No. 763,991. PATENTED JULY 5, 1904.

F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 1.

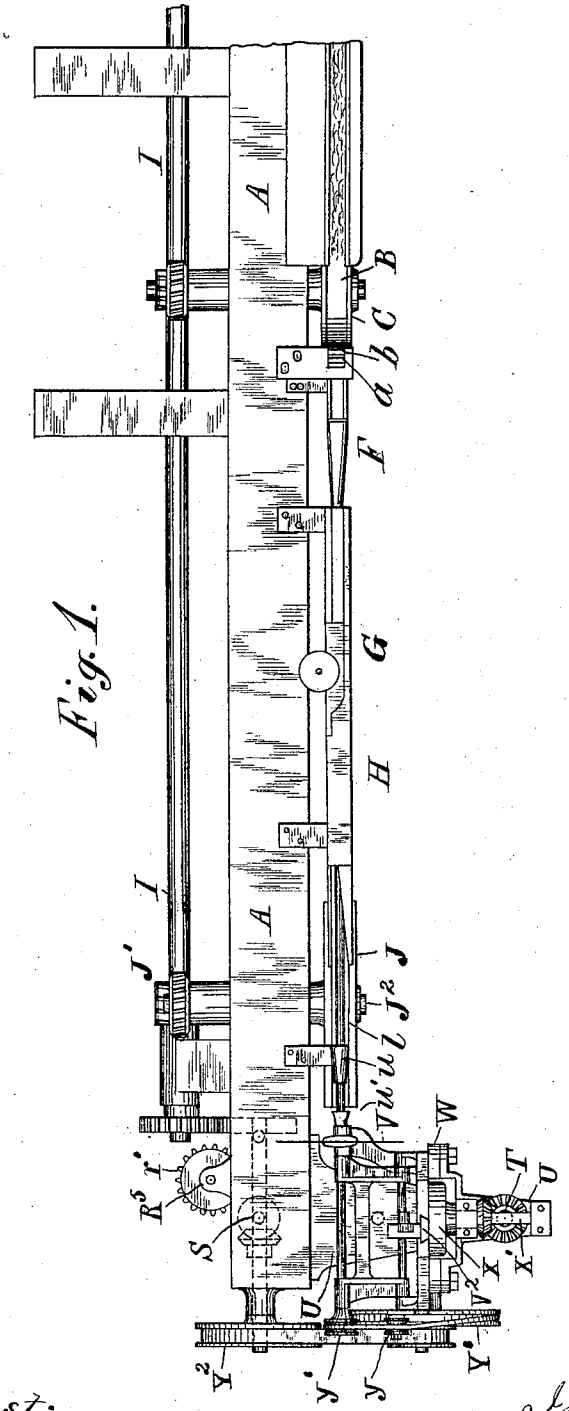


Fig. 1.

Attest:
L. Lee.
Arthur F. Keaton

Inventor.
Frank J. Ludington, per
Thomas S. Crane, Atty.

No. 763,991. PATENTED JULY 5, 1904.

F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

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NO MODEL. 7 SHEETS—SHEET 2.

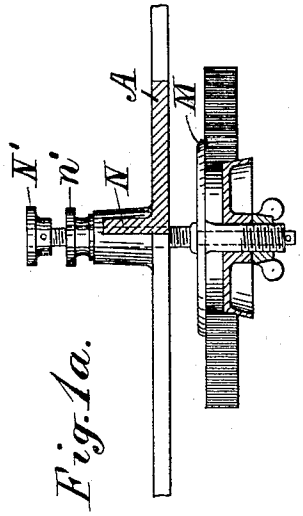


Fig. 1a.

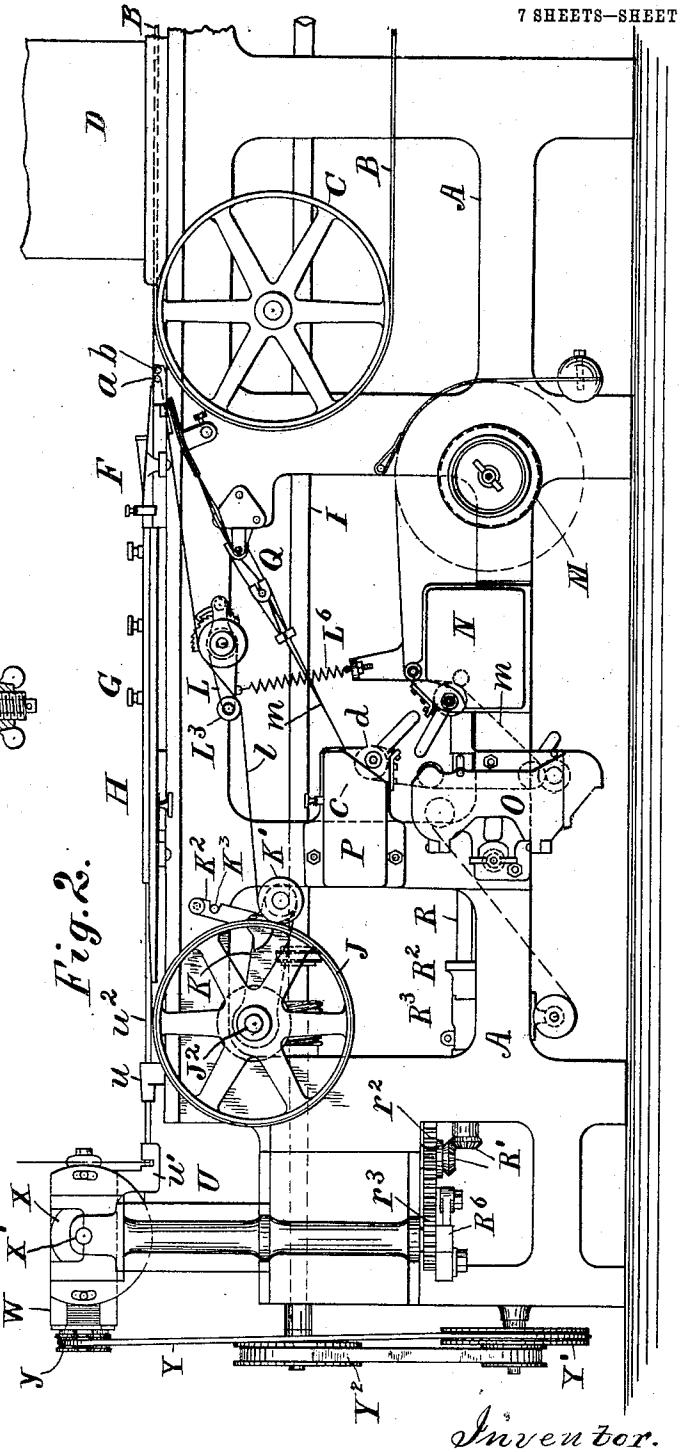


Fig. 2.

Attest:
C. Lee.
Arthur F. Heston

Inventor.
Frank J. Ludington, per
Thomas S. Crane, atty.

No. 763,991. PATENTED JULY 5, 1904.

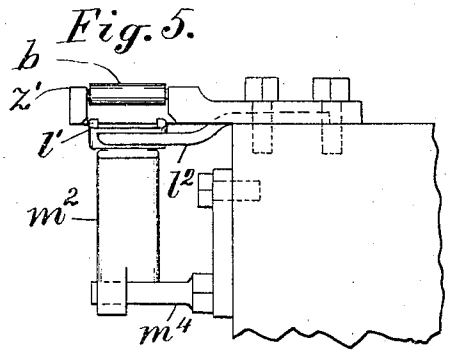
F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 3

Fig. 5.



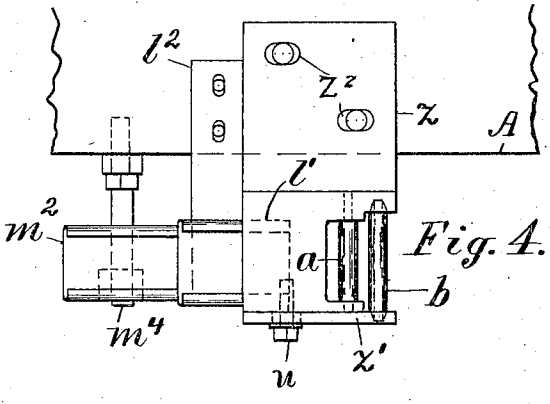


Fig. 4.

