

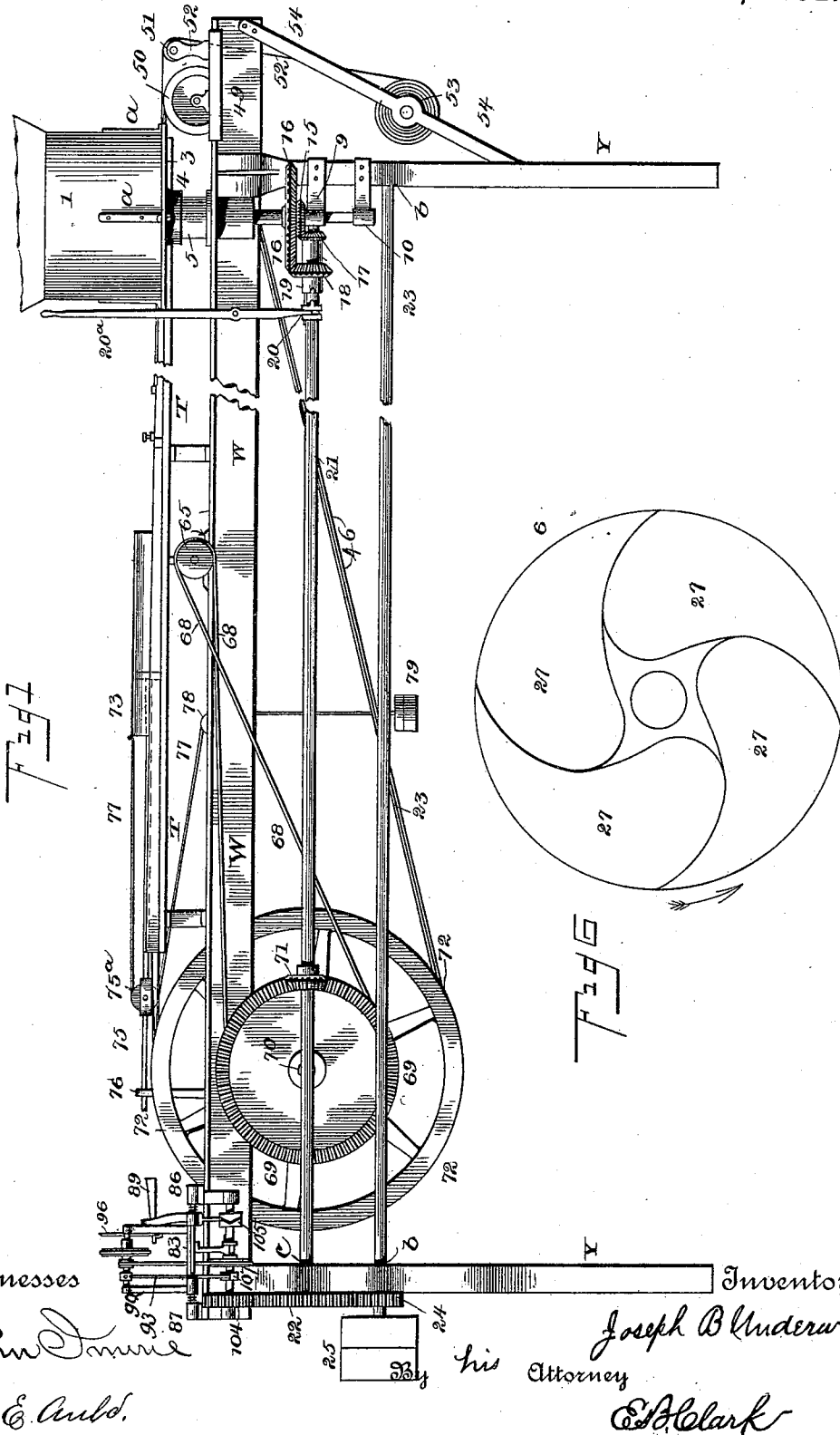
(No Model.)

7 Sheets—Sheet 1.

J. B. UNDERWOOD.
CIGARETTE MACHINE.

No. 470,269.

Patented Mar. 8, 1892.



(No Model.)

J. B. UNDERWOOD.
CIGARETTE MACHINE.

7 Sheets—Sheet 2.

No. 470,269.

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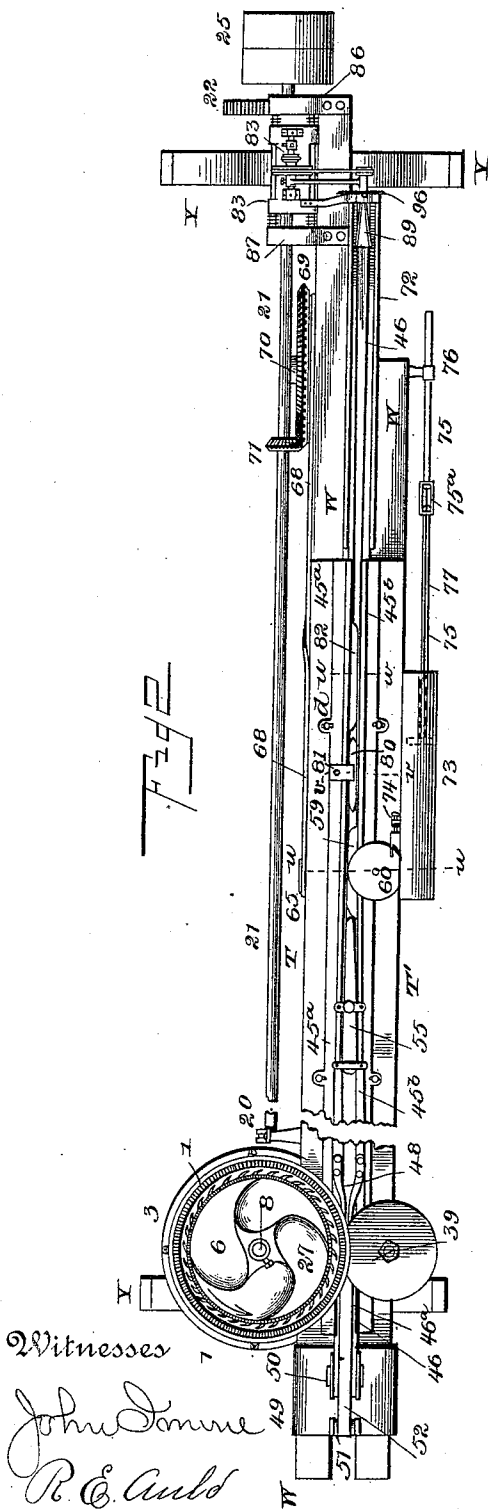
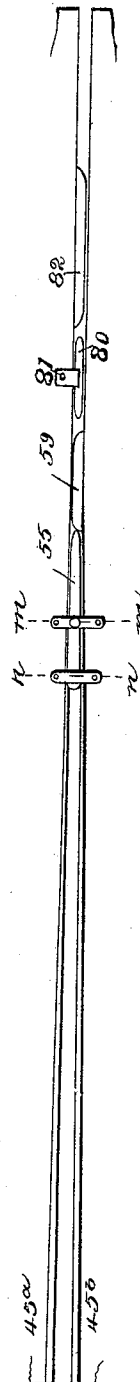


