

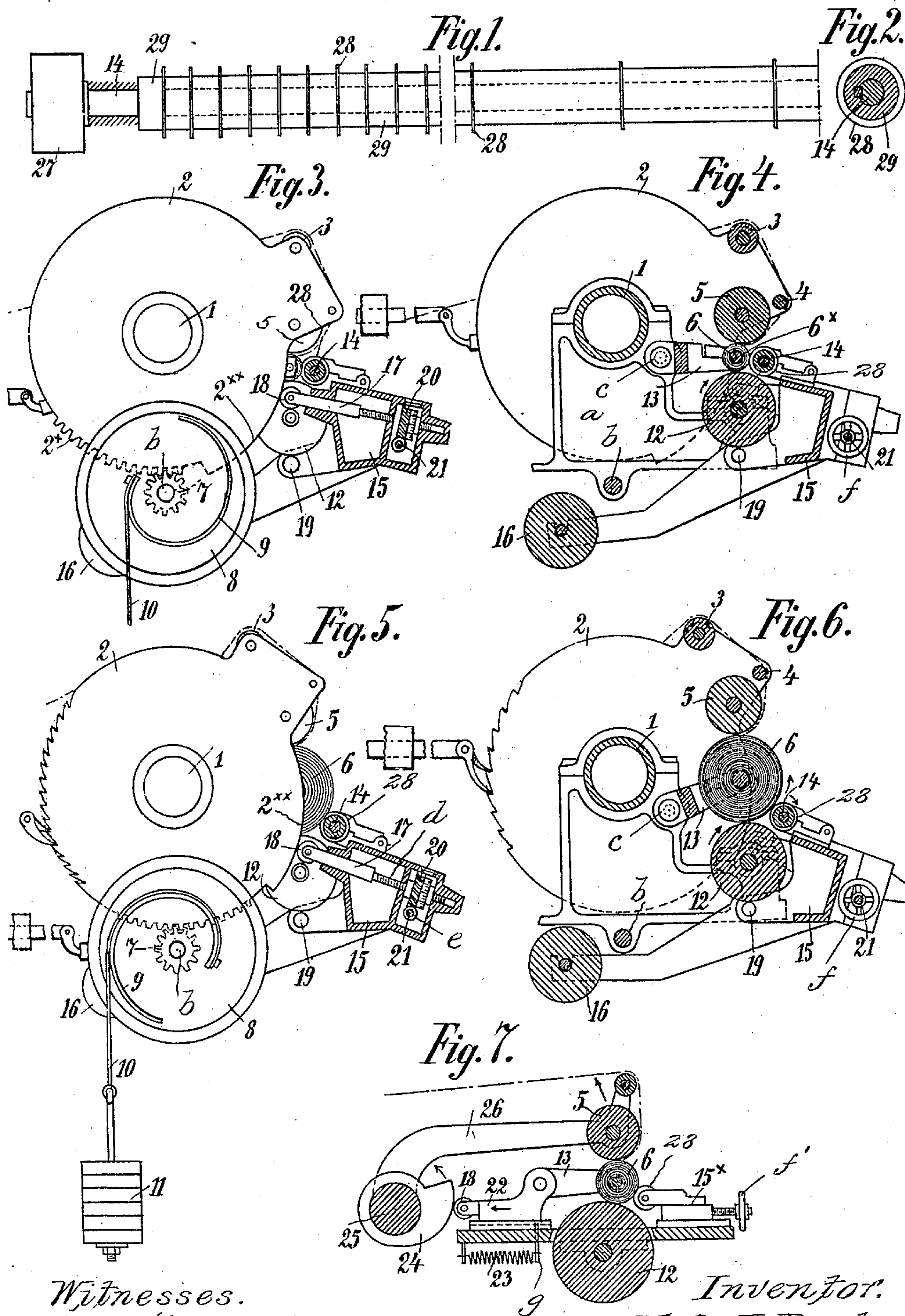
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F. G. J. POST.

DEVICE FOR CUTTING CYLINDER PAPER AND THE LIKE.

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Witnesses.
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UNITED STATES PATENT OFFICE.

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DEVICE FOR CUTTING CYLINDER-PAPER AND THE LIKE.