Fig. 3.

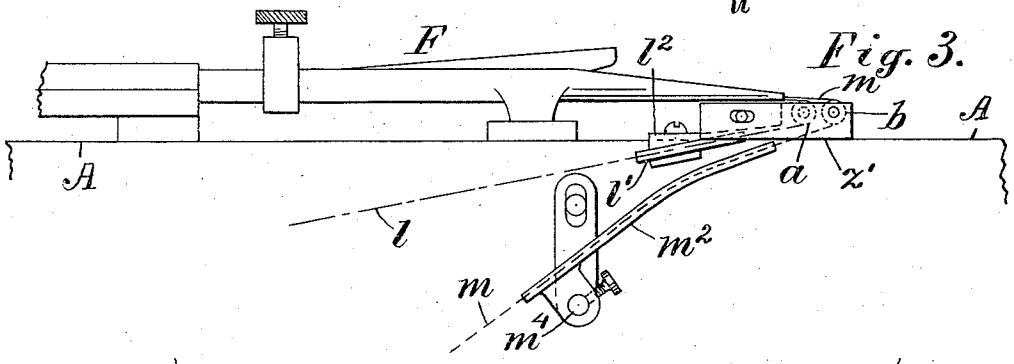


Fig. 6.

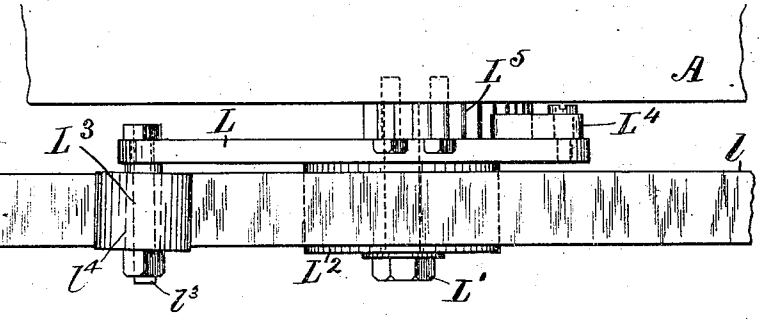


Fig. 6ª

Fig. 7.

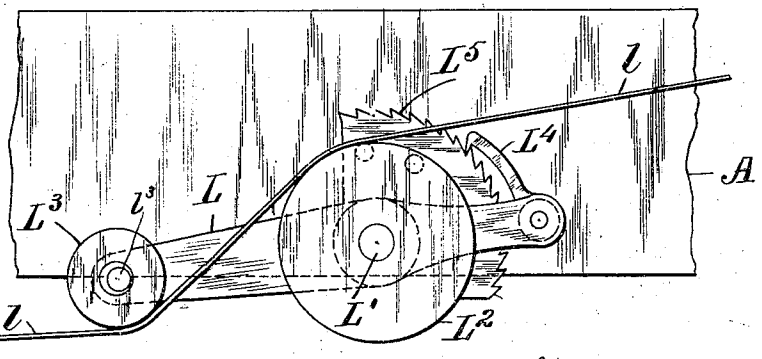




Fig. 7ª

Attest:
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No. 763,991. PATENTED JULY 5, 1904.

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CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 4.

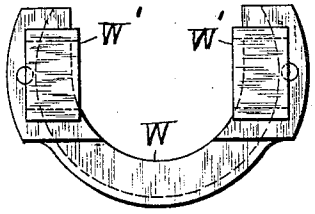


Fig. 19.

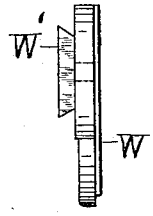


Fig. 20.

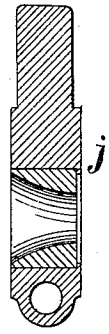


Fig. 10.

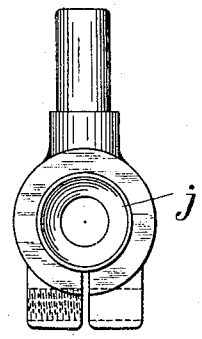
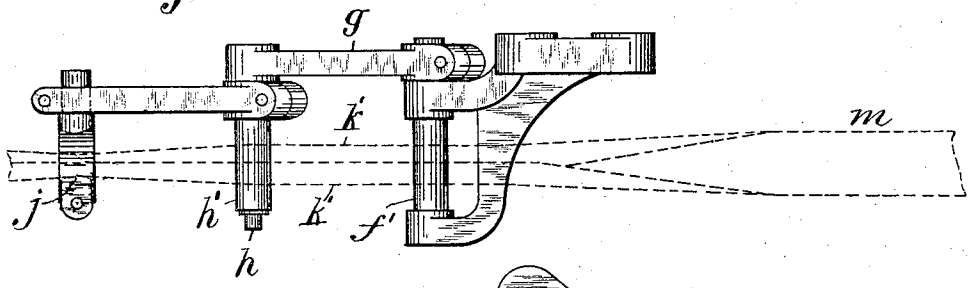


Fig. 11.

Fig. 8.



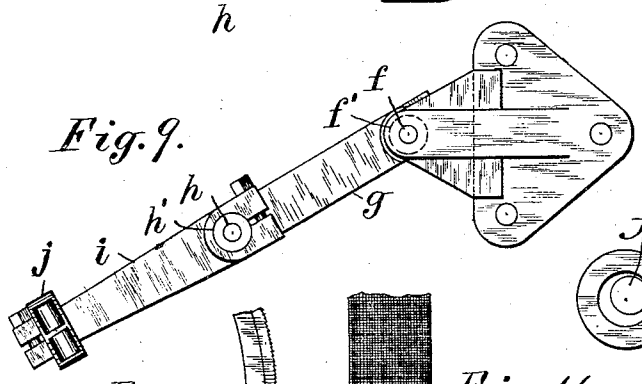


Fig. 9.

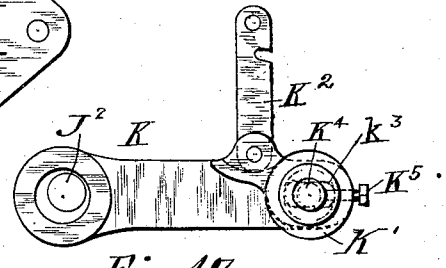


Fig. 17.

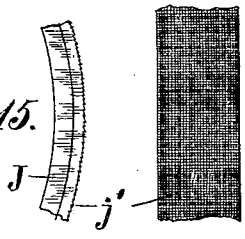


Fig. 15.

Fig. 16.

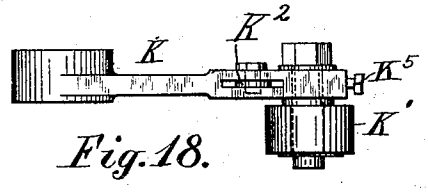


Fig. 18.

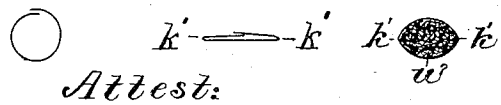


Fig. 12. Fig. 13. Fig. 14.

Attest:
L. Lee.
Arthur F. Beaton

Inventor.
Frank J. Ludington
per Thomas S. Crane, Atty.

No. 763,991. PATENTED JULY 5, 1904.

F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 5.

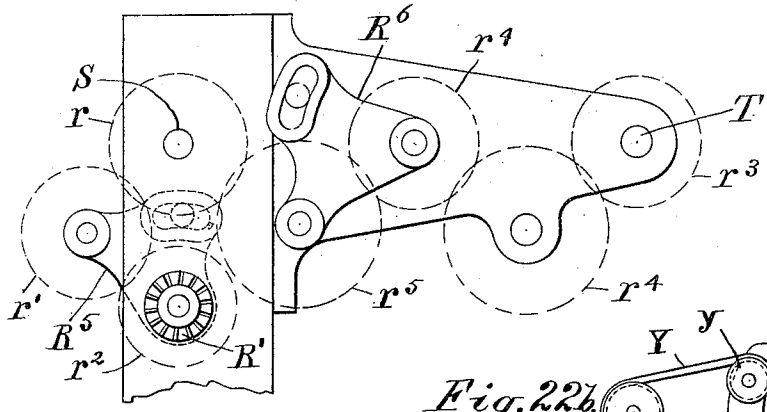


Fig. 21.

