the conveyer-belt and in connection with the former device to shape the same into a continuous filler or tobacco rod.

FRANCIS H. RICHARDS.

Witnesses:

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HENRY BISSELL.