No. 837,340.

Specification of Letters Patent.

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Application filed October 29, 1903. Serial No. 179,009.

To all whom it may concern:

Be it known that I, FRIEDRICH GUSTAV JULIUS POST, a subject of the German Emperor, and a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Devices for Cutting Cylinder-Paper and the Like, of which the following is a specification.

The present invention relates to improvements in machines for cutting stock in web form, such as paper or other fabrics, while it is being wound into rolls by means of cutter-disks cutting directly into the said roll, so as to obtain smaller rolls of such of any desired width that have smooth end faces. The present invention does, therefore, not come into consideration in machines which cut the paper or fabric web into strips before it is being wound into a roll.

With the known paper-cutting machines of the kind in question it was not possible to obtain a smooth cut. The edges of the paper cut were more or less bent or turned and fringed. Also the winding on of the paper, &c., required a comparatively great period of time.

The object of this invention is to produce a machine which obviates the above-mentioned drawbacks, makes a smooth cut, and allows of a quick working or operation, and that at a cheap or moderate expense or price. The said object is attained, first, by arranging the winding-on roll and the cutter-shaft of the machine in such relation to each other that the motion or displacement of the winding-on roll resulting from the increase of diameter of the roll of stock is transmitted to an intervening means, which is adapted to automatically guide and position the cutter-shaft with respect to the roll of paper, &c., being cut, or vice versa, so that the cutter-disks of the cutter-shaft will maintain a uniform depth of cut notwithstanding the continually-increasing diameter of the roll on which they act directly and incidentally by providing auxiliary means to regulate the depth of cut of the circular knives; second, by arranging and journaling the cutter-shaft carrying the cutter-disks in such a manner that only the latter come in contact with or cut into the paper-roll, respectively, all contact of the washers or distance-sleeves spacing or holding the cutters with the paper-roll being avoided, and, third, by employing instead of the commonly-used stable and expensive cutters thin and delicate cutter-disks which will cut unsharpened, which are so thin as to be flexible,

and which receive the necessary stiffness for their cutting operation by running them at a high speed. This arrangement renders it possible to cut or divide a continuous web by means of cutters, acting directly upon the roll being wound, into any number of widths as it is being rolled (a web having a breadth of about three feet can thus be cut into one hundred or two hundred rolls of tape) without limit as to the diameter of the paper-roll, and each tape-roll or roll of tape-stock so cut will have perfectly smooth end faces. Such tape-rolls, as is well known, may be used in printing-telegraphs, in the manufacture of cigarettes, in printing-offices, and the like; but that my invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is an enlarged side elevation of the cutter-shaft and cutter-disks. Fig. 2 is a cross-section of Fig. 1. Fig. 3 is an end view, partly in section, of a preferred form of machine embodying this invention. Figs. 4 to 6 are views, partly in section, showing the parts in different operative positions; and Fig. 7 is a sectional view of a modification.

Referring to Figs. 3-6, there is journaled in a suitable frame 13, pivotally connected at *c* to standards mounted on a suitable base, a winding-on roll 6^x, resting on another roll 12, mounted in fixed bearings of the machine-frame *a* and adapted to engage the winding-on roll 6^x or the stock 6 on the roll, respectively, in order to frictionally drive said winding-on roll. In some cases, however, it may be desirable to dispense with the driving friction-roll and to impart rotation to the winding-on roll directly by any suitable means. Above or against the winding-on roll and always resting upon it is arranged a pressure-roll 5, which may be journaled in a suitable swinging frame. In the present example this frame consists of a shaft 1, preferably hollow, mounted in the machine frame or casting *a*, and on which shaft are fixed two plates 2, distanced apart somewhat greater than the width of the largest web of stock to be subdivided into rolls. Between these two plates 2 and mounted in them are the said pressure-roll 5 and two guide-rolls 3 and 4 for the paper web. It is obvious that the roll 6, of paper or stock, as it increases in radius or diameter swings upward with its swinging frame 13 and lifts the pressure-roll 5, which in turn rotates the plates 2 and their

shaft 1 accordingly, the arrangement being such that all rolls and shafts are and remain exactly parallel to one another.