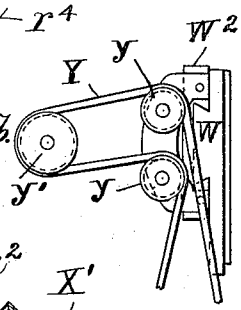
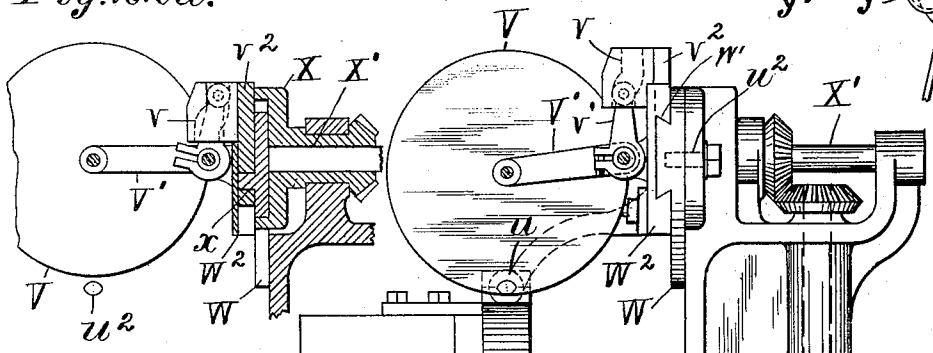


Fig. 22b.

Fig. 22a.



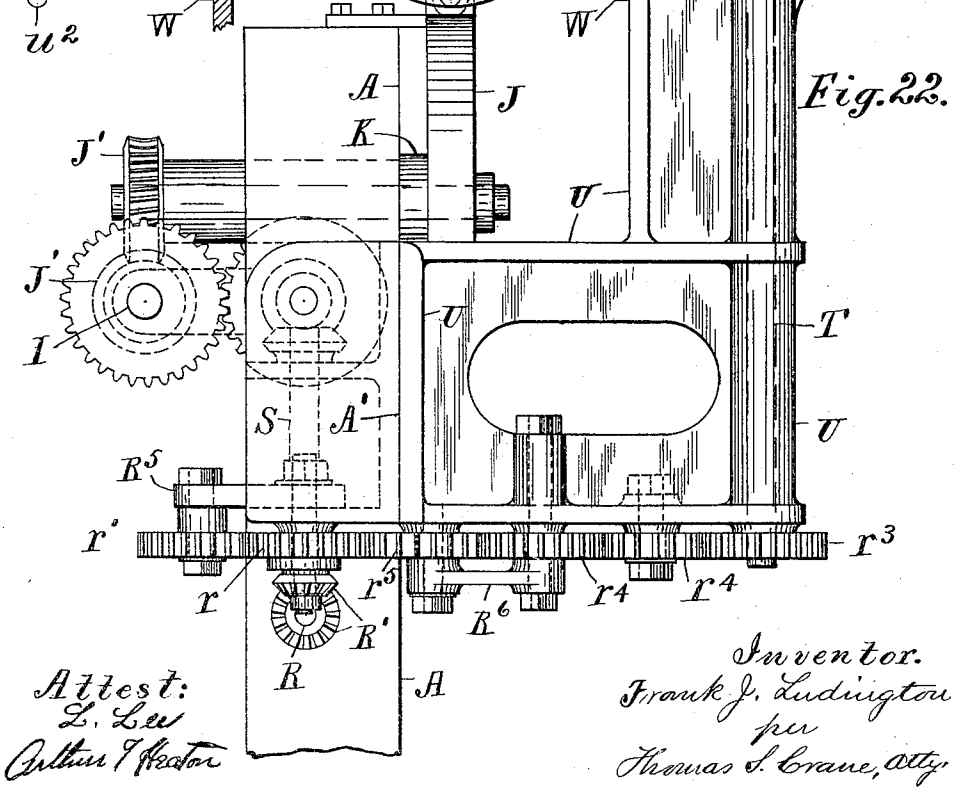


Fig. 22.

Attest:
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per
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No. 763,991. PATENTED JULY 5, 1904.

F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 6.

Fig.24a.

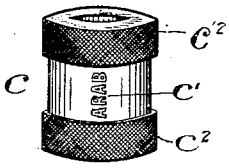


Fig.23.

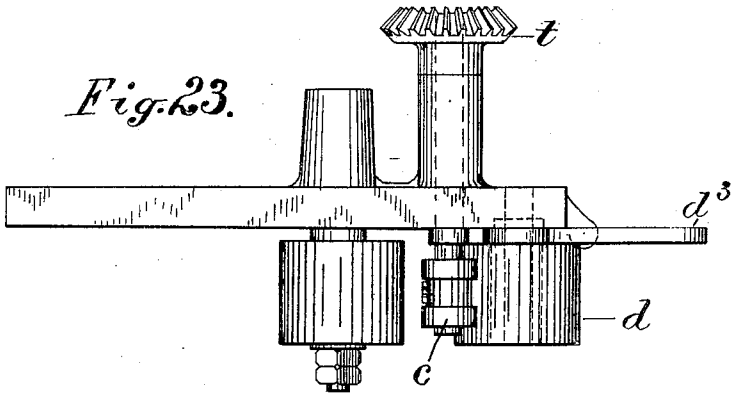


Fig.26.

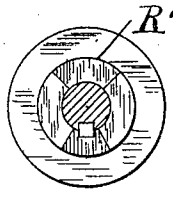


Fig.24.

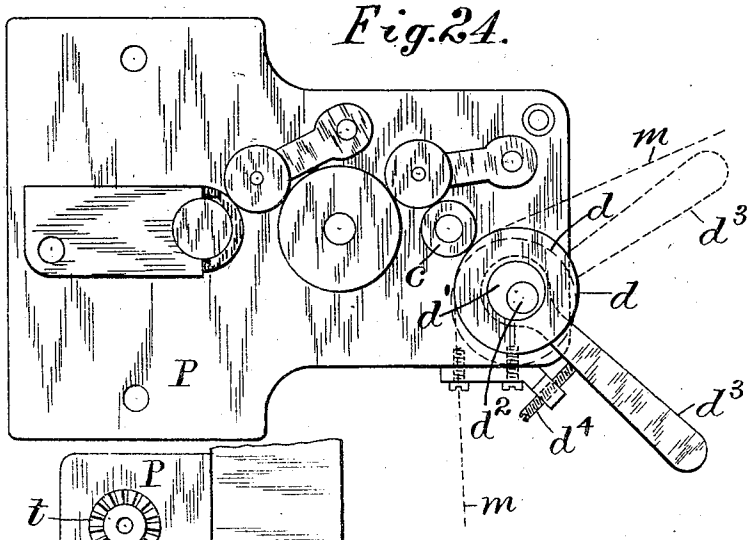


Fig.27.