Fig. 3



Witnesses

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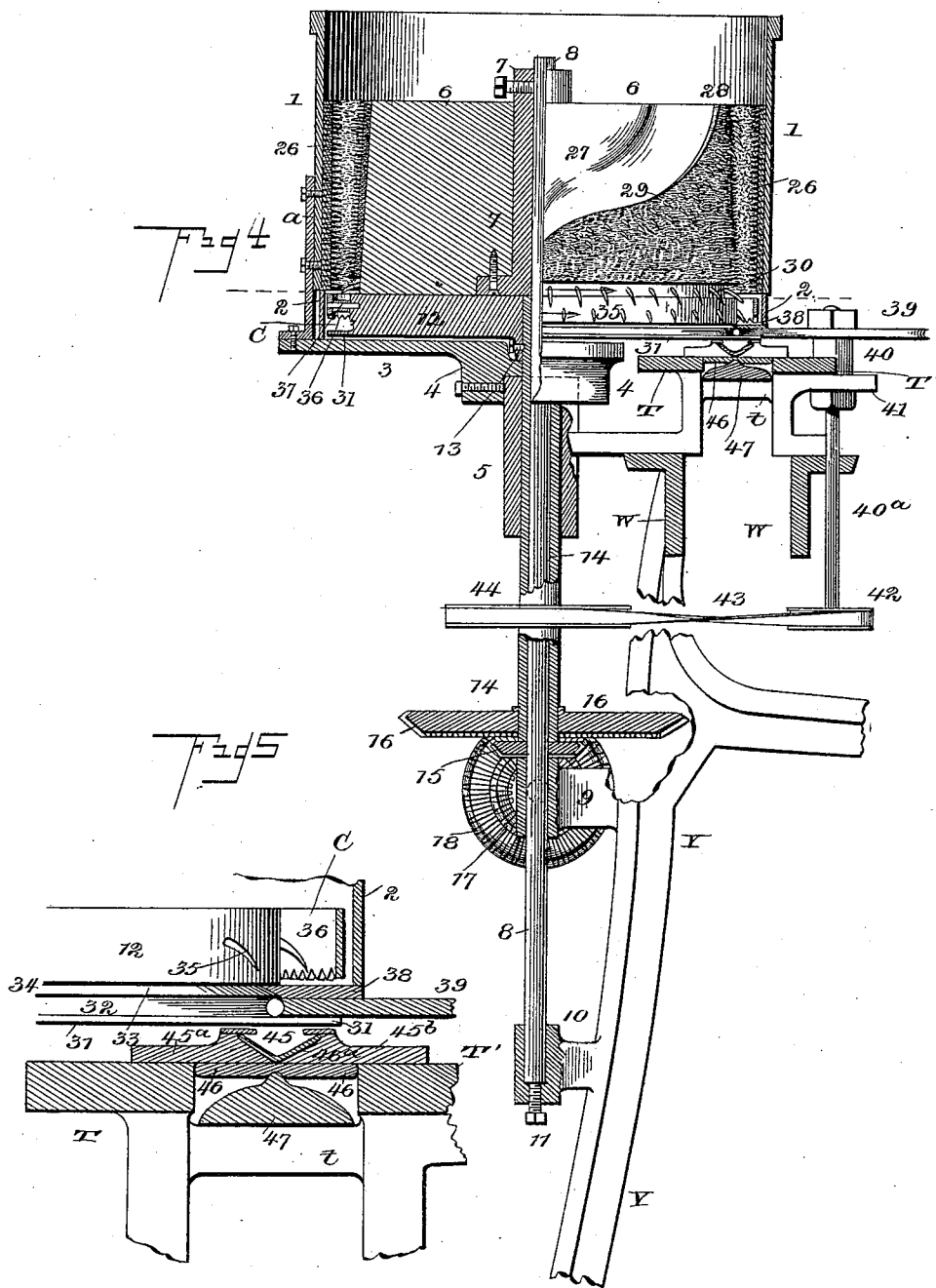
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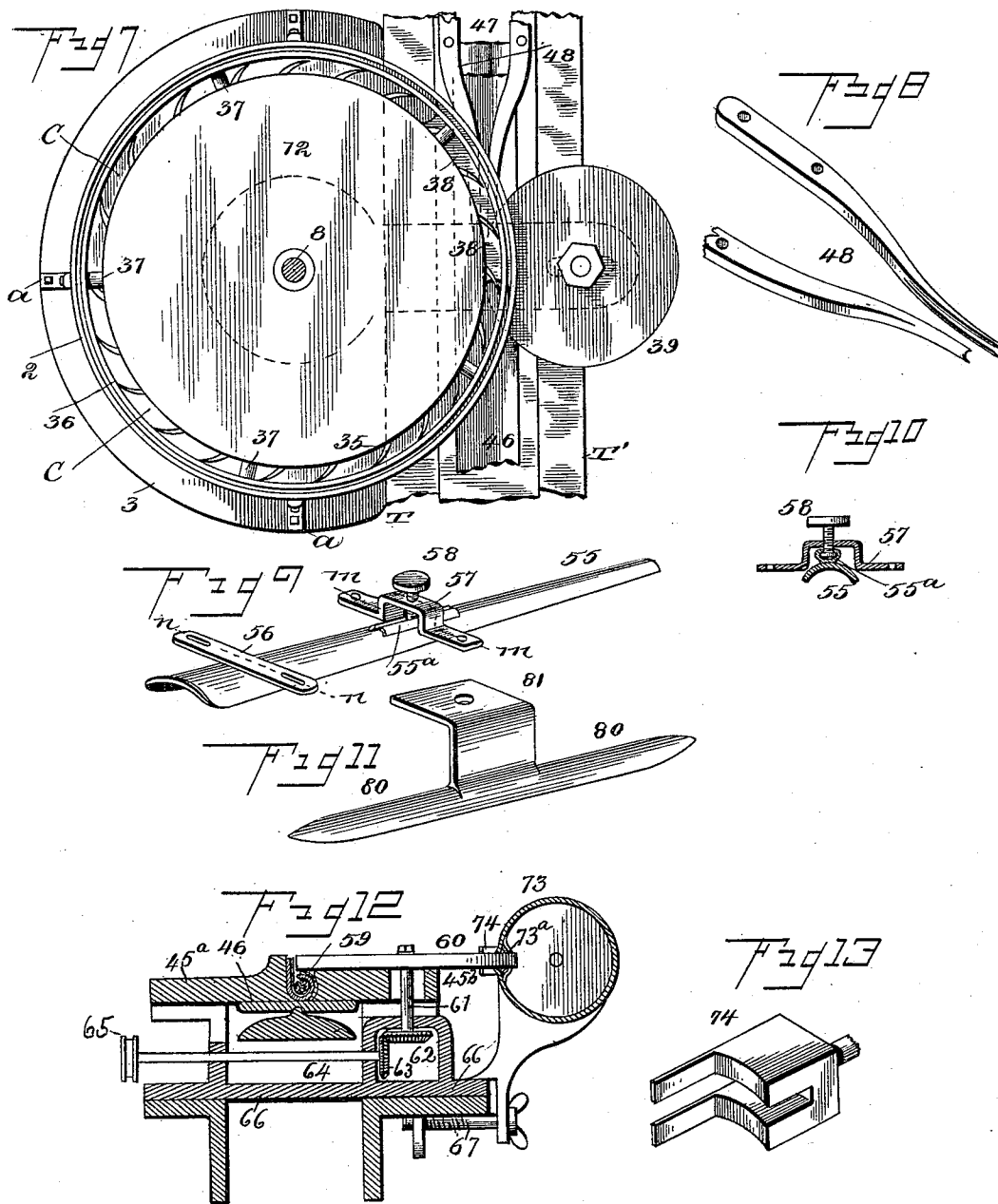
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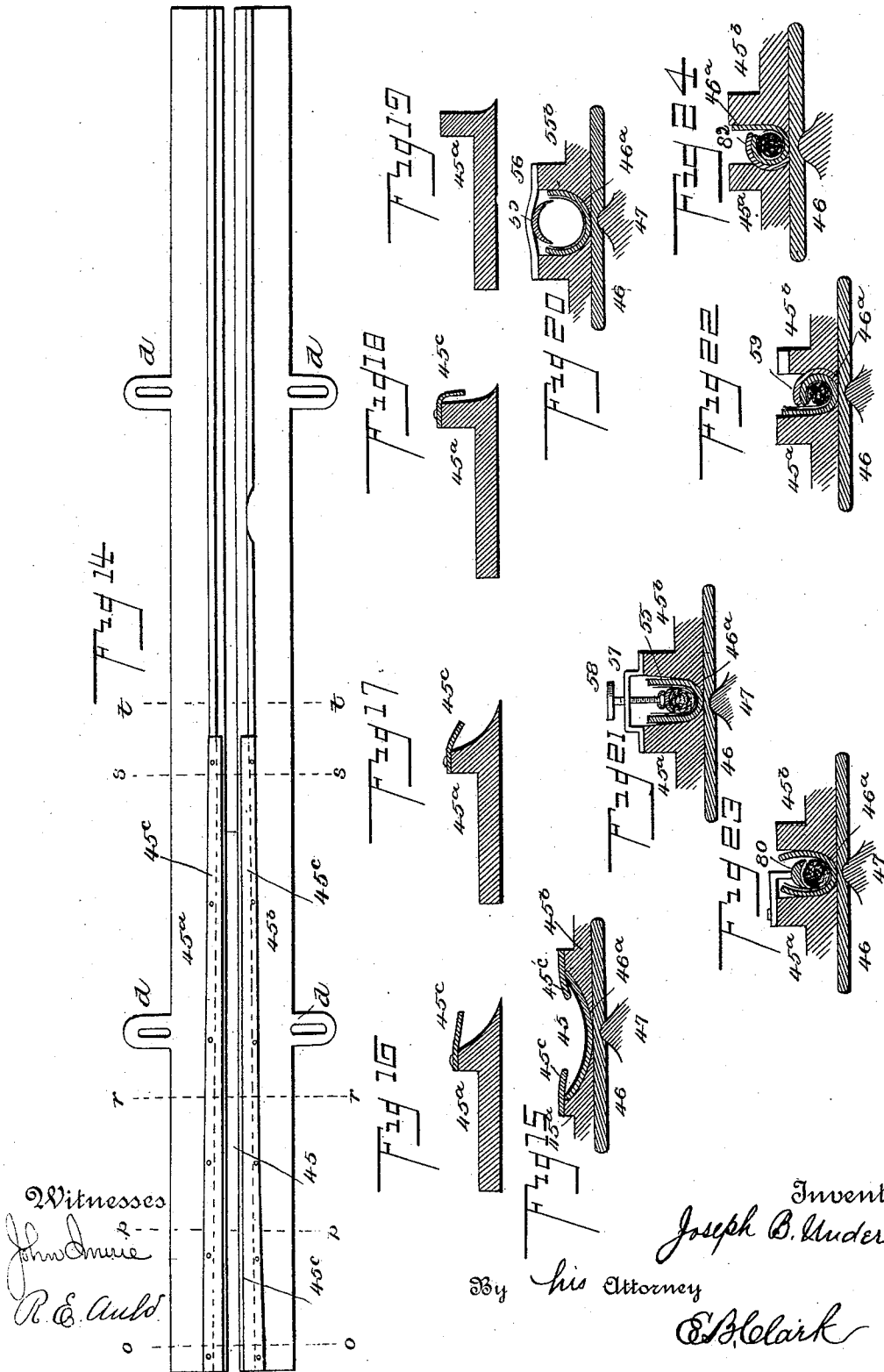