The above-described arrangement of the swinging frame for carrying and guiding the pressure-roll is but of secondary nature and may be replaced by any other guiding means well known in paper cutting and winding machines.

During the operation of the machine the pressure-roll 5 must press upon the stock 6 on the winding-on roll 6^x with a certain pressure. This may be effected by suitable weights acting upon the plates carrying the pressure-roll or by suitably braking the shaft of the plates, or by both means jointly. As the pressure of the pressure-roll must vary in accordance with the increase of the diameter of the roll of paper on the winding-on roll, I prefer the following pressure device: Each plate 2 (or only one of them, if desired) is provided on its edge with a toothed portion 2^x, that is engaged by a pinion 7, mounted on a separate shaft *b*. Connected to the pinions or mounted on their shaft are disks 8, having each a spiral cam 9, to which is secured near its least radius a rope 10, from the end of which is suspended a weight 11. These latter act to rotate the pinions and plates, so as to hold the pressure-roll with the required or necessary pressure against or upon the roll of paper. By suitably braking the shaft of the plates or by means of ratchets and pawls provided on the rims of the plates the latter, and thereby the pressure-roll, may be prevented from lowering back and sinking into or following any irregularity which may occur, especially at the beginning of the winding operation, in the cylindrical surface of the roll of paper or stock, thereby tending to produce and maintain a perfectly-cylindrical roll. Each plate 2 is, moreover, provided with a cam-face 2^{xx}. These cam-faces form the most essential part of the improved machine. For the sake of simplicity of construction they are provided on or attached to the plates; but they may be arranged on or fixed to any other part or place of the machine, provided that the said cams are operated or moved by the raising motion or displacement of the pressure-roll or the increase of radius or diameter of the roll of paper, respectively.

Pivoted on a separate shaft 19 in the machine-frame is a box-shaped swing-frame 15, preferably provided with adjustably or slidably mounted blocks or bars 17, having friction-rollers 18 in their free ends toward the plates. The said friction-rollers bear on the cam-faces 2^{xx} of the plates 2 and are held in positive and absolute contact therewith by means of a heavy weight or weights 16, attached or connected to arms extending from the said box-shaped swing-frame 15. The weight or weights are so heavy that during

the operation of the machine the friction-rollers 18 remain at all times in reliable contact against the cams or cam-faces 2^{xx}. The swing-frame is thereby positively guided and follows the motion or displacement of the said cams with absolute exactness.

On or in the swing-frame 15 is mounted the cutter-shaft 14, carrying the suitably-spaced cutter-disks 28. Owing to the fact that the swing-frame 15 is positively and reliably guided by the cams 2^{xx} and moved in accordance with the swinging movement of the said cams and the pressure-roll 5, which movements depend upon or are governed by the increase of radius or diameter of the roll of paper, the cutter-shaft or cutter-disks, respectively, will always be held in the proper operative relation to the roll 6, of paper, so that the cutter-disks cut only with their edges and the cut roll does not engage the disk-shaft 14 or the spacing-blocks or washers 29 between the cutter-disks 28 on the shaft, thereby dispensing with any auxiliary rolls between the cutter-shaft and paper or stock.

The slidably-mounted block or bars 17, carrying the friction-rollers 18, may be provided with threaded extensions *d*, on which are worm-wheels 20, engaged by worms *e* on a separate shaft 21, mounted in the box-shaped swing-frame 15, said shaft being provided with a hand-wheel *f*, whereby the distance between the friction-rollers 18 and the swing-frame 15 or the cutter-shaft 14, respectively, and consequently the position or distance of the latter with relation to the cams 2^{xx} and the roll 6, of paper, can be adjusted to regulate the depth of the cut of the cutter-disks 28.

Instead of making the friction-roller carrier 15 adjustable the cutter-shaft may be mounted in suitable adjustable bearings, allowing the cutter-shaft itself to approach or recede from the roll of paper.

The cutter-shaft 14, Figs. 1 and 2, is driven by a separate driving-pulley 27, preferably at a greater speed than the winding-on roll, so that the cutter-disks advance or aid in the rotation of the paper-roll.

