No. 723,375. PATENTED MAR. 24, 1903.

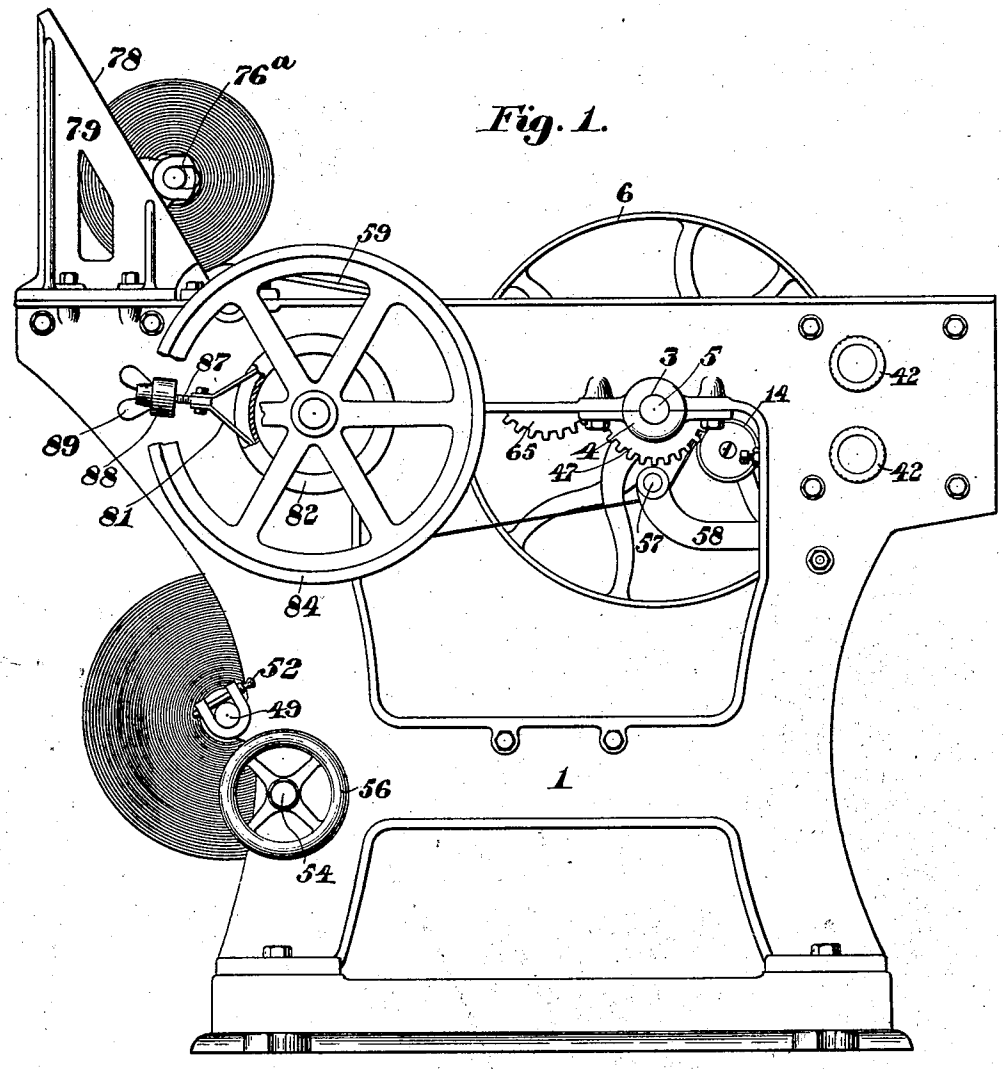
L. F. FALES.

PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

[illegible] Lombard.

Walter C. [illegible] Kearney

Mary [illegible]

Inventor:

Lewis F. Fales,

By his Attorney,

Hart Anderson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 723,375.

PATENTED MAR. 24, 1903.