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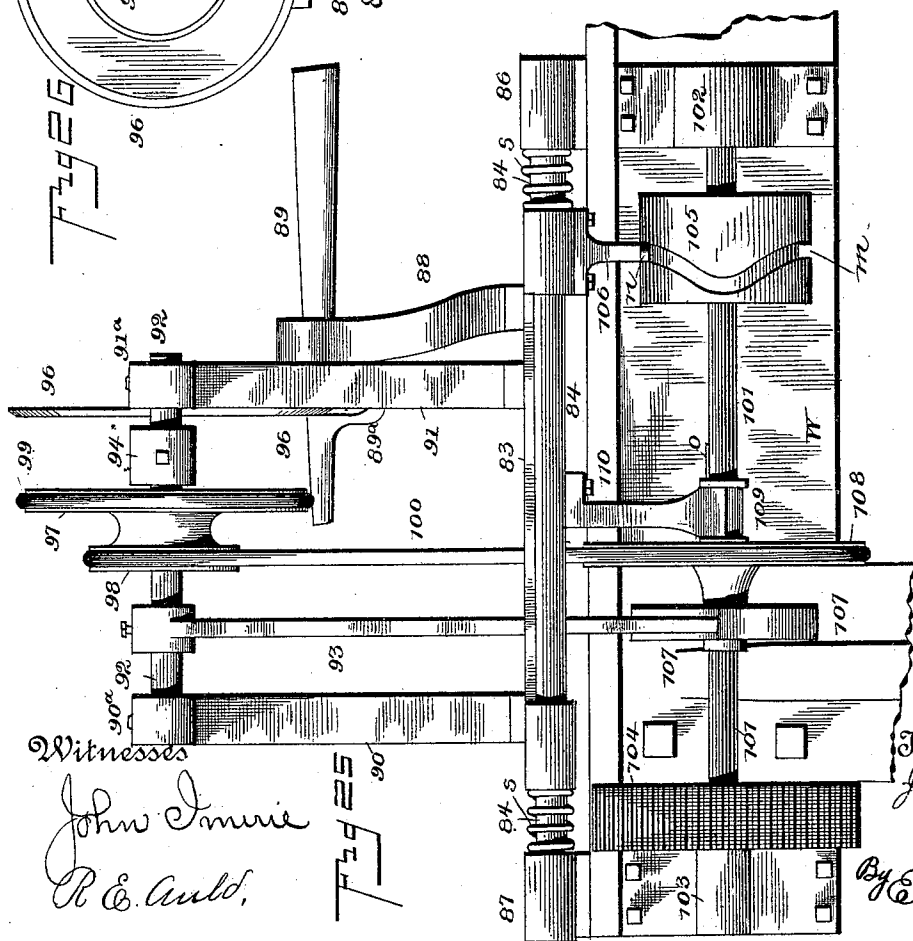
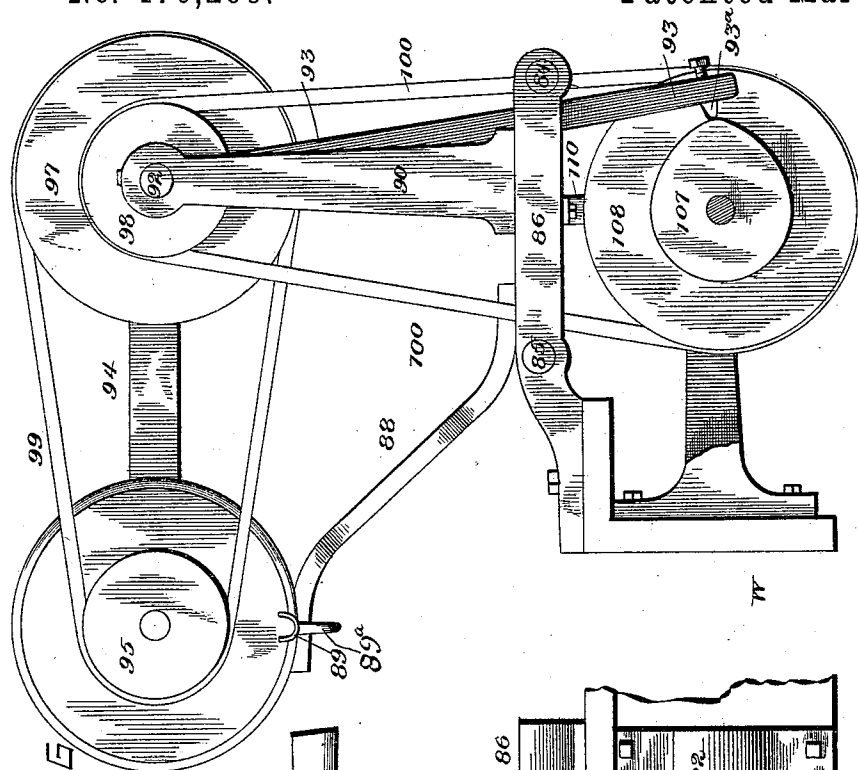
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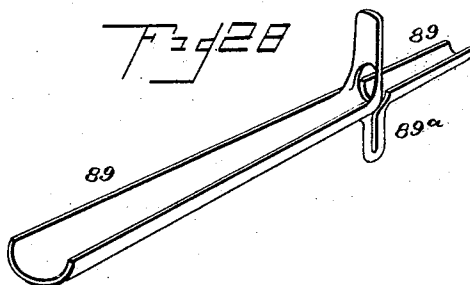
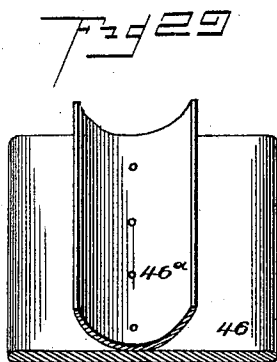
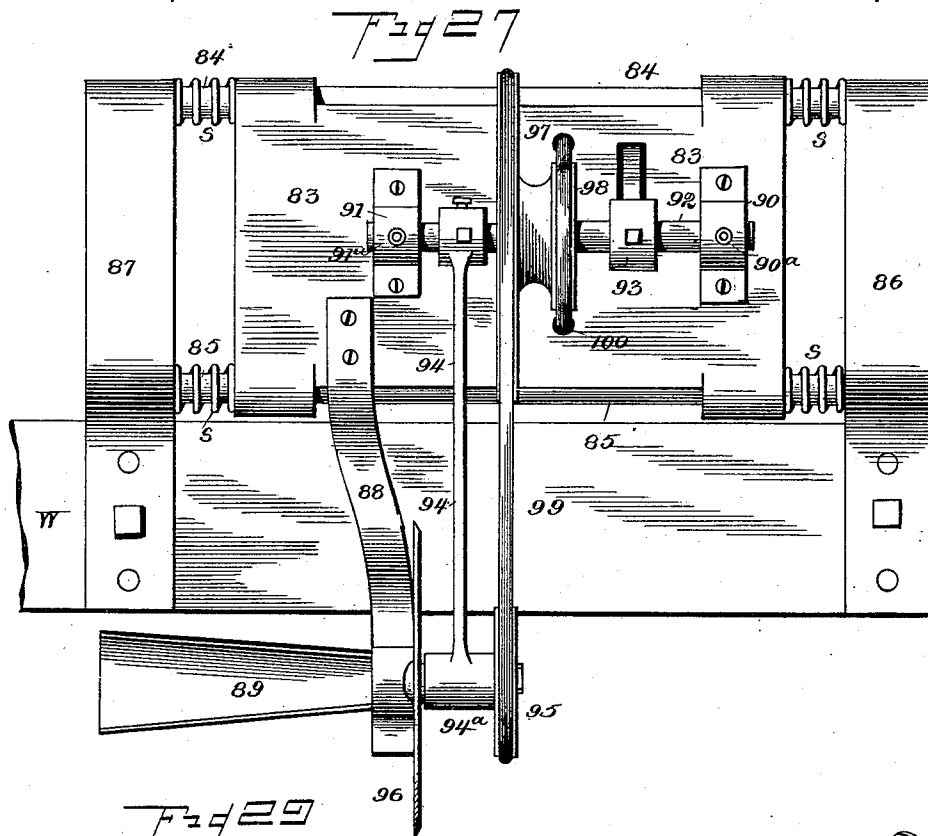
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7 Sheets—Sheet 7.