From the above it is obvious that the described form of the box-shaped swing-frame and the means described for its displacement are not an absolute requirement. On the contrary, it is only necessary that such means be provided by which the cutter-shaft can be moved by the cams and the depth of the cut into the paper-roll be regulated, it being immaterial in what manner such means may be constructed or arranged.

The cutter-disks 28 must be of comparatively small diameter, and the cutter-shaft 14 is preferably of cast-steel supported at both ends, and, if found desirable, also, by an auxiliary bearing between the ends. To prevent torsion on the shaft, it may be driven from both ends.

Any circular disk having a short or a long

cutting edge may be used. The longer and thinner the edge the better will be the cut; but as the sharpening of such disks is very tedious and expensive I use very thin blades, 5 of a thickness of about one-tenth of a millimeter, that have given very good results. Such thin disks may best be obtained by punching or stamping them out from thin-rolled steel sheets without any special hardening of the same. They may be sharpened, 10 if desired; but I have found that this is not necessary and that the required stiffness of such metal disks is given by running them at a high speed. Owing to the fact that the 15 cutter-shaft is not in contact with the roll of paper, and in view of the exceedingly great exactness of its positive movement in accordance with the increase of the diameter of the roll of paper, and because the cutter-disks 20 cut only slightly with their edges, the cutter-shaft can be rotated from two to four times faster than the paper, so as to make about eight hundred to sixteen hundred revolutions per minute. For such a speed of ro- 25 tation cutter-disks will suffice which have only the thickness of note or post paper. It is not necessary that the cutter-disks become absolutely stiff by the rotation, as a stiffness will suffice which enables the cutter-disks 30 when slightly bent by diminutive axial displacements of the cutter-shaft or winding-on roll to again cut their proper way. Such thin cutter-disks cannot become really blunt, as they are not thicker than a cutter edge 35 after a short time of use. After use the thin cutter-disks may be sharpened by filing or by scraping off (smoothing) their edges, whereupon the cutter-disks are sorted and stored according to their diameter, so as to have at 40 any time a great number of cutter-disks of exactly the same size at command.

The winding-on roll 6^x, which may be constructed in one piece or may be composed of two parts, if desired, is preferably provided 45 with two pasteboard tubes, the outer one of which is first cut before the commencement of the winding of the web into rings having the same width as the tapes into which the paper web or roll is afterward to be cut. The 50 said rings of the outer tube are seated firmly on the inner tube and are not liable to be displaced laterally, as the end rings are suitably connected with or fastened to the inner tube. After the entire web has been wound and cut 55 the connection between the end rings and the inner tube can be loosened and the tape-rolls taken off the winding-on roll or the uncut inner tube fastened on the latter, each tape-roll being drawn off the uncut tube with a 60 ring or section of the outer core forming a sort of hub for the said tape-roll.

The cutting of the outer tube into rings or sections may be effected by means of the machine itself—that is to say, by the cutter- 65 disks, which for this end are so positioned

that they cut the outer tube only and leave the inner tube intact.

The paper or other web to be cut is drawn over the guide-rolls and under the pressure-roll and fixed or cemented to the ring-sections of the outer tube in any convenient 70 manner. The cutter-disks are then positioned to dip into the kerfs between the ring-sections of the outer tube and the cutter-shaft is set in rotation. The driving friction- 75 roll is then set in rotation, whereby the winding-on roll is frictionally rotated and the winding on of the paper web started. As the paper-web winds on, it is slit or cut in well-known manner into strips or tapes by 80 the cutter-disks dipping into the kerfs between the ring-sections of the outer tube. As soon as the winding on of the paper web has been started the cutter-disks are adjusted by means of the hand-wheel *f*, so as to make cuts 85 having a depth equal to or only a little greater than the thickness of the paper web to be cut in order to obtain smoother cuts and to save driving power.

During the operation of the machine the, 90 box-shaped swing-frame 15 is pressed by its weight or weights 16 with its friction-rollers 18 firmly against the cam-faces or cams 2^x, so that the cutter-disks obtain and remain in the proper position with respect to the paper- 95 roll 6 to be cut. The position of the cutter-disks will therefore only alter when the position of the cams or of the plates 2, carrying the latter, is changed. The pressure-roll 5 is held on the roll 6 of paper by reason of the 100 weights 11 tending to rotate the pinions 7, which in turn tend to rotate the plates 2, so that the pressure-roll is held positively on the roll of paper.

