No. 686,180. Patented Nov. 5, 1901.

G. S. WITHAM.

PAPER WINDING MACHINE.

(Application filed June 21, 1901.)

(No Model.) 3 Sheets—Sheet 1.

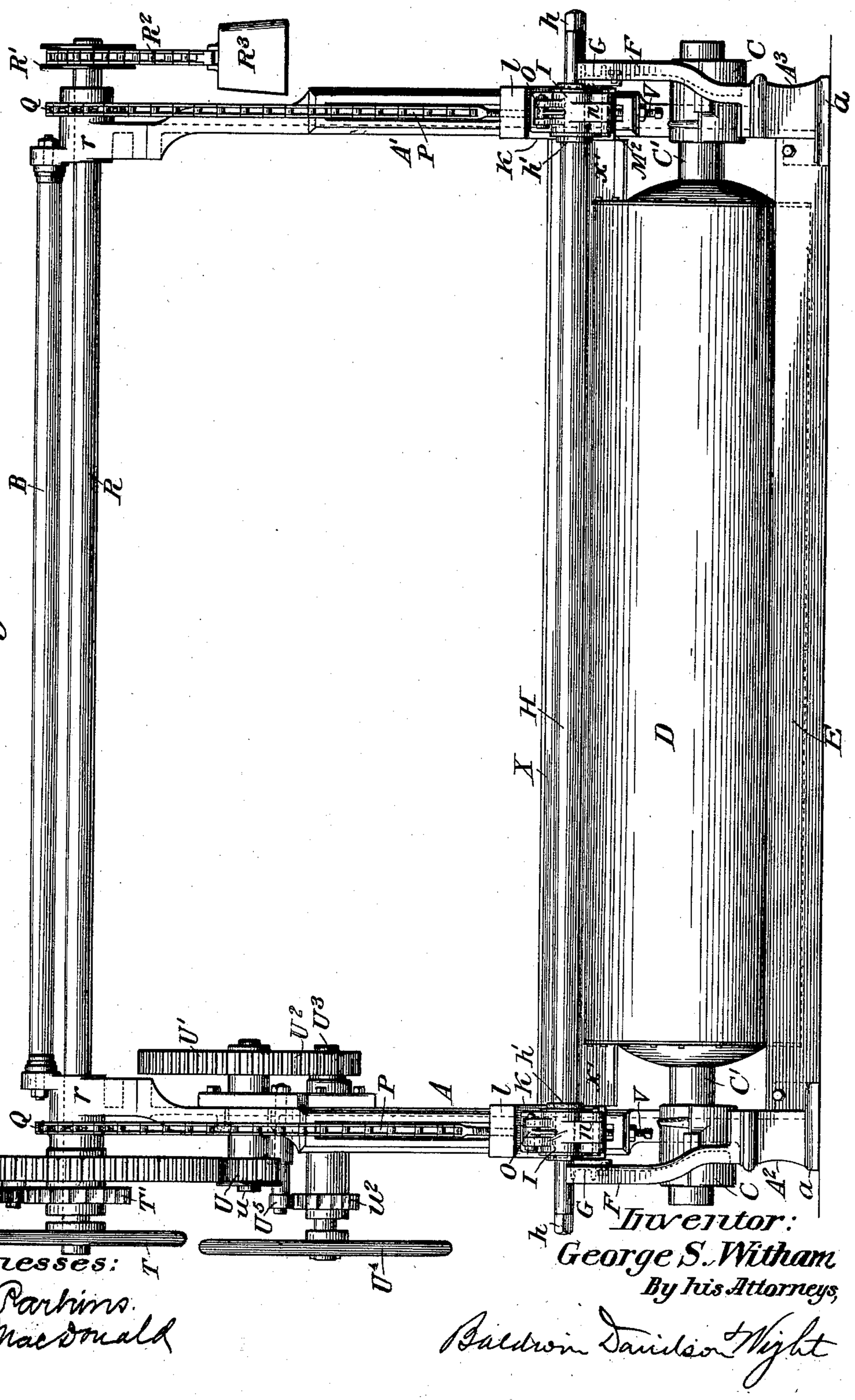

Fig. 1.