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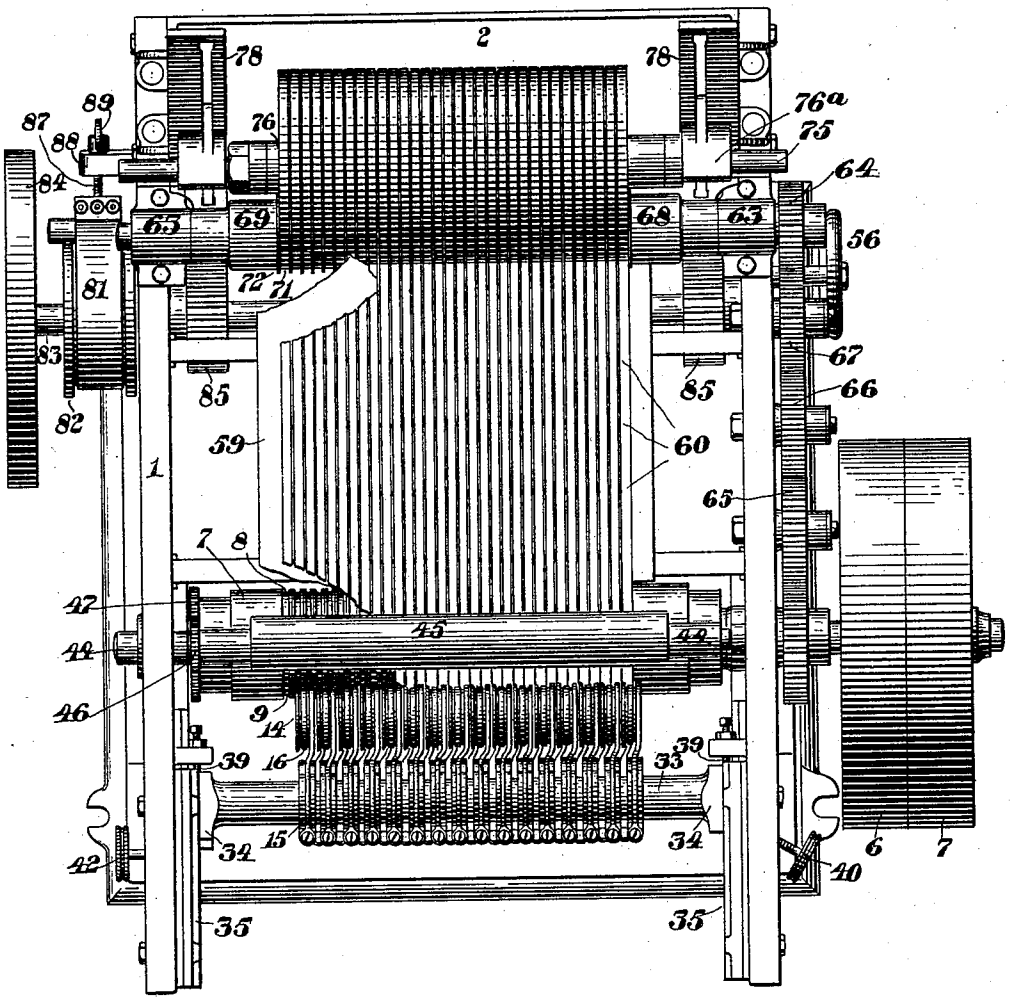
PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL.

6 SHEETS—SHEET 2.

Fig. 2.



Witnesses:

Walter D. Lombard

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No. 723,375. PATENTED MAR. 24, 1903.

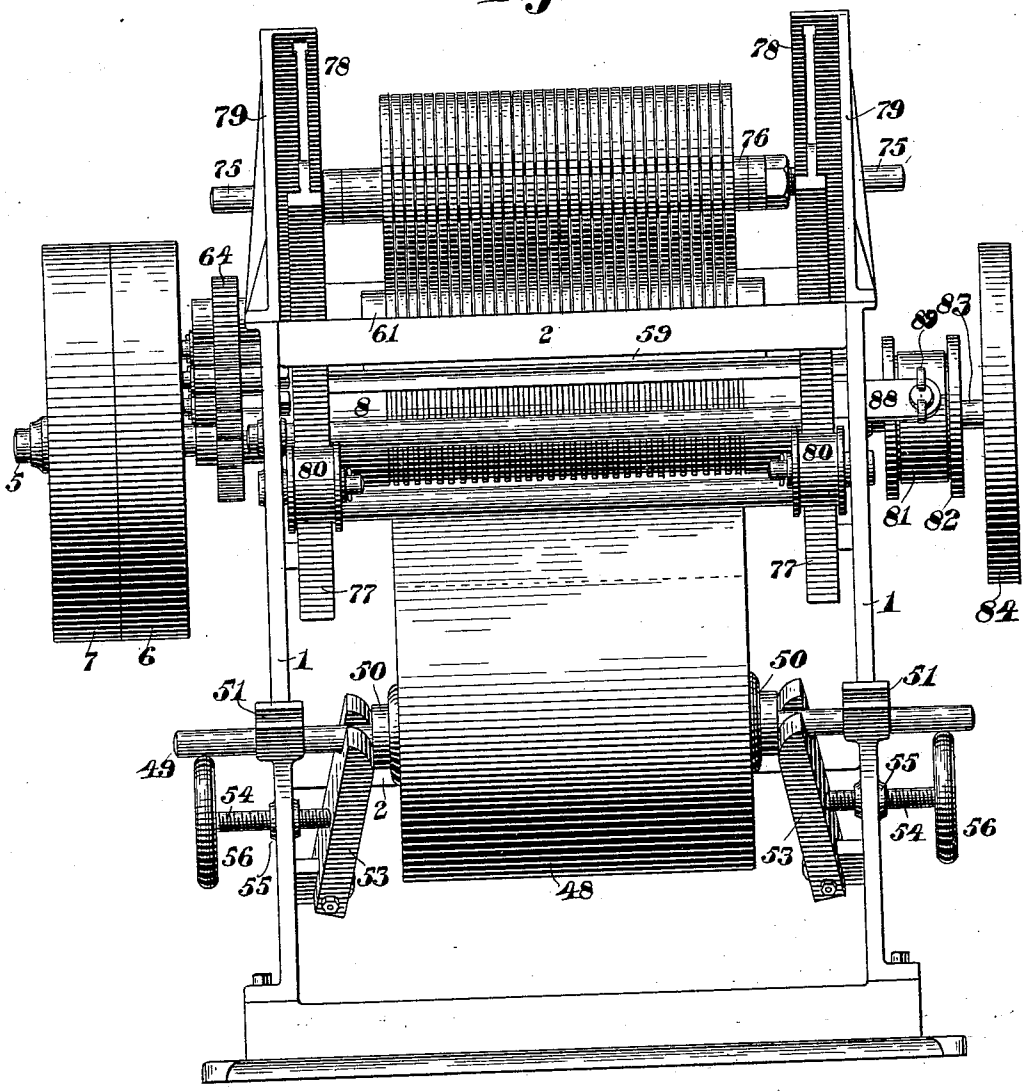
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PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL. 6 SHEETS—SHEET 3.