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UNITED STATES PATENT OFFICE.

JOSEPH B. UNDERWOOD, OF FAYETTEVILLE, NORTH CAROLINA.

CIGARETTE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 470,269, dated March 8, 1892.

Application filed May 5, 1891. Serial No. 391,660. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH B. UNDERWOOD, a citizen of the United States, residing at Fayetteville, in the county of Cumberland and State of North Carolina, have invented certain new and useful Improvements in Cigarette-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a cigarette-machine in which the tobacco-stock is fed and distributed by carding-cylinders and connecting devices so as to form a ring or circle of loose stock in a circular channel at the bottom of the carding-cylinder and of approximately the required bulk or thickness in cross-section to form the continuous rod or filler, which ring of stock is then formed into a continuous compact filler-rod by means of a revolving flanged grooved forming-disk and a grooved compressing-wheel and continuously fed forward upon the traveling paper or other wrapper and carrying-belt, in which wrapper it is folded, one edge thereof being supplied with paste and then the wrapper sealed around the filler-rod, which rod, as it continuously travels forward, is cut into short lengths to form cigarettes, all as fully hereinafter described.

My improved machine is very much simplified in construction and operation as compared with other "continuous-filler" cigarette-machines, and my devices for feeding and distributing the tobacco-stock and forming it into a filler-rod of uniform density are especially simple in construction and effective in operation. Such feeding, distributing, and forming devices are important features of my invention.

My machine also comprises other main features of construction, such as a compound belt composed of a strong thick driving-belt and a comparatively light thin filler-carrying belt connected longitudinally to the driving-belt and arranged to travel in the slotted guide-trough or folding-channel; also, a pair of extractors or stripper-guides arranged on each side of the guide-trough and having pointed curved ends projecting tangentially into the grooves of the forming and compress-

ing wheels or disks for stripping the tobacco-rod, as formed, out of such grooves and guiding it upon the wrapper on the carrier-belt; also, certain presser-fingers and side deflectors connected with the guide-bars of the slotted trough or curving the carrier-belt and wrapping the paper ribbon or other wrapper around the filler-rod; also, certain reciprocating cutting mechanism provided with a revolving and vibrating disk or blade for moving with the continuous cigarette-rod and cutting it into cigarette lengths without bending or deflecting the rod during the cutting operation.

My improved machine also embraces certain details of construction by which a more perfectly-operating machine is produced, as will be hereinafter more fully pointed out in connection with the drawings.

The parts and combination of parts constituting my invention will be defined in the claims.

My machine is illustrated in the accompanying drawings, in which—

Figure 1 represents a left-hand side elevation of the machine with a portion of the length broken away. Fig. 2 represents a top plan view thereof. Fig. 3 represents a plan view of the slotted guide-trough or folding-channel, showing the devices for curving the belt and folding the wrapper around the filler-rod. Fig. 4 represents a view of the carding-cylinders containing the feeding, distributing, and forming devices and their operating mechanism, partly in elevation and partly in vertical section. Fig. 5 represents an enlarged sectional detailed view of part of such devices. Fig. 6 represents a diagrammatic view of the top of the inner feeding and carding cylinder, showing the short spiral grooves thereof. Fig. 7 represents a top plan view of the distributing and forming disk and part of the folding-channel, the top portion or carding-cylinders being removed. Fig. 8 represents a perspective view of the extractors or stripper-guides for detaching the tobacco-rod from the grooves of the forming and compressing disks. Fig. 9 represents a perspective detailed view of a pressing-finger which is applied to the folding-channel. Fig. 10 represents a vertical cross-section thereof on the line *m m* of Fig. 9. Fig. 11 represents a perspective detailed

view of the belt-separator used in the folding-channel. Fig. 12 represents a vertical cross-section through the folding-channel and frame of the machine on the line *u u*, Fig. 2.

5 Fig. 13 represents a perspective detail of the scraper for the paste-wheel. Fig. 14 represents a top plan view of the two lateral guide-bars which form the slotted guide-trough for the folding-channel. Fig. 15 represents an enlarged transverse section of the folding-channel on line *o o*. Figs. 16, 17, 18, and 19 respectively represent enlarged transverse sectional views on the lines *p*, *r*, *s*, and *t* of one of the guide-bars of the folding-channel. Fig.

10 20 represents an enlarged transverse sectional view through the folding-channel, belt, and presser-finger on the line *n n*, Figs. 3 and 9. Fig. 21 represents a similar section on line *m m*. Fig. 22 represents an enlarged section of

20 the folding-channel and a belt-curve on the line *u u* of Fig. 2. Fig. 23 represents an enlarged transverse section of the folding-channel and the belt-separator on the line *v v* of Fig. 2. Fig. 24 represents an enlarged transverse section of the folding-channel and a belt-curve on the line *w w* of Fig. 2. Fig. 25 represents an enlarged side elevation of the reciprocating carriage and cutting mechanism. Fig. 26 represents an end view thereof.