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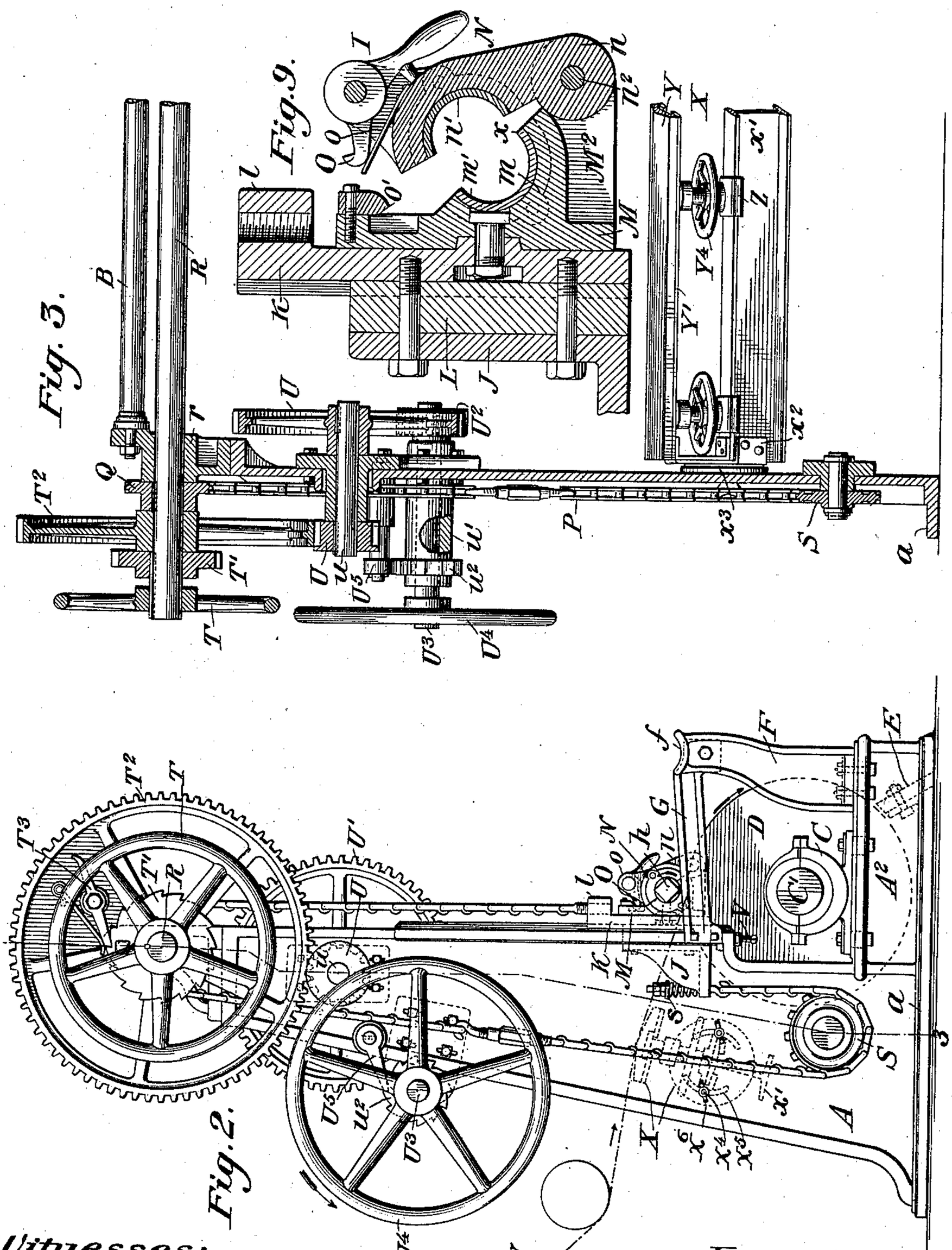
(No Model.) 3 Sheets—Sheet 2.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