Fig. 3.



Witnesses:

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No. 723,375. PATENTED MAR. 24, 1903.

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PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL. 6 SHEETS—SHEET 4.

Fig. 5.

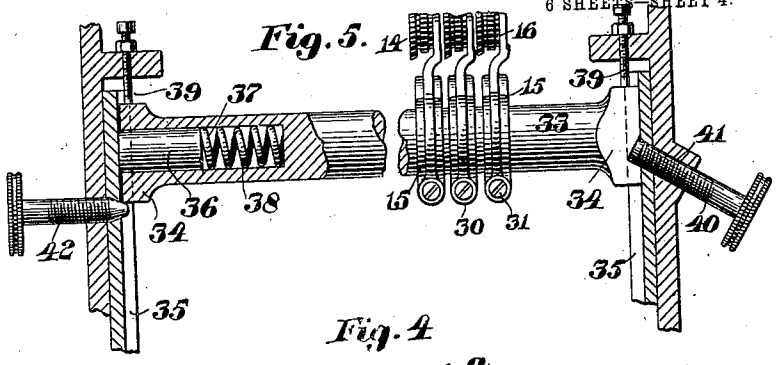
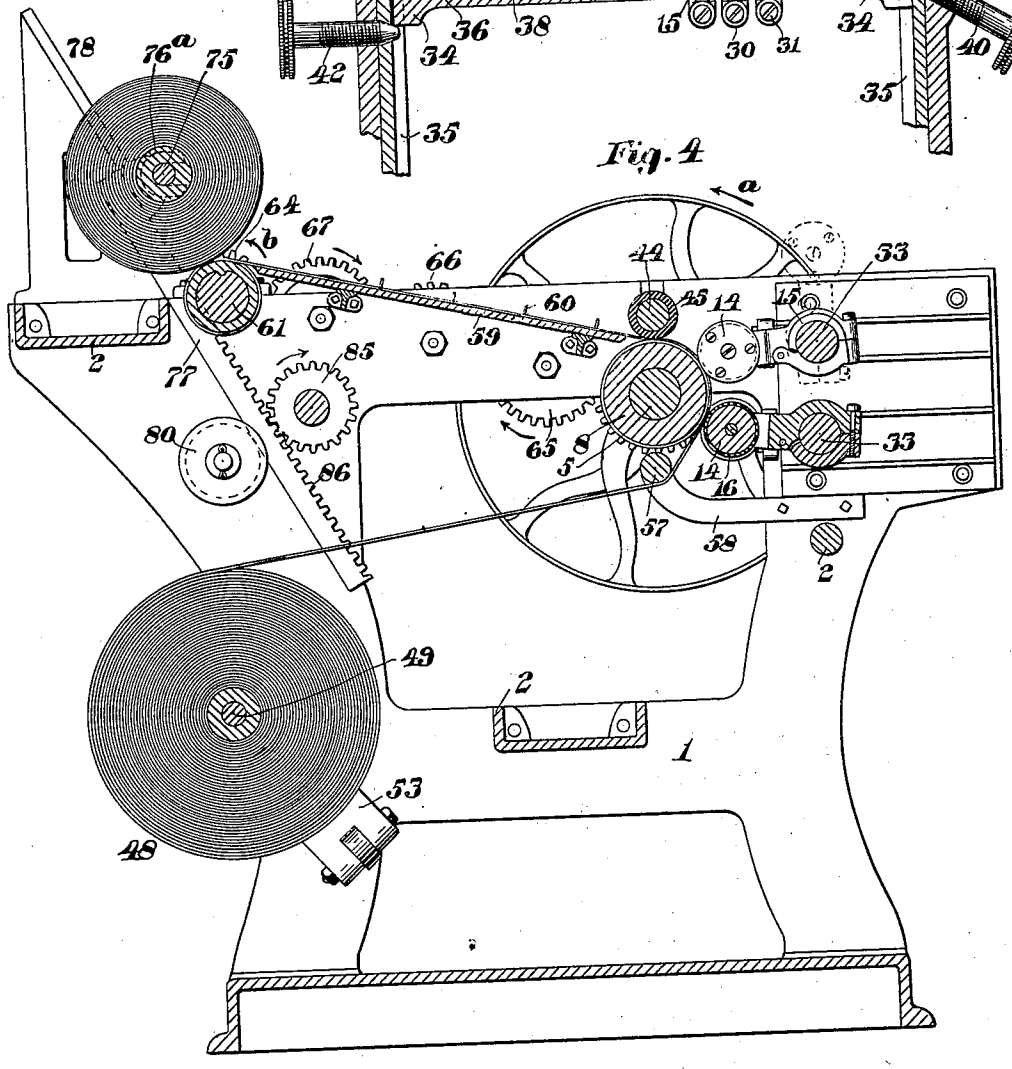


Fig. 4



Witnesses:
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No. 723,375. PATENTED MAR. 24, 1903.

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PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL. 6 SHEETS—SHEET 5.

Fig. 6.