The roll of paper as it increases in radius or 105 diameter swings upward with its swinging frame 13 and lifts the pressure-roll 5, which in turn rotates the plates 2 and their shaft 1. This rotates the pinions 7 and the spiral cams 9, connected therewith, so that the point of 110 suspension of the weights 11, acting upon the said spiral cams 9, is moved away from the center as the roll of paper increases in diameter, thereby providing a continually-increasing lever-arm acting on the pinions, so that 115 as the diameter of the roll of paper increases the pressure of the pressure-roll on the said roll of paper increases also.

As the size of the roll of paper increases the cams or cam-faces are raised accordingly by 120 the rotation of the plates turned by the raising of the pressure-roll, as above stated. The turning or raising of the cams forces the friction-rollers away, and thus rotates the swing-frame on its pivot against the action of the 125 weight or weights acting on the said swing-frame, thereby swinging the cutter-shaft or cutter-disks, respectively, mounted on the said swing-frame, the proper distance away from the center of the winding-on roll to 130

maintain a uniform depth of cut during the entire operation.

In the modification shown in Fig. 7 instead of displacing the cutter-shaft as the size of the roll of stock increases the same result is obtained by displacing the roll of stock. The frame 13, that carries the paper-roll, is pivoted to a sliding frame 22, that carries a friction-roller 18, held against a cam 24, connected to a shaft 25, to which is secured a pair of arms 26, that carry the pressure-roll 5. The sliding frame 22 carries a pin *g*, to which is secured one end of a spring 23, that has its other end fixed in any suitable manner. This spring holds the roller 18 against the cam 24, that forms a substitute for the plates 2. The depth of cut of the disks is adjusted by means of the screw and hand-wheel *f'*. The pressure-roll is held down by a weight (not shown) secured to the cam 24 or shaft 25 in the same manner as described with reference to the first-mentioned structure.

As is evident from the drawings, all the shafts, rolls, &c., in my improved machine are arranged and rotated exactly parallel to one another.

The exact shape of the cam-faces 2^{xx} , operated directly or indirectly by the increase of size of the roll of paper in accordance with the movement or displacement of the cutter-shaft, (which displacement is dependent upon the form and rotation of said cams or eccentrics,) may be obtained, for example, in a machine such as above described as follows: The cutter-shaft is replaced by a solid roller of the same diameter as the cutter-disks, and the friction-roller bearing against the cams is replaced by milling-tools or other suitable rotary cutters independently driven. After a web of paper, preferably tissue-paper, has been drawn over the guide-rolls and fixed to the winding-on roll the entire device is set in operation. The solid shaft will be forced away from the center of the winding-on roll by the increasing size of the roll of tissue-paper, while the milling-tool will exactly cut the cam-surface in accordance with this movement. Instead of a milling-tool a pin may be used, which marks the exact curvature on the side of the metal piece intended to form the cam, and the said metal piece properly marked is afterward cut in a suitable machine.

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

1. In a machine such as described, the combination with a friction-roll having fixed bearings; of a winding-on roll, a swinging frame to support said winding-on roll in contact with the friction-roll, a rotatable frame, a pressure-roll mounted therein and contacting with the winding-on roll to hold the latter against the friction-roll, and cutters to

engage the stock on the winding-on roll, substantially as and for the purpose set forth.

2. In a machine such as described, the combination with a friction-roll having fixed bearings; of a winding-on roll, a swinging frame to support said winding-on roll in contact with the driven friction-roll, a rotatable frame, a pressure-roll mounted therein and contacting with the winding-on roll to hold the latter against the friction-roll, and cutters to engage the stock on the winding-on roll, substantially as and for the purposes set forth.

3. In a machine such as described, the combination with a fixed driven friction-roll and a pressure-roll movable toward and from the friction-roll; of a winding-on roll between the friction and pressure rolls, said friction and pressure rolls contacting with the roll of stock being wound on the winding-on roll and means to automatically increase the pressure of the pressure-roll in proportion to the increased diameter of the roll of stock, substantially as set forth.