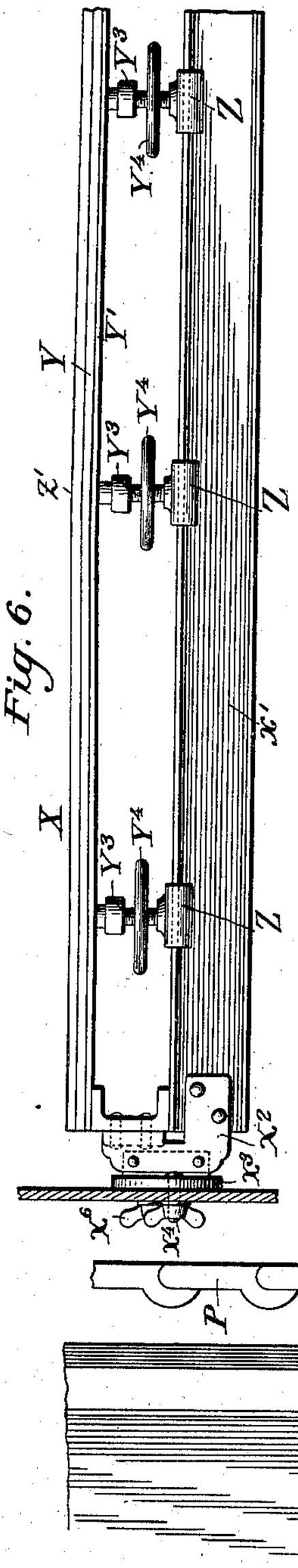

Fig. 8.

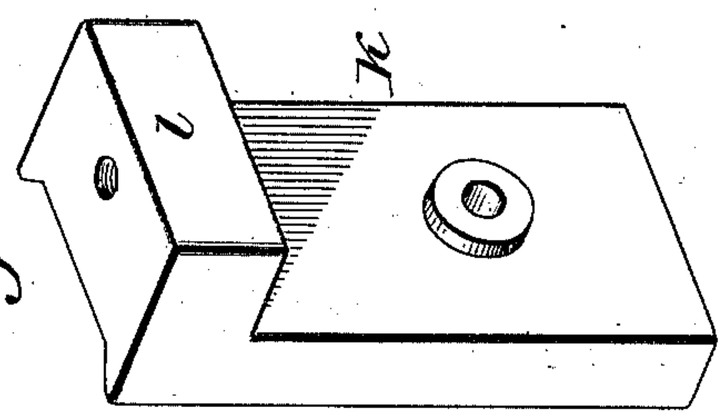

Fig. 7.