30 Fig. 27 represents a top plan view of the same. Fig. 28 represents a perspective detailed view of the cigarette-holder connected with the cutting mechanism. Fig. 29 represents a perspective view of the compound belt:

35 In my machine the important operation of feeding the tobacco-stock, distributing it into a loose circular roll, and forming and compressing such roll into a compact continuous rod or filler, ready to be wrapped with paper

40 or other covering, are all performed with ease and accuracy in my combined feeding and carding cylinders 1 and 6, and the completed filler-rod is delivered by revolving, forming, and compressing disks 12 and 39, operating

45 at the bottom of such cylinders directly upon the traveling wrapper 52 and carrier-belt 46^a, Figs. 1 and 2, arranged below in the slotted folding trough or channel 45. In this folding-channel the filler-carrying belt and the wrapper applied to the top surface of such

50 belt are gradually curved into a U shape in cross-section, and at a suitable point the belt is curved over, together with the wrapper, by a deflector 59 upon one side of the channel,

55 while paste is applied by a wheel 60 to the standing edge of the paper. Then in an advanced position the belt is separated from the turned-over edge of the paper by a separator 80, while the turned-over edge of the

60 paper is held down upon the tobacco-rod by said separator. Then in a more advanced position the other edge of the belt and paper to which paste has been applied are turned down by a belt-curve 82, so as to seal the pasted

65 edge of the paper upon the previously turned-down edge, and thus inclose the filler. The completed cigarette-rod after having been in-

closed in a sealed wrapper is traversed forward and continuously cut into cigarette lengths by a longitudinal reciprocating cutting mechanism provided with a vibrating revolving cutter-disk 96 at the rear end of the machine.

The working devices and mechanism of the machine are suitably mounted and supported upon the table T and frame W, supported by the legs Y. The table is composed of two side bars or plates T T', connected by a number of web-bars *t*, providing a space between them for the passage of the traveling power-belt connected with the filler and wrapper carrying belt and for a longitudinal supporting-bed or guide-bar for the power-belt.

Devices for feeding the tobacco-stock, distributing it into loose circular roll, and forming and compressing it into a filler-rod will first be described as follows:

The external carding cylinder or drum 1 is mounted upon a base-plate 3 and secured thereto by the standards *a*, said cylinder being supported at a sufficient height from the base-plate to admit of the band or ring 2, which, as shown, is a plain metallic band without any carding-teeth. Such band 2, in connection with the carding-cylinder, the base-plate 3, and the disk 12, forms a circular channel C, into which is distributed the tobacco, forming a circular loose roll of stock, from which the filler-rod is formed. The base-plate 3 is provided with a downwardly-extending hub 4, which is secured by a screw to the vertical hollow bearing 5, connected by a side bracket to the frame of the machine. This bracket 5 not only supports the feeding and carding cylinders, but also serves as a bearing for the vertical shafts of the inner carding-cylinder and the inner distributing-disk.

The inner carding-cylinder 6 is slightly tapered from its base upward and is provided centrally with a bushing 7, through which one or more set-screws are inserted for securing it to the inner vertical shaft 8, which shaft is supported below in bearings formed in the bracket-arms 9 and 10, projecting from the frame or legs of the machine, and it rests at its lower end upon an adjusting-screw 11. The flanged grooved distributing and forming disk 12, arranged in the bottom of the outer carding-cylinder, is secured by means of a downwardly-projecting hub 13 and a set-screw to the hollow shaft 14, which is journaled in the bearing 5 and rests at its lower end upon the beveled pinion 15, which is secured to the inner shaft 8, just above the bracket 9. A large beveled gear-wheel 16 is secured to the lower end of shaft 14 and the two beveled wheels 15 and 16, Figs. 1 and 4, mesh with the two beveled wheels 17 and 18, fixed upon short sleeve-shaft 19, mounted loosely upon the revolving shaft 21. A sliding clutch 20 is connected by a spline joint or feather with the shaft 21 and is operated by a lever 20^a to engage with the short sleeve-shaft 19 for throwing the gear-wheels 17 and

18 into and out of connection with the gear-wheels 15 and 16. The shaft 21 is journaled at its front end in the bracket-arm 9 and at its rear end in a box *c* on leg Y, and is also provided at its rear end with a toothed gear-wheel 22, which meshes with a toothed pinion 24, fixed upon the main driving-shaft 23, which shaft is supported in journals at *b b* and is provided with fast and loose pulleys 25.

The outer cylinder 1 is provided internally with a lining of card-cloth 26, having the usual fine teeth. The inner carding-cylinder is slightly tapered from below upward and is formed with four large quarter-turn spiral grooves 27, starting in its upper surface and running out in its periphery, as indicated in Figs. 2, 4, and 6. Said grooves extend spirally downward, as shown in Fig. 4, and aid materially in feeding the tobacco down into the annular space between the inner and outer carding-cylinders. The peripheral surface of the carding-cylinder 6 outside of the spiral grooves is covered with a jacket of card-cloth 28, which is provided along the margin of the spiral groove with one or more rows of comparatively long teeth 29. Cylinder 6 is also provided at the bottom with a circular row of long teeth 30, curved slightly downward and backward and projecting downward into the circular channel C, as shown in Figs. 4 and 5. The rows of teeth 29 and 30 serve for feeding the tobacco downward and distributing it into a loose roll at the base of the carding-cylinders. The card-cloth may be omitted and carding teeth and pins applied directly to the surface of the outer case and the inner revolving cylinder, and I wish it understood that my invention is not limited to the card-cloth, though I have found such clothing, as above described, convenient in practice.

As clearly shown in Figs. 4 and 5, the distributing and forming disk 12 is made of smaller diameter than the outer carding-cylinder 1 and ring 2, and is provided at the bottom with a circular horizontal flange 31, forming the bottom of the circular channel C, and projecting below the grooved compressing-disk 39. Adjacent to flange 31 in disk 12 there is cut a deep annular forming-groove 32, and a projecting sharp cutting-lip 33 forms the upper edge of the groove and fits over the upper cutting-edge of wheel 39, as indicated in Figs. 5 and 7. In order to form the sharp cutting-lip 33, a sharp inclined groove 34 is cut into the disk 12 and serves, also, for receiving the inner edge of the bridge-plate 38. The disk 12 is provided in its periphery above groove 34 with a circle of long distributing-teeth 35, preferably curved downward and backward into the circular channel C. The carding-cylinder 6, secured to the inner shaft 8, is geared to travel two or three times as fast as the distributing and forming disk 12, so that as the stock is fed downward and distributed by teeth 30 it is held within the channel C by the circle of teeth 35, which also

aid in revolving the stock in making a uniform loose roll and also for feeding such roll forward at the proper speed to be formed into a rod. For the purpose of still further distributing the stock and leveling it in the roll formed in channel C, a circular band 36, provided with a serrated lower edge, is connected by distance-pieces and screws 37, Figs. 4 and 7, to the periphery of disk 12, and is of a suitable width to travel over the top of the bridge-plate 38. For the purpose of regulating the amount of tobacco-stock fed into the circular opening between the two grooved forming-disks, I provide a bridge-plate 38 of curved form, as shown in Fig. 7, arranged above the grooved compressing-wheel 39, and projecting at its inner edge into the groove 34 of disk 12. A portion is cut away from the lower edge of band 2, forming a wide notch or recess for inserting the bridge-plate 38 and for receiving the inwardly-projecting edge of the compressing-disk 39, as shown in Figs. 4 and 5.

The compressing-disk 39 is provided with a groove in its periphery and with sharp cutting-edges for operating, in conjunction with the cutting-lip 33 and the forming-groove 32 in disk 12, to shear off the tobacco-stock as it is fed forward in the form of a loose roll and compressed into a filler-rod by passage between the two grooved disks, and such disk 39 is mounted upon an adjustable stud-pin 40, set into a slotted bracket-arm 41, which pin 40 is provided with a nut below the bracket-arm for holding it in place. The stud-pin 40 may have a downwardly-extending shaft 40^a, provided at its lower end with a pulley 42, which is connected by a twisted belt 43 with the pulley 44 on the hollow shaft 14, as shown in Fig. 4, for positively turning the grooved compressing-disk 39, if desired. I have found, however, in practice that the grooved disk 39 may be successfully turned by frictional contact with the tobacco-stock in the groove 32 of disk 12. The stud-pin 40 is flattened on its sides which are in contact with the slotted arm 41 to prevent it from turning, and by means of the nut below the slotted arm the disk 39 may be slightly adjusted out or in for varying the size of the filler-rod.