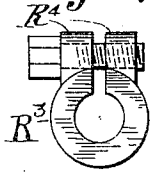
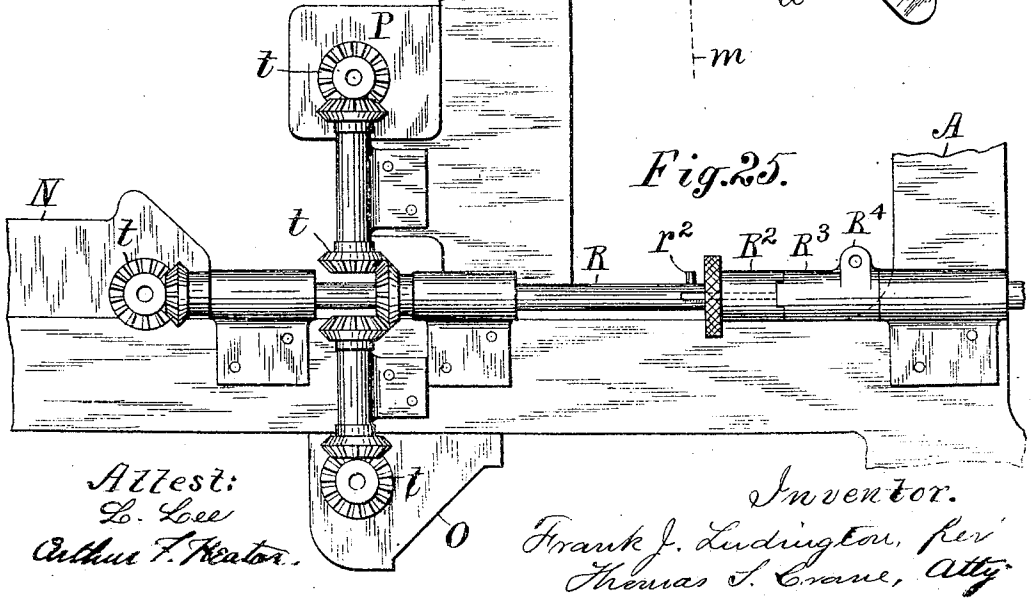


Fig.25.



Attest:
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Inventor.
Frank J. Ludington, Per
Thomas S. Crane, Atty

No. 763,991. PATENTED JULY 5, 1904.

F. J. LUDINGTON.

CONTINUOUS CIGARETTE MACHINE.

APPLICATION FILED NOV. 20, 1902.

NO MODEL. 7 SHEETS—SHEET 7

Fig. 28.

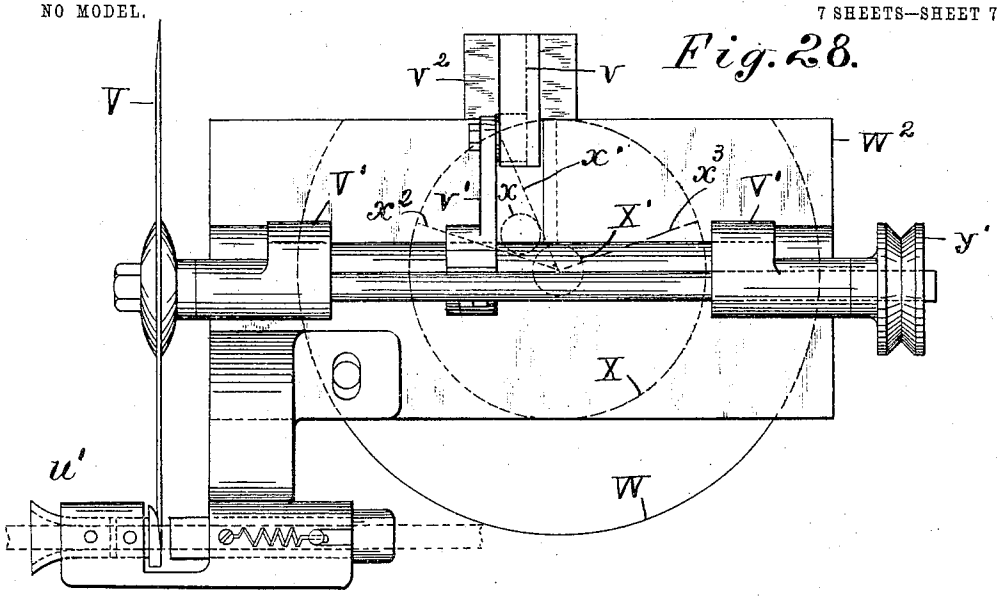


Fig. 31.

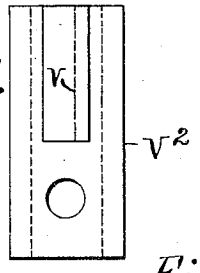


Fig. 33.

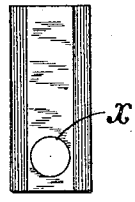
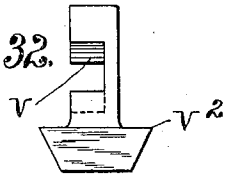


Fig. 34.



Fig. 32.



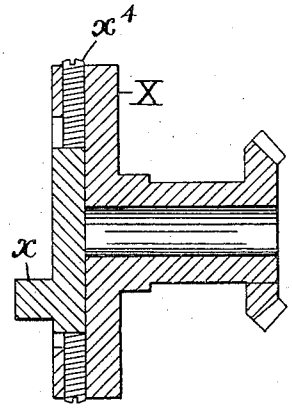


Fig. 29.

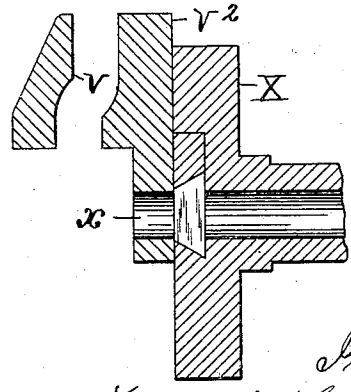


Fig. 30.

Attest:
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Arthur J. Heaton.

Inventor.
Frank J. Ludington, per
Thomas S. Crane, atty.

No. 763,991. Patented July 5, 1904.

UNITED STATES PATENT OFFICE.

FRANK J. LUDINGTON, OF WATERBURY, CONNECTICUT.

CONTINUOUS CIGARETTE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 763,991, dated July 5, 1904.

Application filed November 20, 1902. Serial No. 132,056. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. LUDINGTON, a citizen of the United States, and a resident of 63 Bank street, Waterbury, county of New Haven, State of Connecticut, have invented certain new and useful Improvements in Continuous Cigarette-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to the continuous cigarette-machines in which a wrapper is carried by a tape to receive the tobacco and to be secured around the same to form a continuous cigarette-rod and in which an intermittently-operating cutter or knife severs the rod into individual cigarettes of the required length. In such machines the paper ribbon for the wrapper is carried by a bobbin and delivered by suitable means upon the tape to receive the tobacco, and such wrapper is sometimes printed with impressions in bronze or color, which are required to register accurately with the cut-off mechanism, so that the cigarette-rod may be divided uniformly between such printed impressions.

The present invention includes means for making the printing-roll feed the paper wrapper positively, which is effected by roughening the periphery of the printing-roll at the opposite sides of the printing portion and pressing the wrapper upon the printing-roll by a suitable feed-roll.

The invention also includes mechanism connecting the cutter with the printing-roll to rotate them in unison and a clutch for disengaging such mechanism at pleasure, as well as a friction-clamp coupling, by which the connecting-shaft may be turned in any desired degree to adjust the relation of the cutter and the printing-roll.

It also includes a train of gearing connecting the cutter with the printing-roll and a change-wheel in such train of gearing to vary the length of the cigarettes at pleasure.

No mechanism for connecting the cutter with the printer will maintain an accurate register between the printed impressions and the division of the cigarettes unless the tape be prevented from slipping upon its driving-wheel, which rotates uniformly by connection with the printing devices. To prevent the slipping of the tape, I score the face of the tape-driving wheel with minute ratchet-teeth to engage the tape and drive it positively, and I preferably groove the face of the wheel peripherally with fine grooves to divide such ratchet-teeth into numerous fine points, which proves entirely effective to drive the tape positively. The fine points are preferably formed upon a steel tire secured upon the periphery of the driving-wheel, so that the same may be renewed when the points are worn, as it is necessary to maintain accurately the diameter of the driving-wheel to preserve the required speed. To hold the tape firmly upon the scored surface of the driving-wheel, I mount an arm eccentrically to the bearing of the driving-wheel with a radial slot in its end and secure a stud adjustably in the slot with a yielding roll upon the stud adapted to press the tape upon the surface of the driving-wheel in a suitable adjustment of the arm. The eccentric bearing of the arm is arranged to draw the roll away from the surface of the driving-wheel when the arm is suitably turned to permit the insertion or removal of the tape. A tightener-wheel has commonly been used upon the tape, as the tape requires renewal from time to time and when first applied to the machine is liable to stretch considerably. Where such tightener is merely pressed upon the tape by a weight or spring, the tightening-roll is liable to oscillate and slacken its pressure upon the tape when the latter is resisted at any point in its movement, as sometimes occurs when drawing the cigarette-rod through the forming devices with a slight excess of tobacco. Such slackening of the tightener tends to throw the print out of register with the cutter, and to prevent such slackening I mount the tightener upon a movable arm with a ratchet connected to such arm, which permits the tightener to take up any slack which may arise in the tape, but prevents any reverse movement of the arm after the tape has thus been slackened.