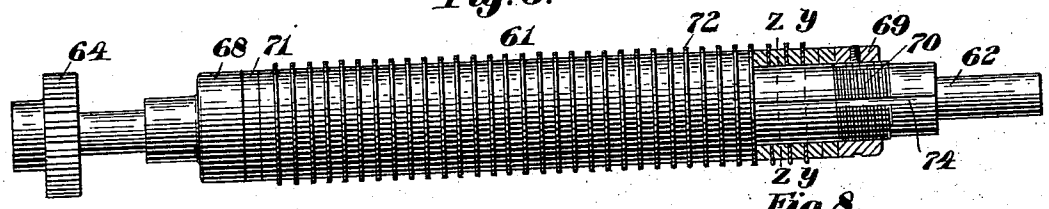


Fig. 7.

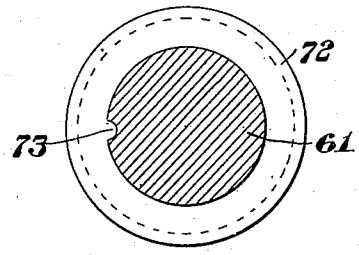


Fig. 8.

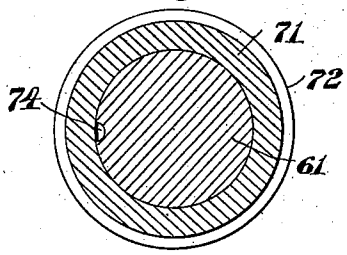


Fig. 10.

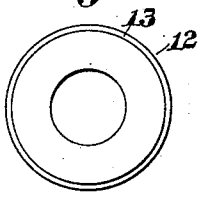


Fig. 9.

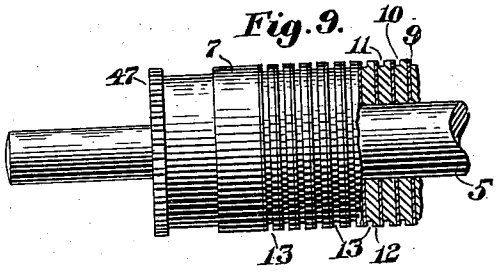


Fig. 11.

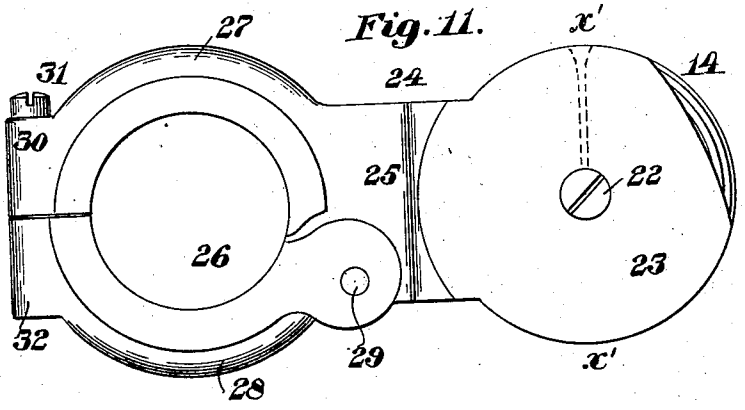
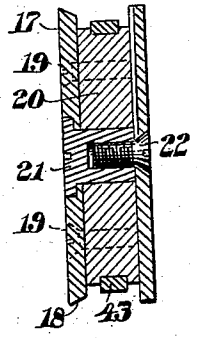


Fig. 12



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No. 723,375. PATENTED MAR. 24, 1903.

L. F. FALES.

PAPER SLITTING MACHINE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL. 6 SHEETS—SHEET 6.