The slotted trough or folding-channel 45 is arranged longitudinally on top of the divided table T T' and extends at its front end below the junction of the grooved compressing and forming disks, as shown in Figs. 4, 5, and 7. The channel is composed of the two adjustable guide-bars 45^a and 45^b, (illustrated in longitudinal plan view in Fig. 14 and by various cross-section views in Figs. 15 to 24, inclusive,) and are provided with lateral slotted lugs *d*, by means of which and suitable set-screws they are so adjusted on the table as to form a narrow slot between them, and they may be adjusted at different distances apart to accommodate different-sized cigarette-rods. They are each provided at the top with an inwardly-projecting and downwardly-inclined flange or belt-guard 45^c, extending

from their front ends to about their middle portions, as shown in Fig. 14. As shown in Figs 15, 16, 17, and 18, these guard-flanges are gradually inclined downward from nearly a horizontal position at their front end, as shown in Fig. 15, to nearly a vertical position at their rear ends, as shown in Fig. 18, and thereby aid in curving the belt and paper ribbon from a horizontal position into a U shape, as shown in Figs. 20 and 21. By reference to the above figures it will also be seen that the inner walls of the guide-bars rise from a nearly-horizontal or slightly-inclined surface at their front ends to a nearly-vertical surface at their rear ends, so as to aid in curving the belt and ribbon and forming a U-shaped channel. It will therefore be seen that the channel is broad and concave at the front end, and is tapered so as to be deep and comparatively narrow at the rear end of the guard-flanges, as indicated in Figs. 18 and 19. In Fig. 14 the tapering walls of the channel 45 are covered by the guard-flanges 45^c, but are indicated by the longitudinal dotted lines. The different slopes and inclinations of the inner walls of the guide-bars are also clearly shown in Figs. 15 to 19, inclusive. Beyond the rear end of the guard-flanges 45^c the walls of the channel are substantially parallel to the rear end thereof. The slot formed between the inner lower edges of the guide-bars 45^a and 45^b is for permitting the passage of the carrier-belt 46^a within the channel, while the power-belt 46, to which it is longitudinally connected, travels below the channel. The power-belt 46 is made thick and strong, preferably of leather or similar material, and is arranged to travel in the longitudinal passage-way between the table-bars T T', as shown in Figs. 4 and 5, and is preferably provided with a central longitudinal groove in its lower surface for bearing upon the central longitudinal rib of the bed or bar 47.

The carrier-belt 46^a is preferably made of enameled leather, which is considerably lighter than the power-belt, and is connected to the power-belt by a longitudinal line of stitches or other connecting devices, as shown in perspective view, Fig. 29. The power-belt, with its attached carrier-belt, passes at the front end of the machine over pulley 50, and at the rear end of the machine over the large driving-wheel 72, by means of which it is caused to travel and pull the carrier-belt, which carries the paper ribbon and filler-rod through the folding-channel. The belt-pulley 50 and the paper-ribbon pulley 51 are mounted in suitable journal-boxes upon the adjustable bridge-plate 49, mounted upon the front end of the divided frame W, as shown in Figs. 1 and 2, and such bridge-plate 49 is made adjustable by means of a screw arranged within the frame, but not herein shown, for the purpose of tightening the belt. The paper ribbon 52 is taken from a reel 53, suitably journaled by its axle in the bar or bracket 54, secured to the frame and legs of the machine,

as shown in Fig. 1, and is applied to the carrier-belt 46^a, in which it is wrapped around the filler-rod.

A pair of extractors or stripper-guides 48, having tapered ends and grooved inner surfaces, are secured to the guide-bars 45^a and 45^b and extend tangentially into the grooves of forming and compressing disks 12 and 39 for detaching the tobacco-rod from such grooves and guiding it onto the carrier-belt and paper ribbon in the folding-channel.

For the purpose of pressing down the tobacco of the filler-rod away from the standing edges of the paper in the channel, I provide a tapering concave presser-finger 55, Figs. 2, 9, 10, 20, and 21, which has attached to its large front end a cross-bar 56, by means of which such finger is secured to the guide-bars 45^a and 45^b, so as to lie within the folding-channel just beyond the rear ends of the guide-flanges 45^c. The front end of the finger is made broadest and is slightly curved upward, as shown in Fig. 9, and its under surface is made concave, as shown in Fig. 10, to assist in shaping the rod just previous to application of the wrapper. At about the middle of the finger 55 raised bridge 57 is screwed to the side bars and is provided with an adjusting-screw 58, which engages, by means of a small head or disk at its lower end, with a dovetailed groove 55^a, attached to the top of finger 55, by means of which the finger may be adjusted up or down for regulating the pressure upon the tobacco-rod. The disk at the lower end of the screw forms a swiveled joint with the dovetail groove 55^a, as clearly shown in Figs. 9 and 10.

Adjacent to the rear end of finger 55 I provide a curved belt deflector or curver 59, attached to the inside of the guide-bar 45^b just below the paste-wheel 60, as shown in Figs. 2 and 12, and such deflector serves to turn over one edge of the carrier-belt and paper wrapper below the paste-wheel, while the opposite edge, which is to receive the paste, is left standing against the opposite vertical wall of the channel for application of paste by the revolving paste-wheel 60, as shown in Fig. 12. The wheel 60 is secured to the top of the short vertical shaft 61, which has secured to it a beveled spur-wheel 62, meshing with a similar spur-wheel 63, fixed upon the horizontal transverse shaft 64, which is suitably journaled in an adjustable carriage 66, arranged in the frame of the machine, and is provided at its opposite end with a grooved belt-pulley 65. The carriage 66 has also connected to it the paste-cylinder 73 and is adjusted laterally by means of a screw 67. The paste-wheel and its gearing are operated by a round band 68, passed over pulley 65 and arranged in a groove formed in the periphery of the gear-wheel 69, Figs. 1 and 2, which is mounted upon the transverse shaft 70 and is turned by the beveled pinion 71, fixed upon the driving-shaft 21. The large belt-wheel 72, on which is placed the power-belt, is also fixed

upon the same transverse shaft 70, which is supported by hangers, (not shown,) but extending downward from the frame W.

The horizontal paste-cylinder 73 is preferably arranged parallel with the frame of the machine to which it is connected and is provided near its front end with a longitudinal slot 73^a for receiving the edge of the paste-wheel 60. The paste-wheel and its operating-gearing and the paste-cylinder being connected to the carriage 66, the whole may be adjusted laterally by means of the screw 67 for operating in conjunction with the guide-bars 45^a and 45^b when it is desired to vary the size of the cigarette.

An adjustable slotted scraper 74, Fig. 13, is connected with the inner side of the paste-cylinder and the two prongs thereof are arranged to embrace the paste-wheel 60 for removing therefrom superfluous paste, so that only the required amount of paste may be applied to the edge of the paper wrapper. The paste-cylinder is provided internally with a piston attached to a rod 75, which is supported in a bearing 76, projecting from the frame W, and is provided with a pulley 75^a, over which passes a cord or chain 77, attached at one end to the paste-cylinder 73 and passing over another pulley 78, secured to the side frame, and having attached to its dependent end a weight 79 for forcing the piston forward into the paste-cylinder, and thereby keeping the paste in contact with the revolving paste-wheel.

Just beyond the deflector 59 I arrange in the folding-channel a separating-finger 80, and connect it to the side bar 45^a by a shank 81, Figs. 2 and 11. This finger 80 performs the important office of raising and separating the edge of the belt which has been turned down by the deflector 59, while at the same time it holds down against the tobacco-rod the turned-down edge of the paper, thus separating one from the other.