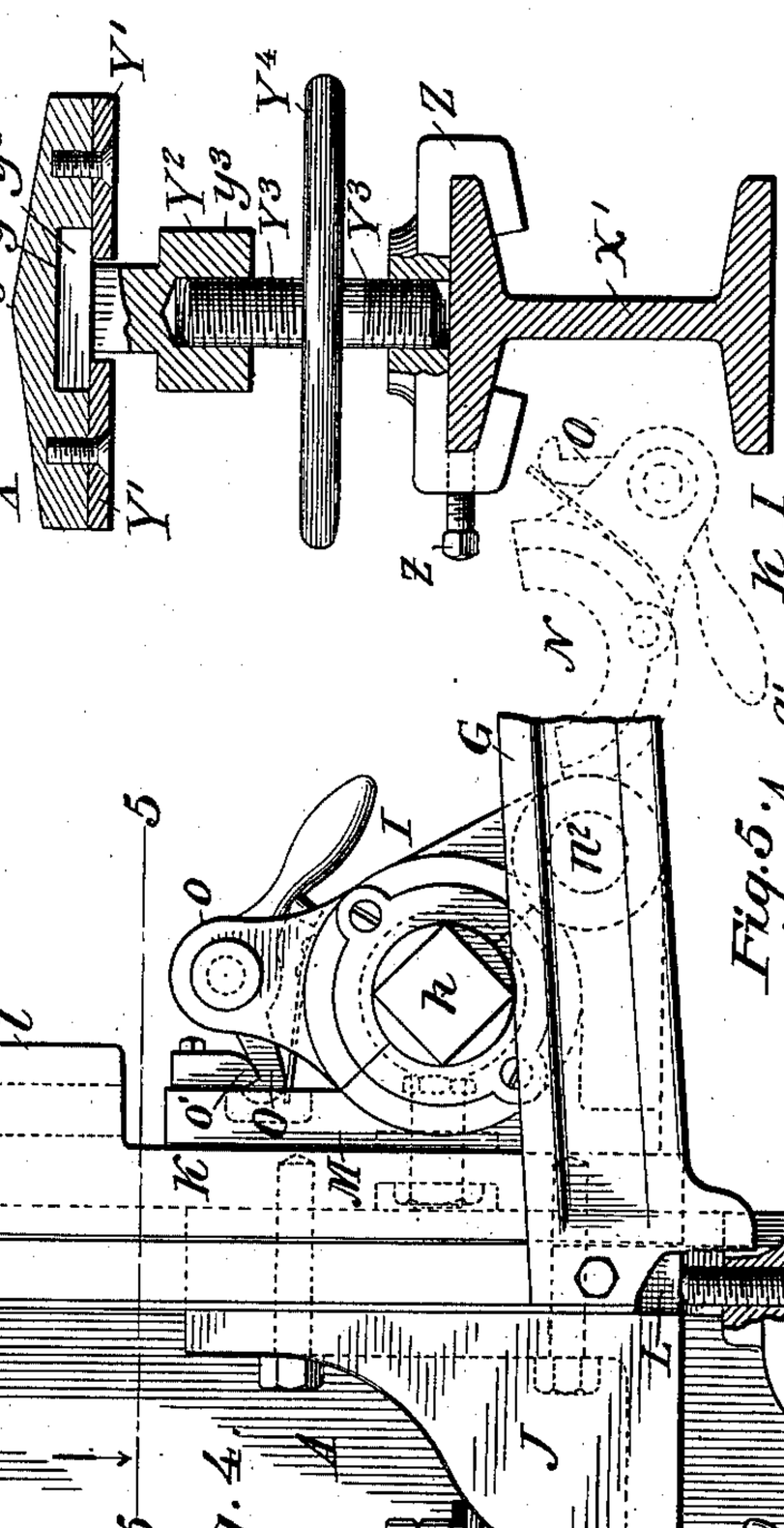

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE S. WITHAM, OF MADISON, MAINE.

PAPER-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 686,180, dated November 5, 1901.

Application filed June 21, 1901. Serial No. 65,432. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. WITHAM, a citizen of the United States, residing at Madison, in the county of Somerset and State of Maine, have invented certain new and useful Improvements in Paper-Winding Machines, of which the following is a specification.

My invention relates to that class of paper-winding machines in which strips of paper cut from a wide web are wound upon a shaft or bar to which motion is imparted by a power-driven drum of larger diameter, upon which the bar rests and which revolves in contact with that portion of the paper interposed between the bar and the drum. Machines of this general type have been quite extensively used, and their general construction is well understood. It is customary to make the winding-bars of great length, often over one hundred and fifty inches, while they are usually only about three inches in diameter, and much difficulty has heretofore been experienced in winding strips or webs of paper evenly or uniformly on such bars by reason of the springing or bending of the bars between their bearings or points of support, which are often from one hundred to one hundred and forty inches apart. It has also been found difficult in such machines to prevent the paper from wrinkling just before being wound, the paper often being wound on the winding-bar with numerous wrinkles in it, which very materially impairs its usefulness.

One object of my invention is to prevent the springing or bending of the winding-bar.

Another object is to prevent the wrinkling of the paper, while a third object of my invention is to feed the paper from the slitting apparatus to the winding-bar in such manner that the edges of the strips of paper shall not overlap, and hence shall be wound in separate distinct rolls.

Further objects of my invention are to provide improved means for raising and lowering the winding-bar, for placing the winding-bar in its bearings, and for removing it therefrom, and novel devices whereby the general efficiency of the machine is increased, while the construction is simplified.