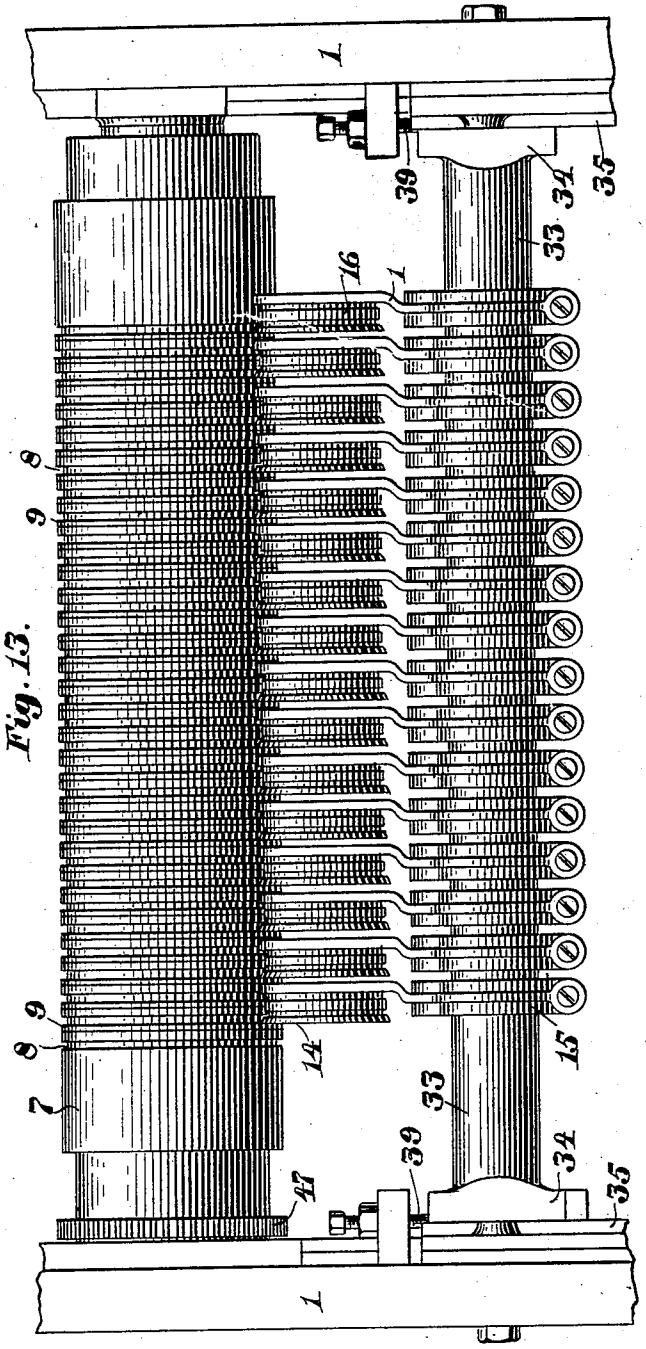


Fig. 13.



Fig. 14.

Witnesses:
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Mary A. Kenney

Inventor:
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By his Attorney,
Albert Anderson

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UNITED STATES PATENT OFFICE.

LEWIS F. FALES, OF WALPOLE, MASSACHUSETTS.

PAPER-SLITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 723,375, dated March 24, 1903

Application filed September 20, 1901. Serial No. 75,708. (No model.)

To all whom it may concern:

Be it known that I, LEWIS F. FALES, a citizen of the United States, residing at Walpole, in the State of Massachusetts, have invented certain new and useful Improvements in Paper-Slitting 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.

The present invention relates to machines for cutting fabric, and more particularly to a machine for cutting a sheet or web into narrow strips, such machines being generally known in the art as "slitting-machines."

The machine is particularly designed for slitting paper in the manufacture of paper tape. Paper tape is now much used for various purposes, vast quantities being daily consumed by telegraphic instruments, such as stock-tickers and other instruments for making and delivering records, and many attempts have been made to produce a machine which will quickly and automatically produce such tape.

In the machines of the prior art there was no provision for individualizing the tension or draft on the strips of tape after they had left the knives and were being drawn forward to the winding mechanism, so that in view of the fact that some of the strips would stretch more than others, caused by the inequalities in the paper, or because of the fact that such strips vary in thickness the proper feeding and winding of the strips of tape was difficult to secure. Again, in the machines of the prior art there was no effectual provision for insuring the complete and effective separation of adjacent tape strips, so that it often happened that such strips would overlap while being wound upon their spools or bobbins, and after being wound up it was found almost impossible to separate the adjacent rolls of tape, oftentimes such separation necessitating the use of a chisel or other separating means.

The object of the present invention is to produce a machine for manufacturing tape, and more particularly paper tape, in which the knives or cutters may be quickly adjusted toward and from each other to vary the width of the strips produced or in which one or more of the knives can be thrown out of operation, if desired, without interfering with the operation of the machine, thus producing tape of varying widths simultaneously.

A further object of the present invention is to improve the feeding and winding mechanism so that the tension upon each strip of tape will be independent and distinct, thus insuring a smooth and accurate feed.

A further object of the invention is to provide a winding-roll so constructed and arranged as to insure effectually the separation of the adjacent strips of tape as they are wound upon their spools or bobbins, and thus insure against the overlapping of adjacent rolls of tape and their easy removal from the winding-arbor.

Further objects of the invention will appear hereinafter in connection with the description of the construction, organization, and mode of operation.

To the above ends the present invention consists of the devices and combinations of devices which will be hereinafter described and claimed.

The present invention is illustrated in the accompanying drawings, in which—

Figure 1 shows in side elevation a machine embodying the same, a portion being broken away to show underlying parts. Fig. 2 shows the machine in top plan view with portions of the feed bed or table and the strip of paper tape broken away for the purpose of showing underlying parts. Fig. 3 shows the machine in rear elevation. Fig. 4 shows the machine in longitudinal vertical section, showing in dotted lines one of the cutters turned up in inoperative position. Fig. 5 illustrates in a broken view details of the support for the cutters. Fig. 6 shows in elevation and partial section the winding and tension roll removed from the machine. Figs. 7 and 8 show in cross-section the winding-roll, Fig. 7 being taken on the line *y y* and Fig. 8 on the line *z z* in Fig. 6. Fig. 9 shows in elevation and partial section a portion of the cutter or bed roll against which the cutters operate. Fig. 10 shows in side elevation one of the disks of the cutter-roll. Fig. 11 shows in side elevation one of the cutters and its holder removed from the machine, a portion of the holder at its forward end being cut away to better show

the construction. Fig. 12 shows a vertical transverse section through one of the cutters on the line x' x', Fig. 11. Fig. 13 shows a plan view of the cutters and bed or cutter roll. Fig. 14 shows the spool or winding-arbor removed from the machine.

Similar reference characters will be used throughout the specification and drawings to designate corresponding parts.

The machine comprises a suitable supporting-frame which is of a size and shape to support the operating instrumentalities and comprises the side frames 1, which are held together by suitable cross girths and rods 2.

Mounted in bearings 3, which are partially formed in the side frames 1 and boxes 4, secured to said side frames, is the driving-shaft 5, which extends through and beyond one of the side frames and is provided with the fast and loose pulleys 6 and 7, which receive a belt driven from any suitable source of power and by means of which the operation of the machine is controlled.