4. In a machine such as described, the combination with a winding-on roll, means to permit the movement of the winding-on roll as the roll of stock increases in diameter and means controlled by the variation in the size of the roll of stock to simultaneously move the cutters and the center of the winding-on roll from each other.

5. In a machine such as described, a pair of cam-plates, a winding-on roll journaled between them, rotating cutters to engage the stock being wound on said roll and arms engaged by the cam-plates to maintain the cutters in proper relation to the roll of stock, substantially as set forth.

6. In a machine such as described, a fixed driven friction-roll, a pair of plates mounted to rotate a pressure-roll journaled in the plates, said plates rotated and the pressure-roll revolved about the center of the plates by the stock, a winding-on roll between the friction and the pressure rolls, a pivoted frame, cutters mounted on the frame and means on the frame to hold the cutters against the roll of stock, substantially as set forth.

7. In a machine such as described, a fixed driven friction-roll, a pair of cam-plates, a pressure-roll journaled in the plates, a winding-on roll journaled in a pivoted frame and between the friction and the pressure rolls, means to rotate the plates and maintain the pressure-roll with increasing pressure against the roll of stock, a pivoted frame, rotating cutters mounted therein, means on the frame to hold the cutters in contact with the roll of stock, means to independently adjust the cutters to and from the roll of stock, and means engaged by the cam-plates to move the frame to maintain a uniform depth of cut by the cutters, substantially as set forth.

8. In a machine such as described, the combination with the winding-on roll, of thin flexible cutter-disks incapable of performing their function until rotated at a speed sufficient to render them operatively stiff, and means to move said cutters automatically with the increase of the roll to prevent the cutter from entering too deeply into and hanging in the kerf.
9. In a machine such as described, the combination with a winding-on roll, of a cutter-shaft, a plurality of thin flexible cutter-disks mounted thereon incapable of performing their function until rotated at a speed sufficient to render them operatively stiff, and means to automatically move the shaft with the increase of the roll to prevent said cutter from entering too deeply into and hanging in the kerf.
10. In a machine such as described, the combination with a winding-on roll and means for rotating the same, of a cutter-shaft, a plurality of thin flexible cutter-disks mounted thereon too flexible to perform their function until rotated at a speed sufficient to render them operatively stiff, means to rotate said shaft at a speed greatly in excess of the winding-on roll, and means to move the cutter automatically with the increase of the roll to prevent the cutter from entering too deeply into and hanging in the kerf.
11. In a machine such as described, a pair of plates mounted to rotate, pressure-rolls mounted in the plates, a winding-on roll, a pivoted frame cooperating with said plates, and cutter-disks mounted on the frame, whereby the roll of stock will rotate said plates and the latter cooperate with the frame to maintain the cutter-blades in proper cutting relation to the roll of stock, substantially as set forth.

12. In a machine such as described, the combination with a rotatable winding-on roll, of a cam adapted to be rotated by the increasing of the stock on said roll, and an independently-operated cutter-shaft movable away from the winding-on roll by the rotation of said cam.

13. In a machine such as described, the combination with a rotatable winding-on roll, of a cam adapted to be rotated by the increasing of the stock on said roll, a cutter-shaft, a movable support therefor, friction-rolls on the latter in contact with said cam, and a weight to hold the rolls in contact with the cam.

14. In a machine such as described, the combination of a rotatable winding-on roll, a pair of cam-plates and a pressure-roll carried by said plates adapted to engage the winding-on roll, whereby the plates are rotated by the increasing of the stock on the winding-on roll, for the purpose specified.

15. In a machine such as described, the combination of a winding-on roll, a pair of cam-plates, a pressure-roll carried by said plates adapted to contact with said winding-on roll, and means to exert a pressure on the pressure-roll, said pressure varying in accordance with the increase of the diameter of the roll of stock on the winding-on roll.

16. In a machine such as described, the combination with the cutter-shaft, the winding-on roll, cam-plates and a pressure-roll for displacing said cams, of a braking device for said cams adapted to prevent the lowering back of said pressure-roll, for the purpose specified.

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