Heretofore what are known as "two-drum winders" and also "one-drum winders" have been used. In my machine I employ one drum. Usually the paper has been carried over the top of the winding-bar and then down between the bar and the drum. In machines operating in this way the pull on the bar by the paper is in the same direction as the push on the bar by the drum. It is for this reason that the winding-bar has tended to spring or bend. In my machine the paper is carried to the under side of the winding-bar and comes into contact with the bar (or the paper on the bar) and the drum in substantially the same vertical plane. Thus the pull on the shaft by the paper is opposed to the push on the shaft by the drum, the two forces counteracting or counterbalancing each other, and the shaft is maintained in a perfectly straight and even condition. In some prior machines the paper has been conveyed to the under side of the winding-bar; but in all such machines the paper has first traversed a considerable portion of the drum, for which reason the counterbalancing pull of the paper incident to my invention is not present, and, furthermore, it is well known that in such machines the paper often wrinkles while traversing the drum before reaching the winder. In my machine the paper passes from the slitting apparatus over a spreader and directly from the spreader to the drum and the winding-bar without first traversing any other portion of the drum. In fact the only part of the paper in contact with the drum is that portion immediately below the winding-bar. The spreader is placed as close as possible to the winding mechanism, so that the strips of paper into which the web is cut have no chance to overlap or to wrinkle before being wound.

By my machine a web of paper of great width—say one hundred and fifty inches wide—may be slit into strips of various widths and wound evenly and uniformly on the same bar. The bar may be easily raised and lowered and may be readily removed from and inserted into its bearings.

In the accompanying drawings, Figure 1 shows a front elevation of my improved paper-winding machine. Fig. 2 shows a left-hand side elevation thereof. Fig. 3 shows a longitudinal vertical section of one end of the machine on the line 3 3 of Fig. 2. Fig. 4 is a detail view, on an enlarged scale, showing

in side elevation one of the bearings for the winding-shaft and some of the parts connected therewith. Fig. 5 shows a transverse section on the line 5 5 of Fig. 4. Fig. 6 is a detail view of a portion of the spreader. Fig. 7 is a view, on an enlarged scale and in vertical section, of the spreader. Fig. 8 is a perspective view of one of the front slide-blocks which rises and falls with the bearings of the winding-bar, and Fig. 9 shows a transverse section of one of the bearings for the winding-shaft on the line 9 9 of Fig. 5.

The main frame of the machine may be of any suitable construction. As shown, it consists of two upright side pieces A A′, having flanged bases *a*, and connected at their upper ends by a brace-bar B. The side pieces A A′ may be otherwise braced, if desired, and they have forwardly-projecting portions A^2 A^3, upon which are mounted the bearings C for the shaft C′ of the drum D. The drum D is of usual construction and may be driven in the usual way. A guard E is secured to the frame below the drum to prevent paper or other trash from finding its way beneath the drum. From the front ends of the extensions A^2 rise standards F, the upper ends of which have curved seats *f* to receive the winding-bar just before it is inserted in its bearings. From these seats *f* rails G extend rearwardly to the side pieces A A′. The rails are inclined downwardly, and the winding-bar may be rolled from its seat *f* down the rail G into its bearings.

The winding-bar H in the machine illustrated is one hundred and forty inches long and three inches in diameter. The ends of the bar are squared at *h* to receive a wrench employed for giving a few revolutions to the bar in order to start the winding of the paper thereon. After a few layers of paper are wound on the bar the remainder of the winding is performed by the drum. The winding-bar is shouldered at *h′* near each end, the portions of the bar from *h′* to the opposite ends being reduced in diameter. By this means endwise movement of the bar is prevented. The reduced portions of the bar project through bearings I, in which the bar is free to revolve while the bearings are raised and lowered in the manner hereinafter described. The bearings for the bar are secured to guide-blocks, which move vertically in guideways on the side pieces A A′. Figs. 4, 5, 8, and 9 illustrate clearly the construction of the bearings and the slide-blocks. Each set of slide-blocks consists of a rear block J, a front block K, and a central guide-block L. The guide-blocks L are arranged to move vertically in slots *a′* in the vertical side pieces A A′. The block L is secured to the rear block J, and the front block K is secured to the central block L in the manner illustrated in Figs. 4, 5, and 9. The block L is shaped to conform to the front of the side frame A or A′, the arrangement being such, as clearly shown in the drawings, that the slide-blocks are guided vertically while being prevented from lateral movement.