The shaft 5 carries the bed or cutter roll 8, which coöperates with the cutters in slitting the web as it is drawn between said roll and cutters, as will be hereinafter described.

The cutter-roll is illustrated in an enlarged detail in Fig. 9 and consists of series of thin steel disks 9, interposed between a series of soft-iron disks 10, the soft-iron disks having a flange of the same diameter as the disks 9, and a reduced shoulder 11, so that when the disks 9 and 10 are placed alternately upon the shaft 5 and clamped thereon there will be formed a series of flanges 12, composed of a steel part and a soft-iron part, and a series of recesses 13, the steel part of said flanges coöperating with the cutters, which take into the recesses 13.

Coöperating with the cutter or bed roll 8 are the cutters 14, preferably two groups of such cutters being employed and engaging the bed or cutter roll on different longitudinal peripheral lines, an upper group 15 and a lower group 16, the cutters in one group being spaced at such a distance apart and so disposed with relation to the cutters in the other group that the cutters in the group 15 when narrow strips are desired will cut along the longitudinal medial line of the strips produced by the cutters in the group 16. Each of the cutters 14 in both groups is entirely independent of the other cutters and is constructed and arranged as follows: A steel disk 17, having a sharpened peripheral edge 18, forms the cutter proper, which is secured, by means of the screws 19, to a circular block 20 of less diameter than the cutter-disk 17.

The cutter-disk 17 and block 20 are mounted to freely turn about a bearing formed by a tubular interiorly-threaded stud 21, which is engaged by and supported upon a screw 22, mounted in the circular or disk-like head 23 of a holder 24, said head 23 forming a guard or flange of substantially the diameter of the cutter-disk 17. The holder 24, back of the guard 23, consists of a shank 25 and a circular clamp 26, one jaw, 27, of which is formed integrally with the holder, the other jaw, 28, being pivotally connected thereto by means of a pivot 29, whereby it may swing toward and away from the fixed jaw.

The jaw 27 is provided with a tubular bearing 30, in which fits a headed and threaded bolt 31, which engages a correspondingly-threaded bearing 32 in the pivoted jaw 28, whereby to draw the jaws closely around the cylindrical supporting rod or shaft 33 of the cutter-supports, which will be described, and thus fixedly maintain the cutters in the desired position on their supports.

One of the cutter-supports is shown in Fig. 5 and somewhat enlarged in Fig. 13 and, as may be seen therein, comprises the shaft 33, which at opposite ends is provided with the substantially rectangular heads 34, which fit into guides 35, horizontally disposed along the inner faces of the side frames 1.

The cutter-supports 33 are slightly shorter than the distance between the guides 35, so that they may have a slight movement in the direction of their length crosswise of the machine for the purpose to be hereinafter set forth.

The supports 33 are movable along the guides 35, whereby to move the group of cutters toward and from the bed or cutter roll when putting them into and removing them from operation as a group, and such movement takes place under the friction developed by a spring-pressed bolt or plug 36, disposed in a bearing 37 and acted on by a spring 38, which has a tendency to force the support and group of cutters toward the right, as shown in Fig. 5. The object of this construction is to secure the proper contact of the cutter-disks 17 with their coöperating steel disks 9 of the cutter or bed roll 8, which is secured as follows: The cutter-holders 24 are so positioned on the supports 33 that when said support is advanced toward the cutter or bed roll 8 the cutting-disks 17 will enter the grooves 13 of the roll 8, adjacent to but not in contact with the steel disks 9. Thereupon a lateral movement of the supports 33 toward the left will bring each cutting-disk 17 against its coöperating steel disk 9 of the cutter or bed roll.

Suitable adjustable stops (shown as threaded bolts 39) are employed to limit the inward sliding movement of the cutter-supports 33, and the lateral movement above described of the cutter-supports is accomplished by means of the threaded thumb-screws 40, which are fitted into inclined threaded bearings 41 in one of the side frames 1, the inner ends of which engage recesses in the right-hand end of the supports 33. After the screws 40 have been set up to produce the lateral movement of the cutter-support, set-screws 42, tapped in bearings in the opposite side frame, are set up, and the pointed ends engage the opposite end of the support 33, thus maintaining the support fixedly in position with the cutters 14 in

proper relation to the cutter or bed roll. This means of securing the proper adjustment of the cutters 17 with relation to the disks 9 I consider to be one of the important features of the present invention, as it permits the movement of the cutters 17 toward and from the bed or cutter roll 8 without the exercise of any extraordinary care on the part of the operator to prevent injury to the cutting edges of the cutters, as the slight lateral movement of the cutter-support provides for the movement of the cutter-disks 17 away from their coöperating disks prior to their movement away from the bed or cutter roll, and thus prevents injury to the cutting edges of the cutters while being advanced or retracted.

The cutter-supports are moved inward toward the bed and cutter roll until the ribs or flanges 12 of said roll formed by the steel disks 9 and the projections 12 of the disks 10 engage the blocks 20, to which the cutter-disks 17 are secured, said blocks 20 being preferably provided with a friction-band 43, of rubber or other suitable material, with which the flanges or ribs of the bed or cutter roll engage. This arrangement is such that a rotation of the shaft 5 and cutter-roll 8, which takes place in the direction indicated by the arrow *a* in Fig. 4 of the drawings, imparts a rotary movement in the reverse direction to each of the cutters, and inasmuch as the diameter of the bed and cutter roll is greater than the diameter of the circular blocks 20, carrying the cutting-disks 17, said disks will have a greater surface speed than the disks 9, thus producing a shearing action of the cutters—a feature which I consider to be of some importance.