Beyond the separating-finger 80 I arrange in the folding-channel a curved deflector 82, attached to the inside of bar 45^a, for curving and turning down the left-hand edge of the belt and the pasted edge of the paper, so as to lap such pasted edge upon the previously-turned-down edge of paper, and cause it be sealed thereon, thus completely inclosing the filler-rod and forming the finished cigarette-rod ready to be cut into short lengths. The cigarette-rod is carried forward by the carrier-belt and the power-belt 46, passing over the large driving-wheel 72, and the cigarette is conducted into the holding-trough 89, connected with the reciprocating carriage of the cutting mechanism.

I will now describe the reciprocating cutting mechanism provided with a revolving and cutter disk, which performs the important office of cutting the continuous cigarette-rod into short lengths without cramping or bending the rod, whereby danger of bursting the wrapper at the newly-pasted edges is avoided.

The reciprocating carriage 83, which supports the cutting-disk, is mounted upon the longitudinal guide-rods 84 and 85, fixed in the laterally-projecting bracket-arms 86 and 87, bolted to the frame W of the machine, as shown in Figs. 26 and 27. A curved arm 88 is secured to carriage 83 and supports at its outer end the cigarette trough or holder 89, which is made tapering and concave, as shown in Fig. 28. It is preferably made in two sections having a transverse slot between them and connected by a downwardly-curved link 89^a, which transverse slot is provided for the passage of the cutting-disk 96. The edge of one section of the trough at the transverse slot acts as one edge of a shear, against which there works the other edge of the shear composed of the vibrating cutting-disk 96. The mechanism for revolving the cutting-disk and giving it a vibrating motion is mounted on a rock-shaft 92, supported in journal-boxes 90^a and 91^a at the top of the standards 90 and 91, which are secured at their lower ends to the carriage 83, as clearly shown in Figs. 25, 26, and 27. To shaft 92 are secured two lever-arms 93 and 94 nearly at right angles one to the other, the arm 93 extending downward through the carriage and having at its lower end a set-screw 93^a, which bears upon the cam 107, and the lever 94 extending horizontally and having at its outer end a short journal-bearing 94^a. A short shaft is arranged in the bearing 94^a and carries at one end the grooved pulley 95 and at the other end the cutting disk or blade 96. It will be seen that since the lower end of lever-arm 93 bears upon cam 107 the cutting-disk will be given an up-and-down vibrating motion through the medium of rock-shaft 92 and lever-arm 94, so as to alternately approach and recede from the holder-trough 89 for cutting the cigarette-rod into short lengths.

For the purpose of revolving the cutting-disk I provide the large and small pulleys 97 and 98, connected to the same hub, which is mounted on the rock-shaft 92, and I connect pulley 97 to pulley 95 by a band 99 and connect pulley 98 by a band 100 with pulley 108, fixed upon the driving-shaft 101 below the reciprocating carriage. The driving-shaft 101 is mounted in journal-boxes 102 and 103 upon the ends of horizontal arms secured to the frame W, and has secured to it the pinion 104, which meshes with the spur-wheel 22 on shaft 21, Fig. 1. A grooved cam 105 is attached to shaft 101 and is provided in its periphery with a cam-groove *m*, with which there engages a downwardly-projecting arm 106, having at its lower end the roller *n*, working in the cam-groove. The arm 106 is rigidly secured to the reciprocating carriage 83, and by means of such arm and the cam 105 the carriage is given a reciprocating motion. The guide-rods 84 and 85 are provided at their ends with coiled springs *s* between the carriage and the bracket-arms 86 and 87 for assisting the motion of the carriage as it is thrown back and forth

by the cam 105. The cam 107, pulley 108, and the grooved hub 109 are preferably all cast together and are connected with shaft 101 by means of a spline joint or feather 0, so that they may be reciprocated upon such shaft, while at the same time they are made to turn with it.

In order to give the cam and pulley reciprocating motion with the carriage 83, I attach to the under side of such carriage the forked arm 110, the prongs at the lower end of which engage with the grooved hub 109, as shown in Fig. 25. By means of this construction the lever-arm 93, cam 107, pulley 98, and pulley 108 are maintained in proper alignment and relation to each other as the carriage 83 is reciprocated. By means of the reciprocating carriage and the operating mechanism the cutting-disk is moved forward with the cigarette-rod during the instant required for cutting through such rod, thereby preventing any cramping or bending of the same. By means of the vibrating motion given to the cutting-disk—that is, a motion downward and through the traveling cigarette-rod—I avoid the objectionable deflection of the rod in order to bring it in contact with the cutting-edge of the disk, as heretofore proposed, and thus avoid wrinkling or breaking the paper wrapper and the tendency to open the seam at the pasted edges, which result from moving the rod toward and from the cutting-disk, as heretofore proposed.

The operation of the machine is very simple and it can be successfully managed by one attendant. The belt is shifted on the fixed pulley of the power-shaft 23, and the clutch 20 upon the shaft 21 is moved by the lever 20^a to engage with the sleeve-shaft carrying the gear-wheels 17 and 18, by which all parts of the machine are set in motion. The fine-cut tobacco-stock is fed into a hopper set on the outer carding-cylinder 1, and thus falls down into the spiral grooves of the carding-cylinder 6, by which it is fed into the space between the carding-cylinders, and thus opened and drawn apart into a loose thin jacket and is gradually fed downward and distributed by the circle of teeth 30 into the circular channel C.

Since the carding-cylinder revolves two or three times as fast as the grooved forming-disk 12, the circle of teeth 35 on the latter disk serve to hold the roll of stock in channel C, and such teeth, together with the serrated band 36, serve to regulate the stock and to level it into a practically uniform roll, also to carry forward such roll into the opening formed by the junction of the grooves in the distributing and forming disk 12 and the forming and compressing disk 39. The overlapping cutting-edge 33 of disk 12 and the cutting-edge of disk 39 shear off the required amount to form the filler-rod, which is compressed and passed through the opening between the grooves of the two disks, while the

excess of stock, which is fed forward in the channel, is conducted above the bridge 38 by means of the teeth 35 and the serrated band 36. As the stock is sheared off by the cutting-edges of disks 12 and 39 and is passed through the opening formed by the grooves it is compressed into a filler-rod, and such rod is detached or stripped out of the grooves by the tangential stripper-guides 48, and guided thereby directly upon the paper ribbon 52, traveling with the filler-carrying belt 46^a in the folding-channel 45. As the filler-rod passes forward in the channel it is smoothed down and somewhat compressed by the presser-finger 55, so as to leave the standing edges of the wrapper and belt free from fibers in a most favorable condition for being inclosed in the wrapper. As the filler-rod, paper wrapper, and carrying-belt pass beyond the rear end of the presser-finger the right-hand edge of the paper and belt are turned over and down upon the filler by means of the curved deflector 59, while the paste-wheel 60, above such deflector, applies paste to the opposite standing edge of the paper. The paste-wheel is preferably tilted downward toward the rear end of the machine and is caused to revolve in a direction opposite to the travel of the paper and carrier-belt, whereby the paper is better held in a smooth vertical position. After leaving the deflector 59 and paste-wheel the turned-down edges of the belt and paper are separated one from the other by means of the separating-finger 80, which raises the edge of the belt into a standing position, while it holds down the edge of the paper upon the filler. The belt is sufficiently resilient and springy to readily unfold and return to a standing position in the channel, while the edge of the paper passes under the separating-finger 80. The left-hand edge of the wrapper and belt are turned over by the deflector 82, thereby lapping the opposite edge of the paper upon the previously-turned-down edge and sealing the wrapper around the filler, thus completing the formation of the cigarette-rod. The completed rod is carried forward by the belt and conducted into the holder-trough 89, in which it is subjected to the action of the cutter-disk 96, working through the transverse slot in such trough, as before explained. During the downward stroke of the vibrating lever-arm 94 the disk 96 is caused to traverse the cigarette-rod and project into the transverse slot of trough 89, and at the same time the reciprocating carriage 83 is moved forward, so that during the instant when the cutting-disk passes down through the cigarette-rod it also moves forward in line with such rod, so that there is no back-pressure on the rod, and so that no injury results to it from cramping or bending and no trouble arises from bursting of the wrapper and the freshly-sealed edges. As a result I obtain a well-formed, well-sealed, and smooth cigarette.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with a casing and means contained within it for feeding tobacco-stock, a grooved forming-disk in said casing, and a grooved compressing-disk working in the groove of said forming-disk to form a filler-rod, substantially as described.