Where cigarette-wrappers are printed in two colors, it is necessary that the colors should register perfectly with each other or

one color is apt to be printed on top of the other. To produce accurate registration, I feed the paper by the printing-roll of the last printer, controlling the feed of the wrapper wholly by the printing-roll. It is a well-known fact that two rotary feeding-rolls cannot continually feed the same strip of paper without one feeding faster than the other. The wrapper is delivered from a reel of paper to the printer under a slight tension, which is produced by applying a brake-strap to the surface of the paper upon the reel, and I drive the tape a very little faster than the wrapper is delivered by the printing-roll, so that it receives the wrapper under a slight tension and is compelled to slip slightly upon the wrapper or cigarette-rod as the latter passes through the forming devices. The tape in the present invention is made narrower than the wrapper, and if the wrapper were delivered directly upon the tape over a guide-roller the tension would cause the tape to crease or wrinkle the wrapper longitudinally. The guide-rollers are termed herein "leading-rollers," and one is arranged to receive the endless tape from the driving-wheel and conduct it into the so-called "barrel-guide," which folds the tape and wrapper into U shape and gathers the tobacco therein. The other leading-roller receives the paper wrapper from the printer and delivers it upon the top of the tape without passing over the tape-roller or exerting any pressure upon the tape so as to be affected thereby. To guide the wrapper laterally, so as to vary its position in the forming-dies and the lap at the seam of the cigarette, I furnish adjacent to the leading-roller for the wrapper a "leading-guide" having flanges at the edges to guide the wrapper and provide means for adjusting the guide laterally. I have found that the paper when traveling loosely through a straight guide is liable to crowd against the side flanges, but that if the guide be curved transversely to the thickness of the paper the paper presses upon the curved surface and is less liable to crowd against the flanges, and I therefore curve the leading-guide longitudinally.

In making oval cigarettes it is considered an index of hand-workmanship to exhibit sharp corners at the opposite edges of the cigarette; but I have found that sharp corners can be produced in machine-made cigarettes by creasing the wrapper at suitable points before it is delivered to the tape and furnished with the tobacco filler. At some point between the paper-reel and the delivery of the wrapper to the tape I arrange the creasing device and lead the paper through the same, which marks the paper upon two contiguous lines, where the corners of the cigarette are subsequently formed in making the continuous cigarette-rod. A convenient means of creasing the cigarette upon the required lines consists of a hollow guide or former, which bends the wrapper into cylindrical shape with suitable overlapping edges, the same as upon the cigarette-rod, and rolls for then flattening the cylindrically-shaped wrapper, which produces creases along the opposite edges of the paper tube. Such tube is reopened before the wrapper is delivered to the tape, so that it may receive the tobacco filler and be formed and seamed in the usual manner.

For convenience of forming the seam upon the top of the cigarette-rod it has been common when making oval cigarettes in a continuous machine to dispose the corners at opposite sides of the rod upon the same level and to divide the rod by a disk cutter pressed laterally toward the rod and advanced at a suitable rate to travel with the rod during the dividing operation. In the present invention I move the cutter vertically, so as to divide the cigarette-rod upon its narrowest dimension, and thus avoid considerable transverse movement of the cutter. To divide the cigarette-rod squarely, I have found it necessary in place of a cam to use an adjustable crank to move the cutter-carriage in unison with the cigarette-rod. As cigarettes are made of different lengths in the same machine, it is obvious that a crank-pin can be adjusted to vary the stroke of the cutter-carriage and that the speed of the cutter-carriage will be increased by increasing the stroke of the crank-pin. As the cigarette moves at a uniform speed, such increase of the carriage speed is necessary when the cigarette is increased in length, so that the carriage travels an increased distance for each stroke, and such speed of the carriage cannot be produced by a cam without injuriously affecting the movement in some part of its throw. In the present invention I adjust the cutter upon the carriage and the crank-pin which drives the carriage so as to project the cutter across the cigarette-rod before the crank-pin and carriage have attained their highest speed, and the speed afterward attained by the cutter-carriage operates to move the cutter away from the traveling cigarette-rod and to push the severed cigarette at a higher rate of speed, so as to deliver it readily into a receptacle.

The various improvements described herein are applicable to continuous cigarette-machines of different constructions, and they can be used separately in any machines to which they may be adapted.

In the annexed drawings, Figure 1 is a plan of a cigarette-machine provided with the improvements. Fig. 1[a] shows the means for adjusting the reel laterally. Fig. 2 is a front elevation of the machine. Fig. 3 is a front elevation of the leading-rollers and guides for the tape and paper. Fig. 4 is a plan of the same, and Fig. 5 is an end view of the same. Fig. 6 is a plan, and Fig. 7 a front view, of the tightener for the tape. Fig. 6[a] is a longitudinal section of the eccentrically-bored

bushing l^4, and Fig. 7^a is an end view of the same. Fig. 8 is a plan, and Fig. 9 a front view, of the creasing devices enlarged. Fig. 10 is a cross-section of the creasing-former, and Fig. 11 is a side view of the same. Fig. 12 is a cross-section of the wrapper bent to cylindrical form by the creasing-former. Fig. 13 is a cross-section of the wrapper folded flat by the creasing-rolls. Fig. 14 is a cross-section of an oval cigarette. Fig. 15 shows a part of the edge of the tape-driving wheel, and Fig. 16 a side view of the same to exhibit the scored surface. Fig. 17 is a side view of the arm and presser-roll for the tape. Fig. 18 is a plan of the same. Fig. 19 is a side view, and Fig. 20 an edge view, of the adjustable slide-carrier for the cigarette-cutter. Fig. 21 shows the under side of the gearing-bracket for the cigarette-cutter. Fig. 22 is a side elevation, partly in section, of the cigarette-cutter and its operating mechanism with the cutter intersecting the cigarette. Fig. 22^a is a section of the mechanism for vibrating and reciprocating the cutter with the cutter drawn clear from the cigarette. Fig. 22^b shows the guide-pulleys for the cutter-belt on the end of slide W^2. Fig. 23 is a plan of one of the printers. Fig. 24 is a front view of the same. Fig. 24^a shows one of the printing-rolls in perspective. Fig. 25 shows the gearing for the printers. Fig. 26 is an end view of the clutch for the printing devices. Fig. 27 is an end view of the friction-coupling for the printing devices. Fig. 28 shows the face of the cutter-slide and its attachments. Fig. 29 is a longitudinal section of the adjustable crank for the cutter-slide; Fig. 30, a transverse section of the same; Fig. 31, an elevation, and Fig. 32 a lower view, of the cam-slide for actuating the cutter; Fig. 33, an elevation, and Fig. 34 an end view, of the adjustable crank-pin.

General features of the machine.—The machine illustrated is of the type shown in my Patent No. 700,958, granted May 27, 1902, in which the tobacco is gathered and pressed into a filler upon a metallic traveling belt before it is delivered to the paper wrapper. In the drawings the forward end only of the belt B is shown, as it forms no part of the present invention, the frame of the machine being designated A, the metallic belt B, the pulley over which it turns C, the spout for discharging the tobacco D, and the guides which retain the tobacco upon the belt B. The so-called "barrel-feed," which bends the tape and wrapper into U form, is designated collectively F in Figs. 1 and 2. The first folder, in which the paste is applied to the wrapper, is designated G, and the cigarette pressing and shaping die is designated H. The machine is furnished with a driving-shaft I, which is connected by gearing with the various moving parts, so that all move in agreement with one another.