It will be noted that the cutters 17 are each independent and are independently driven, so that either an entire group of cutters may be moved backward out of operation without affecting the operation of the other group, thus producing a group of strips twice as wide as those produced when both groups of cutters are in operation, or, on the other hand, any cutter in either of the groups of cutters may be thrown out of operation by loosening the screw 31 and swinging the cutter-holder about its support 33 away from the bed or cutter roll, leaving the other cutters in the group or groups of cutters in operation, thus producing simultaneously strips differing in width—a feature which I believe to be broadly new in the art.

Coöperating with the cutter or bed roll is a presser-roll 44, mounted to turn in suitable bearings in the side frames 11 and having a surface of soft rubber 45 or other suitable yielding material, and between which and the cutter or bed roll the strips are engaged and fed or drawn past the cutters, assisting and augmenting the feed of the strips caused by the frictional engagement thereof between the ribs or flanges of the bed or cutter roll and the blocks 20, carrying the cutter-disks 17.

The presser-roll 44 is driven or rotated by means of a pinion 46, fixed to its shaft and engaging a gear 47 on the shaft of the cutter or bed roll 8, and inasmuch as the presser-roll is driven at a greater speed than the cutter or bed roll it has a tendency to at all times exert sufficient draft upon the strips when they leave the cutters to insure the proper advancement of said strips between the cutters and the bed or cutter roll.

The web of material 48 to be cut is mounted upon a shaft 49, provided with suitable centering blocks or collars 50, movable along said shaft and engaging opposite ends of the web or roll 48. The shaft 49 is removably mounted in open bearings 51, formed at the rear of the side frames 1, and suitable means, such as a pin 52, may be provided for retaining the shaft in its bearings. It is desirable to provide suitable friction devices for restraining the too free unwinding of the roll 48, and such devices in the machine of the drawings consist of the pivoted forked arms 53, which are engaged by the inner ends of the threaded rods 54, tapped in bearings 55 in the side frames 1 and provided with hand-wheels 56, whereby the arms 53 may be forced against the movable collars 50 and press them closely against the ends of the roll 48, and such devices while acting as friction devices also insure the proper positioning of the roll 58 or the centering thereof with relation to the longitudinal medial line of the machine. From the roll 48 the web of material passes around a rounded bar 57, supported beneath and substantially in vertical alinement with the axis of the cutter or bed roll 8 at the forward end of arms 58, secured to the side frames 1. After the material has been acted upon by the cutters and formed into strips said strips are advanced along an inclined table or bed 59 to the winding mechanism which winds or coils each strip about its spool or bobbin or the winding-arbor. The table 59 is preferably provided with spacing-pins 60, which are removably fitted in apertures in the upper surface of said table for the purpose of gradually spreading the strips as they approach the winding mechanism. While these pins are desirable they are not essential, as by the use of my improved winding-roll 61, which will now be described, I insure the proper spreading and separation of the strips and prevent their overlapping while being wound.

The winding-roll 61 comprises a shaft 62, the reduced ends of which are mounted to rotate in suitable bearings 63 in the side frames 1 and is positively driven from the main shaft 5 by means of a pinion 64, fixed to the end of the shaft 62, and the intermediate train of gearing 65, 66, and 67. The shaft 62 is provided at one end with a fixed collar 68 and a movable clamping collar or nut 69, which engages a threaded portion 70 on the

enlarged intermediate part of the shaft 62. Loosely mounted upon the enlarged intermediate part of the shaft 62 are rings 71, which rings normally turn with but under certain conditions are free to turn on said shaft to produce the result which will be hereinafter set forth. Between the rings 71 are placed what I shall call "separating-rings" 72, which rings are made of thin sheet metal and are each provided with a feather 73, engaging a groove 74 in the enlarged portion of the shaft 62, the arrangement being such that the separating-rings 72 are positively rotated with the shaft 62, while the rings 71 under normal conditions are rotated with the shaft 62 and yet permitted an independent movement on said shaft.

The winding-arbor 75 may or may not be provided with independent wooden spools or bobbins 76, about which the strips of material are wound; but, as shown in the drawings, such independent spools or bobbins are provided and are preferably employed. This winding-arbor 75 is removably mounted in bearings 76, which bearings are carried by the upper ends of the rack-bars 77, free to move in an inclined direction toward and from the winding-roll along the inclined faces 78 of standards 79, fixed to the upper surfaces of the side frames 1 at the rear end of the machine, the lower ends of the rack-bars 77 resting upon guide-rolls 80, whereby such rods or bars are properly guided in their up-and-down movements.

The strips of paper are entered between the winding-arbor 75 or the spools or bobbins 76 carried thereby and the winding-roll 61, each strip resting upon one of the loose rings 71. The winding-arbor is held against the rings 71 of the winding-roll under sufficient pressure to insure its being driven by the frictional contact therebetween by the positively-rotated winding-roll, such friction being secured by means of a tension-band 81, engaging a drum 82 on a short shaft 83, provided with a hand-wheel 84 at its outer end and carrying at its inner end a pinion 85, which meshes with the rack 86, formed on one of the rack-bars 77. The other rack-bar at the opposite side of the machine engages a corresponding pinion. The result is that both of the bearings of the winding-arbor are controlled in their upward and downward movement by the friction device just described and also are maintained in proper horizontal alinement during such movement.