To each front slide-block L is secured a casting M, forming one member of a bearing for the winding-bar. This casting M is provided with a curved seat *m′*, in which fits a curved bushing, forming one-half of the bearing for the bar. This bushing may be secured to the front slide-block L in the manner illustrated in Fig. 4. Each casting M is formed with two forwardly-projecting lugs M^2, between which is arranged the downwardly-projecting arm *n* of the upper member N of the bearing. This upper member is provided with a curved or semicircular bushing *n′*, which forms the upper portion of the bearing for the bar H. The arm *n* is hinged to the lugs m^2 by a bolt n^2, and the upper member N of the bearing is adapted to swing about the axis of the bolt. From the upper end of each casting N projects two lugs *o*, between which is pivoted a spring-pawl O, adapted to engage a tooth *o′*, secured to the upper end of the casting M, the arrangement being such that when the pawl O engages the tooth *o′* the two members of the bearing are securely locked together; but when the pawl is disengaged from the tooth *o* the bearing may be opened and the upper member N may be swung forward, as illustrated by dotted lines in Fig. 4. It will be observed that the two portions of the bearing are divided not by a horizontal division, but on an incline, the point *x* at the lower front end of the bearing being a considerable distance below the horizontal plane passing through the axis of the winding-bar. By this arrangement when the bearings are lowered the points *x* may be lowered below the top of the rails G and the bar may be rolled out of the seats *f*, down the rail G, and into the bearings in the members N, while the front members of the bearings are swung forward to the position indicated by dotted lines in Fig. 4. When the shaft is thus rolled into position, the members N may be raised, pushed back, and locked. By these arrangements I am enabled to handle the winding-bar with great facility. The bar may be placed on the seats *f* by hoisting apparatus and may then be readily rolled into its bearings. I am thus enabled to save considerable time in the operation of the machine.

The upper end of each slide-block K is formed with a forwardly-projecting lug *l*, to which is attached one end of a sprocket-chain P, which extends over a sprocket-wheel Q on the shaft R. This shaft extends from one end of the machine to the other and is mounted in suitable bearings *r*, mounted on the upper ends of the side frames A A′. The chains P after passing over the sprocket-wheels Q extend downwardly some distance below the plane of the rails G and under the sprocket-wheels S, mounted in bearings supported by the frame-pieces A A′. The chains then extend upwardly and are connected by yield-

ing connections *s* to the rear slide-blocks J. The sprocket-wheels Q are keyed to the shaft R, and the arrangement is such that as the winding-bar is raised its bearings are raised, and likewise the slide-blocks J K L, the shaft R being turned as the bar rises. When the bar is lowered, the shaft R is turned in an opposite direction.

On the right-hand end of the shaft R is attached a pulley or sheave R′, to which is attached a chain R^2, carrying a weight R^3. The effect of these last-mentioned devices is to tend to move the shaft R in such a direction as to tend to move the winding-bar downwardly. This is for the purpose of causing a certain amount of downward pressure to be exerted for the purpose of facilitating the winding of the paper on the bar when commencing the operation, as the weight of the bar in itself is not always sufficient to cause enough pressure when the winding is started. On the left-hand end of the shaft R is keyed a hand-wheel T, just inside of which is also keyed a ratchet-wheel T′, and between the ratchet-wheel T′ and the sprocket-wheel Q is arranged a large gear-wheel T^2, which is loose on the shaft R. The gear-wheel T^2 carries a spring-pawl T^3, which engages the ratchet-wheel T′. The large gear-wheel T^2 engages a pinion U below it, which latter is keyed to a shaft *u*, mounted in suitable bearings attached to the side frame-piece A. On the inner end of this shaft is keyed a large gear-wheel U′, which meshes with a pinion U^2 on the inner end of a shaft U^3, mounted in suitable bearings *u′* in the frame-piece A. On the outer end of the shaft U^3 is secured a large hand-wheel U^4, and just inside the hand-wheel a ratchet-wheel u^2 is arranged and which is also secured to the shaft U^3. A pawl U^5, pivoted to the frame A, engages the ratchet-wheel u^2. By this organization of apparatus as the paper is wound on the winding-bar the bar and its bearings rise, the chains P being correspondingly moved, and these impart a corresponding movement to the shaft R and the parts secured thereto; but no motion is imparted at this time to the loose wheel T^2 or the other mechanism geared thereto. It will be observed by reference to Fig. 2 that when the shaft R is moved during the ascent of the winding-bar, caused by the gradually-increasing diameter of the paper thereon, the pawl T^3 will merely ride over the ratchet T′ tooth by tooth.