Tape driving and tightening appliances.—The tape-driving wheel J is connected with the shaft I by worm-gearing J′, and an arm K is hinged eccentrically to the shaft J^2 of the tape-wheel and provided with a yielding roll K′ to press the tape *l* upon the side of the tape-wheel. Fig. 17 shows the bearing of the shaft J^2, formed eccentric thereto externally to fit the eye of the arm K. The arm is shown with a slot k^3 near its outer end and a stud K^4, fitted in the slot to carry the roll K′. A screw K^5 is provided to adjust the stud in the slot and to press the roll K′ toward the tape-wheel, as required, and the stud is secured in the usual manner when adjusted by a nut. (Shown in Fig. 18.) When the arm is turned to move the roll K′ toward the lower side of the tape-wheel J, the roll clears the edge of the tape-wheel and the tape can be readily removed and replaced; but when the roll is moved upwardly at the side of the wheel, as shown in Fig. 2, the eccentric pivoting of the arm presses the roll toward the tape-wheel and causes the roll and wheel to bite the tape. A link K^2 is pivoted to the arm and provided with a handle to raise the same, as indicated by a circle at the top of the link in Fig. 17, and the link is also provided with one or more notches fitted to a pin k^3 upon the frame to hold the arm in its operative position. The circle J^2, disposed eccentrically within the hub of the arm K in Fig. 17, shows the relation of the tape-wheel shaft J^2 to the arm and its bearing, which latter is shaped eccentrically to the shaft, as shown in Fig. 17, where the hub of the arm K is fitted thereto. The rim of the tape-wheel is provided with a renewable steel tire shrunk on the rim of the wheel, and its periphery, as shown in Fig. 15, is formed with minute ratchet-teeth and also with fine circular grooves, as shown in Fig. 16, which cover the surface of the wheel with fine points or teeth. Experience has shown that the tape does not slip upon such a wheel, and as there is no abrasion of the tape it is not injured by such a driving-surface, but its movement is rendered perfectly uniform and reliable.

The tightener consists of an arm L, pivoted upon a stud L′, which also carries a guide-roll L^2, and the end of the arm is furnished with a pressing-roll L^3, which rests upon the top of the tape, which is bent so that its under side rests upon the roll L^2. The arm L has an extension at the opposite side of the pivot provided with a pawl L^4, and a stationary segment of ratchet-teeth L^5 is secured to the frame or bearing of the stud L′ to engage the pawl when the roll L^3 moves under the slackening of the tape. A spring L^6 is shown in Fig. 2 applied to the arm L to press the roll L^3 toward the tape, and when the tape is first applied to the machine and yields under the strain the roll gradually takes up the slack and is prevented by the pawl and ratchet from

again loosening the tape. In order to guide the tape centrally into the sheet-metal guides near the entrance of the barrel-feed I place on a stud l^3 in the end of the tape-tightener arm a bushing l^4 (on which the idler-roll revolves) with a hole drilled through it on an angle, so that by turning this bushing on the stud the axis of the idler-roll L^3 can be changed to different angles to lead the tape as desired, thereby preventing undue wear on its edges as it passes through the sheet-metal guide.

Leading-rolls *a* and *b* are supported adjustably at the entrance of the barrel-feed F, the roll *a* being journaled upon the adjustable foot *z*, which is provided with slots z^2 and bolted adjustably to the frame A, and the roll *b*, journaled at one end upon a plate *z'*, adjustable upon the foot by means of the screw *u*. The wrapper *m* is led by the roll *b* to a level with the surface of the tape, so that it is delivered upon the same without pressing thereon and either the tape or wrapper can be adjusted independently to guide the same into the required relation to one another and to the folding and pasting appliances. The bobbin of paper ribbon (see Fig. 1^a) is mounted upon a threaded stud N, adjustable upon the frame A by knob N', so that as the ribbon runs into the printers it can be adjusted laterally to locate the printed impressions. The stud is locked by nut *n'*. The reel may be adjusted laterally by any other equivalent means. The wrapper is carried through a size-printer N, a bronzer O, and the color-printer P and can be adjusted accurately sidewise to receive the printing impressions by suitably setting the stud N in the frame.

Feeding and adjustment of printed paper.—From the color-printer the wrapper passes through a creasing device (marked Q in Fig. 2) and thence through a wrapper-leading guide m^2, (see Figs. 3 to 5,) having flanges fitted to the edge of the wrapper, the guide being adjustable laterally upon a stud m^4. The guide m^2 is curved in longitudinal section, so that the wrapper presses against the bottom of the guide in its movement through the same. I have found by experience that such pressure of the wrapper against the bottom of the guide serves to make the wrapper move more steadily and with less tendency to crowd against the edges of the guide than the wrapper exhibits when it passes loosely through a straight guide. With the use of such a curved guide it is necessarily adjusted so as to bend the wrapper out of its direct course, which causes the wrapper to press against the bottom of the guide in the desired manner. A similar tape-guide *l'* is adjustable upon the frame by slotted foot l^2, and both guides are set adjacent to the leading-rollers *a* and *b*. The adjustment of these leading-guides and of the leading-rolls *a* and *b* operates conjointly upon the tape and wrapper to guide them both so effectively as to avoid chafing or pressing the sides of the same. The printing-roll in each of the printers is connected by gears *t* to a shaft R, (see Fig. 25,) which is connected by bevel-wheels R' and a train of gears to a shaft S, (see Figs. 21 and 22,) which shaft is connected by a separate train with the cut-off appliances. Dotted circles represent the gear-wheels in Fig. 21, such gears being shown in full lines in Fig. 22. The wheel *r* upon the shaft S is one of a set of change-wheels and is connected with the printers through the bevel-wheels R' by gear r^2 and an intermediate *r'*, which is mounted upon an adjustable bracket R^5. The wheel *r* is also connected with a gear-wheel r^3 upon the cutter-driving shaft T by idle wheels r^4 and an adjustable intermediate r^5, which is mounted upon a bracket R^6. When the change-wheel *r* is varied in size, the intermediates *r'* and r^5 are correspondingly adjusted, and the changing of one change-wheel thus operates to produce simultaneously a change in the relations of the printer and the cutter to the tape-driving appliances, and thus enables the operator to print upon the wrapper and to divide the cigarette at any desired intervals. The shaft S, as shown in Figs. 2 and 22, is driven from the main shaft I, which also operates the tape-driving wheel J by means of a worm and worm-wheel J', and the printer is thus operated in unison with the movement of the tape. A sliding toothed clutch R^2 is shown upon the shaft R in Fig. 25, and the shaft is cut within such clutch and one part is connected with the other by the engagement of such clutch with a sleeve R^3, which is split longitudinally and clamped upon the shaft by a bolt inserted through ears R^4, as shown in Figs. 25 and 27. The sliding clutch, as shown in Fig. 26, has teeth of unequal size upon its end which fit corresponding teeth upon the sleeve R^3, and as the sleeve when loosened can be turned upon the shaft R it forms a species of friction-coupling by which the relation of the printing-rolls to the cut-off devices may be varied at pleasure. The sliding clutch is fitted movably to a feather or key upon the shaft R, and a stop-pin r^2 is provided to limit the movement when the teeth of the clutch are disengaged, and the inequalities in the sizes of such teeth insure their always being engaged in the same position, so that the impressions made by the printer will register with the divisions made by the cutter. The clutch R^2 serves to wholly disengage the printers when cigarettes are made without impressions, while the friction-coupling R^3 permits the adjustment of the printed impressions at any desired point upon the individual cigarettes.

Figs. 23 and 24 show the printer P with means for positively feeding the paper wrapper during the printing operation, the printing-roll being driven by the gears *t*. (Shown in Fig. 25.) I have found that feeding the wrapper by the tape alone when printing in

two colors prevents the two printed impressions from registering accurately with one another and I have devised means for use in such cases to drive the wrapper independently of the tape as it passes through the last printing device and use a brake to deliver the wrapper to the printing devices under tension. I thus prevent the irregularity of the impressions which would otherwise be caused. To feed the paper while printing I form the printing-roll at the edges flush with the printing-surface and press the wrapper upon such flush surface by a pressure-roll, so that the printing-roll operates also as a feeding-roll.