2. In combination with a casing and means for feeding tobacco-stock, a grooved forming-disk having a broad circular horizontal flange at its bottom edge and arranged in the casing, and a grooved compressing-disk overlapping said flange and working in the groove of the forming-disk to form a filler-rod, substantially as described.

3. A distributing and forming disk provided with a circle of teeth, a circular horizontal flange at the bottom, and a circular forming-groove adjacent to said flange and having a cutting-lip above, in combination with a feed-casing and a grooved compressing-disk working in conjunction with said forming-disk to form a filler-rod, substantially as described.

4. The combination, with the outer carding case or cylinder and the inner carding-cylinder having an annular space between them, of the flanged grooved distributing and forming disk in the carding-case and a grooved compressing-disk operating therewith, substantially as described.

5. In combination with the outer carding-cylinder having card-clothing on its inner surface, the inner spirally-grooved carding-cylinder secured to a rotary shaft within the outer cylinder for feeding and distributing tobacco, and suitable filler-rod forming and compressing devices beneath them.

6. In combination with the outer carding-cylinder, the inner carding-cylinder secured to a rotary shaft within the outer cylinder, and the grooved forming-disk secured to a separate rotary hollow shaft and arranged below the carding-cylinders, and a grooved compressing-disk operating with said forming-disk, substantially as described.

7. In combination with the outer and inner carding-cylinders and the grooved forming-disk secured to a shaft below the inner cylinder, a serrated distributing-band 36 of greater diameter than the disk and secured to its periphery, and a grooved compressing-disk, substantially as described.

8. In combination with the outer carding-cylinder, the inner rotary carding-cylinder having spiral grooves extending from its upper surface downward into its periphery, and spiral rows of teeth in its periphery, the grooved rotary forming-disk provided with a circle of teeth and arranged at the bottom of the outer carding-cylinder, and a grooved compressing-disk, substantially as described.

9. In combination with the outer carding-cylinder, the inner carding-cylinder secured to a rotary shaft within the outer cylinder, the

grooved forming-disk secured to a separate rotary shaft and arranged below the carding-cylinders, a grooved compressing-disk operating with said forming-disk, and the stripper-guides projecting tangentially into the grooves of said disks for detaching the filler-rod, substantially as described.

10. In combination with the outer carding-cylinder, the inner carding-cylinder secured to a rotary shaft within said outer cylinder, the grooved forming-disk secured to a separate rotary hollow shaft and arranged below the inner carding-cylinder, and gearing secured to the shafts of said inner cylinder, and a forming-disk adapted for turning them at different speeds, and a grooved compressing-disk operating with said forming-disk, substantially as described.

11. In combination with the outer and inner carding-cylinders and the grooved forming-disk provided with a bottom flange and distributing-teeth and secured to a shaft below the inner cylinder, a grooved compressing-disk working in the groove of said forming-disk, and a bridge-plate 38, arranged above the compressing-disk at its junction with the forming-disk, substantially as described.

12. In combination with the outer carding-cylinder, the inner rotary carding-cylinder provided at the bottom with a circular row of teeth, the grooved rotary forming-disk 12, secured to a separate shaft below said inner cylinder and having a bottom flange 31 and a circle of teeth, the distributing-band 36, having a serrated lower edge and secured to disk 12, the grooved compressing-disk 39, working in the groove of said disk 12, and a bridge-plate 38 above disk 39 in the outer carding-cylinder, substantially as described.

13. The combination, with feeding and distributing devices comprising outer and inner carding-cylinders and the grooved forming and compressing disks at the bottom of said carding-cylinders and working in conjunction with each other, said forming-disk being provided with teeth, of the folding-channel and the filler and wrapper carrying belt below said disks, substantially as described.

14. In combination with a slotted folding-channel, the compound belt composed of the longitudinally-connected power-belt and a filler and wrapper carrying belt, said power-belt having a longitudinal groove in its under surface and arranged below the folding channel and said carrying-belt being arranged in the folding-channel, and a longitudinal supporting-bar below the power-belt and having a longitudinal guide-rib fitting in the groove of said power-belt, substantially as described.

15. In combination with the side bars T T', spaced apart, and the slotted folding-channel, the compound power-belt and carrier-belt connected together, as described, said power-belt being arranged in the space between such side bars and said carrier-belt being arranged in the folding-channel, and a longitudinal

supporting-bar below the power-belt, substantially as described.

16. The combination, with the folding-channel and carrier-belt arranged therein, a presser-finger 55, adjustably supported within the channel above the carrier-belt, and suitable adjusting devices 56, 57, and 58 therefor, substantially as described.

17. In combination with the folding-channel and carrier-belt arranged therein, the pivoted and concave adjustable presser-finger 55, supported within the channel above the carrier-belt and provided with an adjusting-screw for raising or lowering one end thereof, substantially as described.

18. In combination with the folding-channel and carrier-belt therein, the presser-finger 55, adjustably supported in the channel above the belt, and the curved deflector 59, attached to one wall of the channel beyond and adjacent to said finger, substantially as described.

19. In combination with a folding-channel and carrier-belt therein, the curved deflector 59 in the channel, and the separating-finger 80, having a concave under surface and located in the channel beyond and adjacent to said deflector for separating the carrier-belt from the turned-down edge of the wrapper, substantially as described.

20. In combination with a folding-channel and carrier-belt therein, the curved deflector 59, projecting from one wall of the channel, the separating-finger 80 in the channel beyond and adjacent to deflector 59, and the curved deflector 82, attached to the other wall of the channel beyond and adjacent to finger 80 for turning down the belt and pasted edge of the wrapper, substantially as described.

21. The folding-channel consisting of the two laterally-adjustable guide-bars set to form a slot between them at the bottom, having their inner walls gradually and laterally converging and gradually increasing in height and carrying on their upper surfaces inwardly-turned guard-flanges, which are gradually turned downward from nearly a horizontal to a vertical position, in combination with a carrier-belt, substantially as described.

22. The adjustable guide-bars having wide flaring inner surfaces at their front ends and gradually converging to a deep vertical form toward their middle portions and forming a folding-channel open at top, in combination with the carrier-belt in such channel and the inwardly-projecting guard-flanges extend-

ing from the tops of said bars for curving the carrier-belt and wrapper into a U shape, substantially as described.

23. In combination with the folding-channel composed of the guide-bars having a slot between them and the compound power and carrier belt, the latter arranged in the channel, the curved belt-deflector 59, attached to one of the guide-bars of the channel, the other bar of said channel having a vertical wall opposite said deflector for supporting the standing edge of the paper, and the paste-wheel arranged across the channel above such deflector 59 for applying paste to the standing edge of the paper, substantially as described.

24. In a continuous cigarette-machine, a longitudinal reciprocating carriage carrying a cigarette holder 89, provided with a transverse slot, and a longitudinal rock-shaft having arms 93 and 94, the latter provided with a rotating cutter, a belt on a pulley on said shaft for rotating the shaft of the cutter, means for rotating the pulley, and a rotating cam bearing on the lower end of arm 93, all combined and operating substantially as described.

25. In a cigarette-machine, a longitudinal reciprocating carriage carrying a cigarette-holder and a longitudinal rock-shaft having arms 93 and 94, the latter provided with a rotating cutter, a pulley on said shaft having a driving-belt for rotating the shaft of the cutter, a driving-shaft provided with a cam bearing against arm 93, and a pulley and belt for operating the former pulley, and an arm connecting the carriage with a hub of the pulley and cam, whereby said pulley and cam are adapted to slide on said driving-shaft, all combined and operating substantially as described.

26. The horizontal paste-cylinder having a longitudinal slot in its side for receiving the edge of a paste-wheel, the paste-wheel working in said slot, in combination with a piston in said cylinder, having a piston-rod provided with a pulley, and a cord or chain fixed at one end, passing over said pulley and provided at its opposite end with a weight, whereby the paste in the cylinder is fed up to the slot, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH B. UNDERWOOD.

Witnesses:

CHAS. HAIGH,
G. A. THOMSON.