By means of the hand-wheel T the winding-bar may be quickly raised when desired; but if the winding-bar has paper wound thereon it is preferably raised by the hand-wheel U^4, and by means of this hand-wheel U^4 the winding-bar may be lowered. Assuming that the winding-bar has a large roll of paper wound thereon and it is desired to lift it off from the drum, the hand-wheel U^4 may be turned in the direction indicated by the arrow in Fig. 2. This will cause the gear-wheel T^2 to move in the proper direction, and the pawl T^3, engaging the ratchet-wheel T′, will cause the shaft R to move in the proper direction to lift the bearings of the shaft. By the form of gearing shown small power applied to the hand-wheel U^4 will raise a great weight on the winding-bar. If the winding-bar is elevated and it is desired to lower it, the pawl U^5 may be thrown out of engagement with the ratchet-wheel *u*, and a whirl may be given to the wheel U^4 in the proper direction, which will, through the gearing shown, cause the shaft R to be revolved in such direction as to lower the winding-bar. It will be noted that the top ratchet allows the roll of paper to lift as it grows in size without turning the gearing; but when it becomes necessary to lift the winding-bar for any purpose this ratchet is always in position to turn the sprocket-shaft without any attention whatever. The lower ratchet-wheel u^2 is merely used to hold the winding-bar in an elevated position while the attendant is removing it from its bearings. When the roll of paper is wound to its full size and is taken out of the machine, it is necessary to lower the bearings to their position for receiving the empty shaft. This is done by merely throwing out the pawl U^5 of the lower ratchet and turning the hand-wheel U^4 in the proper direction. As before stated, a whirl may be given to the hand-wheel which will cause the bearings to run down to the proper position for receiving the new shaft. When the bearings for the winding-bar have reached their lowest position, it will not be necessary to stop the rotation of the hand-wheel in order to prevent binding or shock to any parts of the mechanism, because, as will be observed, the wheel T^2 being loose on the shaft R the upper ratchet will allow the hand-wheel to continue its rotation even after the bearings have stopped their descent. In order to limit the downward movement of the bearings for the winding-bar, I provide adjusting-screws V. (Indicated in Fig. 4.) These may be adjusted to the desired elevation to come in contact with the central guide-blocks L when the bearings are lowered. These devices will stop the downward movement of the bearings in proper position to receive the empty winding-bar.

The web of paper to be wound comes from slitting apparatus (not shown in the drawings) and passes by guide-rollers W to a spreader X. From this spreader the paper passes to the winding bar and drum and enters between them without first passing over the top of the bar or traversing any portion of the drum. The drum revolves in the direction indicated by the arrow in Fig. 2, while the shaft revolves in the direction indicated by the arrow in the same figure. The paper exerts a strain on the winding-bar in a direction opposed to its line of movement—that is, it tends to pull to the left, as indicated in Fig. 2—while the drum exerts a strain on the winding-bar in the opposite direction. These two forces acting on the winding-bar counterbal-