Fig. 24ª shows the printing-roll c with type c' along its middle line to print the impressions and bands or collars c^2 at opposite sides of the middle line upon the periphery of the roll. This roll is driven positively by the gears t, (see Fig. 25,) and the collars are preferably roughened, as shown in Fig. 24ª.

Figs. 23 and 24 show a yielding presser-roll d to press the wrapper m firmly against the periphery of the printing-roll. The roll d is mounted upon an eccentric hub d', which can be turned upon a stud d^2 by an attached handle d^3. When the handle is in the position shown in full lines in Fig. 24, the roll d presses the paper firmly against the printing-roll, where the roughened bands c^2 grip the paper and feed it positively. When the roll d is turned into the position shown in dotted lines, by raising the handle d^3 upwardly the rolls are separated to insert or remove the paper. An adjusting-screw d^4 is provided to adjust the handle d^3 to press the paper against the printing-roll with the required force in its lowest position. As the printing-roll is geared by the shaft R and its connections to the cut-off devices the paper is compelled by the means described to move positively at a uniform rate, which insures the registering of the printed impressions with the divisions in the cigarette-rod.

When printing in only one color, I find that the feeding of the wrapper by the printing-roll is unnecessary, as it is required chiefly to make the two printed impressions register properly. The proper feeding of the wrapper is easily effected by providing the printing-roll with collars of the same height or radius as the type and pressing the wrapper firmly against the same during the printing operation, the roughening of such collars, if employed, preventing the slipping of the paper positively.

Paper-creasing appliance.—The paper-creasing appliance (marked Q in Fig. 2) consists, as shown in Figs. 8 and 9, of a tubular former j, to shape the wrapper in tubular form, with its edges overlapped, as shown in Fig. 12, and rolls arranged to flatten the tube, so that it is creased at opposite sides while the edges still overlap, as shown in Fig. 13. In the construction illustrated, a roll-stud f is mounted upon the frame, and an arm g is jointed thereon, carries a stud h upon its end, upon which an arm i is also jointed and provided at the end with the former j. The studs f and h are provided, respectively, with rolls f' and h' and the arms are arranged in the path of the wrapper in its movement from the color-printer to the leading-roll b, so that the wrapper, which is normally of the width shown at m in Fig. 8, is formed in the tubular shape by the former j and the tube then flattened by the rolls h' and f', after which the movement of the paper over the leading-roll b operates to open the tube and flatten it as it is delivered to the tape.

The modifications in the shape of the wrapper in its movement through the creasing devices are shown in Figs. 8 and 2. Fig. 14 shows an oval cigarette with sharp creases k' at the opposite sides, such as are desired in a well-finished oval cigarette, and any means besides those shown in the drawings may be used to form two creases k' in the wrapper, so that they will be disposed upon opposite sides of the oval cigarette when finished.

If the folded wrapper were drawn over a stationary surface or a sharp corner, it would be flattened substantially the same as by the rolls f' and h'; but rolls are preferable, as they cause the least resistance to the travel of the paper.

Cigarette cut-off appliances.—The cigarette-rod u^2 is delivered through a stationary guide u upon the delivery end of the frame A, and the frame is formed with a vertical seat A', Fig. 22, upon which a bracket U is mounted to carry the reciprocating and vibrating cutter V. The bracket carries a turn-table plate W, held on bracket U by bolts u^2 and having dovetails W' upon which slide W^2 is fitted to support the reciprocating guide u' and cutter V, which is mounted in arms V', hinged upon the slide W^2, and the pivot-rod of which is provided with an arm v', having a roll fitted to a cam-groove v. (See Figs. 28 to 34.) The groove is formed upon a cam-bar v^2, fitted (see Fig. 1) to move vertically in the slide W^2. A crank-plate X is shown having an adjustable crank-pin x fitted to a crank-pin hole in the cam bar v^2, the rotation of the crank serving to move the cam-bar vertically and the slide W^2 longitudinally. The cam and arm v' press the cutter across the cigarette before the crank-pin x, as shown in Fig. 28, has reached the middle of its stroke, so that the subsequent motion of the slide W^2 is accelerated and moves the cut cigarette quickly forward, so as to discharge it readily to a receptacle. The crank moves from x^2 to x' in making the cut and from x' to x^3 in delivering the cigarette and is adjusted by screws x^4 (shown in Fig. 29) to vary the operation of the cutter as required. The crank-plate X is mounted upon a horizontal shaft X' in the center of the turn-table W. The shaft X' is geared to

the vertical shaft T, and thus drives the reciprocating slide and operates the cutter in unison with the tape-driver and printer, which are connected with the shaft T by the shaft S and intermediate gears, Guide-wheels y (see Fig. 22[b]) are provided upon a support attached to the slide W^2 to lead in a horizontal direction the cord Y, which drives the pulley y' upon the spindle of the cutter V. The driving-pulley Y′ is shown in Figs. 1 and 2 located below the slide, so that the vertical movement of the cutter would alternately slacken the cord if led directly to the pulley y'. The pulley Y′ is driven by pulley and belt Y^2, connected with the driving-shaft I.

In forming oval cigarettes it is more convenient to form the corners in the same horizontal plane, and the cigarette-guides u u' are fitted to the cigarette-rod thus disposed, and the vertical vibration of the cutter produced by the arrangement described operates to divide the cigarette-rod through its smaller diameter. This has proved an advantage in practice, as the cutter does not remain so long in contact with the cigarette-rod and is able to make the cut more square and perfect. The oblique cut upon the cigarette-rod is produced whenever the longitudinal movement of the rod and of the cutter are not adjusted accurately to one another, as any insufficient or surplus movement of the cutter tends to move its sharp edge forward or backward upon the cigarette-rod while severing the same. The guide u' is shown formed with a slotted adjustable connection to the slide W^2, so that the guide may be set horizontally when the slide is inclined for the purpose of compensating for such erroneous relation of the cutter and cigarette-rod. The turn-table W serves to vary slightly the inclination of the slide to the movement of the cigarette-rod whenever the operation of the machine shows by the oblique division of the cigarettes that such inclination is required; but such slide is never in practice varied materially from a horizontal position.

Operation of the entire machine.—The tape is driven with precision by means of the tightening devices shown, and the wrapper may be creased before it is delivered upon the tape by the independent leading-roll, which prevents its being wrinkled, as often happens when it is carried over a small roll under tension with the tape. The filler is delivered upon the wrapper and the wrapper seamed, and the continuous cigarette-rod then passes through the stationary guide u and the reciprocating guide u'. The wrapper is propelled in perfect unison with the movements of the tape, as the printing-roll operates to feed the wrapper positively when required. The cutter is reciprocated back and forth by the side of the cigarette-rod and vibrated across the same to sever the rod in unison with the impressions formed by the printer through the connection of the cutter and printer by means of the gearing provided. When a change in the length of the wrapper is required and the printed impressions require to be spaced nearer or farther apart upon the wrapper, a change in the single change-wheel r serves to vary the speed of both printer and cut-off, and thus varies the length of the cigarette and the space between the printed impressions simultaneously. Should the tape become slack by strain upon it, the slack is taken up and held automatically by the ratchet and pawl connected with the tightener. Either the tape or wrapper when traveling through the forming and pasting devices may be adjusted laterally in relation to the other or to the said devices by adjusting the leading-roll a and the roll L^3 to guide the tape and the roll b to guide the wrapper.

Having thus set forth the nature of the invention, what is claimed herein is—

1. In a continuous cigarette-machine having a printer to print upon the wrapper before it is delivered to the tape, the combination, with the tape, and a driving-wheel to propel the same, of a printing-roll having type along its middle line to print the impressions and collars upon its periphery at opposite sides of such line, a feed-roll adapted to press the wrapper against the said collars, and means connecting the tape-driving wheel and the printing-roll, to rotate the printing-roll positively, to feed the wrapper in unison with the tape.