The friction-band 81 is provided with an adjusting-screw 87, which passes through a fixed lug 88 and is engaged by winged nut 89, whereby the band may be caused to engage the drum 82 with more or less friction, as desired.

The rotation of the winding-roll 61 in the direction of the arrow *b* (shown in Fig. 4) causes the winding-arbor to rotate in the opposite direction by means of its frictional engagement with the rings 71 of the winding-roll, and thus to wind each strip of the material upon the winding-arbor or its spool or bobbin carried on said arbor, and as the rolls increase in diameter the bearings of the winding-arbor move upwardly, such movement taking place under the friction exerted by the friction-band 81, which as the rolls increase in size and weight may be adjusted as required providing for the desired amount of friction.

The strips of material, as before stated, rest upon the movable rings 71 and against which they are held by the spools or bobbins on the winding-arbor or the rolls which are being wound up on said spools or bobbins, and thus the winding-arbor is turned by its frictional contact with the winding-roll.

Inasmuch as the rings 71 are free to move about the shaft 62 it will be observed that each strip and each strip-roll are wound up under a tension or strain independent of every other strip, for if, because of some inequality in the material—such as paper, for instance—one portion should stretch more than the other portions and produce slack in one or more strips the normal rotation of the winding-roll will, while winding up the strips which have been stretched, and thus take up any slack which may occur therein, permit the winding-roll to rotate whole parts thereof or the rings 71, which may be in engagement with other strips of less elasticity, remain stationary and fixed, thus insuring, notwithstanding the inequalities in the texture of parts of the web of paper, the proper and even feeding and winding thereof.

At this point I desire to state that in so far as I am advised of the state of the art a paper-slitting machine in which the entire gang or group of tapes or strips are wound upon a single or common winding-arbor, said machine being provided with means for exerting an independent tension on each strip as said strips are wound upon the arbor and means for insuring the complete separation of each strip from adjacent strips as they are wound up, is broadly new with me and that while the mechanism shown and described herein is the best form now known to me my invention is not restricted to such illustrated and described embodiment thereof.

The separating-rings 72 enter between the strips of paper and between the rolls of such strips on the winding-arbor and effectually prevent the overlapping of adjacent strips while being wound. This is the main function of these rings 72; but in addition thereto they have another function, which is that they frictionally engage the edges of the strips and in a degree assist in drawing said strips along the table 59 and in the feeding thereof to the winding-arbor.

It is thought that the operation of the machine has been sufficiently described in connection with the foregoing description of its form and arrangement and that a further description of its operation is unnecessary.

Having described my invention, I desire to say that in so far as I am aware of the state of the art it has never been proposed to provide a slitting-machine with a winding-roll or other means constructed and arranged to produce an independent tension upon each strip nor to provide a winding mechanism with means for insuring the spacing or separation of the strips as they are being wound or coiled and that therefore, while the machine as hereinbefore described and as illustrated in the accompanying drawings is the preferred form thereof and the best form now known to me, the present invention is not limited to the details of construction thus illustrated and described; but

I claim as new and desire to secure by Letters Patent of the United States—

1. A machine for slitting sheet material, having in combination, a grooved bed or cutter roll, a gang or group of independent cutters, a support for said cutters movable toward and from said cutter-roll and means to impart a lateral adjustment to said support to cause the cutters to contact with one side of the grooves in the bed or cutter roll, substantially as described.

2. A machine for slitting sheet material, having in combination, a winding-roll, a winding-arbor frictionally driven from the winding-roll, movable bearings for the winding-arbor and a tension device restraining the movement of said bearings, substantially as described.

3. A machine for slitting sheet material, having in combination, a slitting mechanism comprising a positively-driven bed or cutter roll, and frictionally-driven knives, a winding-roll positively driven from the bed or cutter roll and a winding-arbor comprising a series of independent movable sections frictionally driven from the winding-roll, substantially as described.

4. A machine for slitting sheet material, having in combination, a slitting mechanism and a winding mechanism, a supporting-table for the strips interposed between said mechanisms and removable spreading guides in said table, substantially as described.

5. A machine for slitting sheet material, having in combination, a winding-arbor, means for permitting said arbor to move toward and from its driving means, and a tension device to control the degree of pressure between said arbor and its driving means, substantially as described.

6. A machine for slitting sheet material, having in combination, means for cutting a web into strips, a common winding-arbor upon which said strips are wound, means for turning said arbor by frictional contact and a winding-roll provided with means for exerting an independent tension on each strip, substantially as described.

7. A machine for slitting sheet material, having in combination, means for cutting a web into strips, a common winding-arbor upon which said strips are wound, a winding-roll for frictionally turning said winding-arbor, and separating-disks upon said winding-roll for separating the strips as they are wound upon the winding-arbor, substantially as described.

8. A machine for slitting sheet material, having in combination, means for cutting a web into strips, a common winding-arbor upon which said strips are wound, and means for exerting an independent tension on each strip, substantially as described.

9. A machine for slitting sheet material, having in combination, means for cutting a web into strips, a common winding-arbor upon which said strips are wound, means for exerting an independent tension on each strip and means for separating said strips as they are wound upon the winding-arbor, substantially as described.

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

LEWIS F. FALES.

Witnesses:
Mrs. H. L. ENGLEY,
IDA J. COBURN.