2. In a continuous cigarette-machine, the combination, with a tape and means for propelling the same, means for supplying the paper wrapper and feeding the tobacco thereto, means for forming the cigarette-rod and a cutter for cutting off the cigarettes, of a printer having a printing-roll to print upon the wrapper, said roll having its periphery at the edges flush with the type, means to drive the printing-roll, and means to press the wrapper thereon, to feed the wrapper positively from the printer to the tape.

3. In a continuous cigarette-machine, the combination, with a tape and means for propelling the same, means for supplying the paper wrapper and feeding the tobacco thereto, means for forming the cigarette-rod and a cutter for cutting off the cigarettes, of a printer having a printing-roll to print upon the wrapper, said roll having its periphery at the edges flush with the type, means to drive the printing-roll, means to press the wrapper thereon to feed it positively from the printer to the tape, and mechanism connecting the cutter with the printing-roll to operate them in unison.

4. In a continuous cigarette-machine, the combination, with a tape and means for propelling the same, means for supplying the paper wrapper and feeding the tobacco thereto, means for forming the cigarette-rod and a

knife for cutting off the cigarettes, of a printer having a printing-roll to print upon the wrapper, said roll having its periphery at the edges flush with the type, means to drive the printing-roll, means to press the wrapper thereon to feed it positively from the printer to the tape, mechanism connecting the printing-roll with the cut-off knife to operate them in unison, gearing connecting the cut-off knife with the tape-driving wheel and a change-wheel in in such gearing to vary the length of the cigarettes.

5. In a continuous cigarette-machine, a tape-driving wheel having a removable steel tire scored around the periphery and across the periphery to form numerous fine points upon the surface, and means for rotating such wheel positively.

6. In a continuous cigarette-machine, the combination, with the tape, of a driving-wheel for the same, an arm mounted eccentrically upon the bearing of the driving-wheel, and a tape-presser roll upon said arm arranged to press the tape upon the surface of such wheel in one adjustment of the arm, and to clear the wheel for inserting the tape in the reverse adjustment of the arm.

7. In a continuous cigarette-machine, the combination, with the tape, of a driving-wheel for the same, an arm mounted eccentrically to the bearing of the driving-wheel, a radial slot in such arm, a stud secured adjustably in such slot, and a presser-roll upon the stud arranged to press the tape upon the surface of the wheel in a suitable adjustment of the arm.

8. In a continuous cigarette-machine having an endless tape and means for forming the cigarettes thereon, the combination, with the tape, and a leading-roll at the front end of the cigarette-forming devices, of a driving-wheel having its face scored as set forth, and an arm mounted eccentrically upon the bearing of the driving-wheel and carrying a yielding roll arranged and operated to press the tape upon the surface of such wheel.

9. In a continuous cigarette-machine, the combination, with an endless tape and a driving-wheel to propel the same, of a tightener comprising a pivot carrying a movable arm, a roll mounted upon said pivot, a stud and roll upon the end of the arm, the tape being conducted over and under such rolls, a pawl attached to the arm, and stationary ratchet-teeth adapted to engage the pawl and hold the same after each yielding of the tape.

10. In a continuous cigarette-machine, the combination, with an endless tape, a driving-wheel to propel the same, forming devices to form the cigarette-rod upon the tape, a printer to print upon the paper wrapper before its delivery to the tape, and adjustable leading-rollers arranged one to lead the tape into the forming devices, and the other to deliver the wrapper smoothly upon the tape.

11. In a continuous cigarette-machine, the combination, with an endless tape, a driving-wheel for the same, and forming devices to form the cigarette-rod upon the tape, of two contiguous leading-rollers arranged one to lead the tape into the forming devices, and the other to deliver the wrapper smoothly upon the tape, and adjustable leading-guides for the tape and wrapper, such guides having flanges fitted to the edges of the tape and wrapper to guide them upon such leading-rollers and vary their relation to the forming devices.

12. In a continuous cigarette-machine having means for feeding a paper wrapper with means for supplying the same with tobacco and forming a continuous oval cigarette-rod, the combination, with the oval-rod-forming devices, of a creasing device operating before the wrapper is delivered to the forming devices to suitably crease the wrapper to form sharp corners upon the oval cigarette-rod.

13. In a continuous cigarette-machine having an endless tape, means for forming an oval cigarette-rod thereon, and means for delivering a paper wrapper thereto, the combination, with a paper-reel and a leading-roller to lead the wrapper upon the tape, of an intermediate creasing device adapted to form the wrapper into a tube, flatten such tube, and means for opening the tube before it is delivered to the tape.

14. In a continuous cigarette-machine, the combination, with a tape and means for propelling the same, means for supplying the paper wrapper and feeding the tobacco thereto, means for forming the cigarette-rod, and a cutter operated to cut off the cigarettes, of a printer having a printing-roll to print upon the wrapper, a train of gearing connecting the cutter with the printing-roll to operate them in unison, and a divided shaft in such train of gearing with a coupling furnishing a rotary adjustment of the parts of said shaft, to vary the relation of the printer to the cutter.

15. In a continuous cigarette-machine, the combination, with a tape and means for propelling the same, means for supplying the paper wrapper and feeding the tobacco thereto, means for forming the cigarette-rod and a cutter operated to cut off the cigarettes, of a printer having a printing-roll to print upon the wrapper, a train of gearing connecting the cutter with the printing-roll to operate them in unison, a divided shaft in such train of gearing with a coupling furnishing a rotary adjustment of the parts of said shaft, to vary the relation of the printer to the cutter, and a clutch to wholly detach the printer from the cutter when required.

16. In a continuous cigarette-machine having means to form and paste a continuous cigarette-rod, the combination, with a cigarette-guide, of a slide carrying such guide and reciprocated in a substantially horizontal direction, a cutter mounted upon such slide and movable vertically adjacent to the guide to

sever the cigarette-rod, means for slightly inclining the slide, and for inclining the guide with respect to the slide, so as to preserve their adjusted relation to one another during the operation of the machine.

17. In a continuous cigarette-machine, the combination, with a cutter and means for traversing the same transversely to the cigarette-rod, of a reciprocating slide carrying the cutter and a turn-table carrying such slide and secured adjustably upon the frame of the machine to vary its angle as desired.

18. In a cutter for a continuous cigarette-machine having a tape and tape-driving appliances, the combination, with a reciprocating slide, a cigarette-guide and a cutter carried by said slide, and a cam-bar fitted movably across the slide, of a turn-table supporting the slide for movement in an approximately horizontal direction, a horizontal shaft journaled in the center of the turn-table and provided with a crank fitted to the cam-bar, and means connecting such horizontal shaft with the tape-driving appliances, as and for the purpose set forth.

19. In a continuous cigarette-machine, the combination, with the main frame A having the vertical seat A′ near the delivery end, and a bracket upon the seat A′ carrying the vertical shaft T and gearing connecting the same with a tape-driving mechanism, of a slide movable upon the upper part of the bracket, a reciprocating guide carried by said slide, a horizontal shaft connected with the vertical shaft T, a crank on the horizontal shaft for actuating the reciprocating slide, and a cutter carried by such slide and means for vibrating said cutter vertically adjacent to the reciprocating guide.

20. In a continuous cigarette-machine having an endless tape and driving-wheel to propel the same, the combination, with said wheel and tape, of a tightener comprising the stud l^3, the eccentrically-bored bushing l^4 clamped adjustably upon the stud, and the tightening-roller L^3 fitted to turn upon the bushing and adjustable thereby to vary the lead of the tape.

21. In a cutter for a continuous cigarette-machine, the combination, with a reciprocating slide and a cigarette-guide carried thereby, of arms V′ hinged upon the slide carrying the cutter V, a cam-bar fitted movably across the slide and provided with crank-pin hole, an arm actuated by the cam upon the bar to move the arms V′, and a shaft having an adjustable crank-pin x fitted to the crank-pin hole of the cam-bar to move the cam-bar transversely and the slide longitudinally, the crank and cam being adjusted in relation to the cutter to sever the cigarette before the crank reaches its highest velocity at the middle of its stroke.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANK J. LUDINGTON.

Witnesses:
THOMAS S. CRANE,
C. F. CONNER.