ance or neutralize each other, and hence there is no strain on the winding-bar which would tend to bend or spring it. The spreader X is arranged as close to the winding-bar as possible, being removed therefrom a distance merely sufficient to keep it out of the way of the maximum size of the roll of paper. It will be observed by reference to Fig. 2 that the paper moves in a downwardly-inclined direction from the spreader to the winding mechanism. This keeps the paper off from the drum until it is directly under the winding-bar, while the paper comes in contact with the roll of paper on the winding-bar immediately over the axis of the drum at first and very close to this point, even when the roll has increased in size. When the roll has attained its largest size, the paper comes into contact with the roll a little—say an inch—to one side of the point where the paper is nipped between the bar and the drum; but this does not interfere with the operation, as the pull by the paper on the bar is still opposed by the push on the bar by the drum, and the contact of the paper with the roll before entering between the drum and bar serves to lay the paper smoothly on the roll just before being subjected to the pressure incident to passing between the drum and bar. The winding-bar, it will be observed, is arranged directly over the axis of the drum and moves in a straight vertical plane at all times. In this way the feed of the paper in between the bar and the drum is properly maintained. If the bar moved in the arc of a circle, this feed would be interfered with. This spreader is for the purpose of preventing the strips of paper into which the web is cut from overlapping or becoming interlocked with each other. This spreader is preferably constructed as follows: An **I**-beam x' has secured to each end a bracket x^2, to which is attached a disk x^3, which lies close to one of the frame-pieces A A'. To these brackets x^2 are attached bolts x^4, which pass through curved slots x^5 in the disks x^3, and also pass through holes in the frame-pieces A A'. The bolts are provided with thumb-nuts x^6 on their outer ends. By these devices the inclination of the spreader may be varied, while it is firmly supported on the main frame of the machine. It will be observed by reference to Fig. 2 that the spreader may be adjusted to regulate the inclination of the paper as it passes to the winding mechanism. Nothing intervenes between the winding mechanism and the spreader, so that by varying the inclination of the spreader, as above stated, the inclination of the paper as it enters the winding mechanism may be regulated. The spreader-bar Y extends from one side of the machine to the other, being of a length sufficient to accommodate the several strips of paper which are fed to the winding-bar. The spreader-bar is oppositely inclined in cross-section, as indicated in Fig. 7, the paper traversing the bar in contact with the edge y and a short distance on each side thereof. The under side of the spreader-bar Y is formed with a longitudinal rectangular groove y', and to the under side of the bar are secured plates Y', which overlap the under edges of the groove for a short distance at front and rear, as indicated in Fig. 7. In the groove y' are arranged a series of sliding blocks Y^2, each of which is provided with a head y^2, adapted to slide in the groove, and with an enlarged lower end y^3, adapted to receive the upper screw-threaded end of a short shaft Y^3, carrying a hand-wheel Y^4. The lower screw-threaded end of the shaft Y^3 enters a yoke Z, which is adapted to slide on the **I**-beam x' and to be held securely in any desired position thereon by the set-screw z. There are a number of hand-wheels Y^4 with the parts connected therewith arranged on the **I**-beam. They may be moved from place to place on the **I**-beam beneath the spreader-bar, and they are used for adjusting the spreader-bar. I have found that if the spreader-bar is crowned or slightly convexed between the strips of paper that the edges of the strips are made to separate from each other and thus are prevented from overlapping or in any way interfering with each other. In Fig. 6 it will be observed that the spreader-bar is slightly crowned or convex at z'. Such crowns or convex portions may be produced at the desired points throughout the length of the spreader by a proper manipulation of the hand-wheels Y^4, and the hand-wheels and devices connected therewith may be moved from place to place under the spreader-bar, and the crowns or convexes may be produced at the desired points. This spreader operates very efficiently in connection with the winding mechanism, coöperating therewith to cause the strips of paper to be wound on the winding-bar without being overlapped or wrinkled, while irregular winding ordinarily caused by the bending or springing of the bar is avoided by reason of the fact that the paper passes directly from the spreader to the winding-bar in the manner before described.

I claim as my invention—

1. A paper-winding machine comprising a winding-bar, a winding-drum, and a spreader placed close to the winding-bar and from which strips of paper pass directly into contact with the drum under the winding-bar, without first traversing a portion of the surface of the drum or passing over the top of the roll of paper on the bar.

2. The combination of a winding-bar mounted in bearings movable vertically in straight lines, a power-driven drum beneath the winding-bar; and a guide for the paper adjustable to change the inclination of the paper, just before it enters the winding mechanism, said paper being guided into contact with the drum below the winding-bar, with-

out first traversing a portion of the surface of the drum, or passing over the top of the winding-bar.

3. The combination of the drum, the winding-bar, the seats therefor, the bearings for the bar, and the guide-rails extending from the seats to the bearings.

4. The combination of the drum, the winding-bar, the guide-rails, and the bearings, each comprising a lower member, the front lower edge of which is below the axis of the bar, and a cap fitting over the upper part of the bar.

5. The combination of a winding-drum, a winding-bar, guide-rails for the bar, and bearings for the bar, each comprising a lower member, the front edge of which is below the axis of the bar, and a cap hinged to the lower member and swinging thereon to open the lower bearing to receive the bar from the rails.

6. The combination of the drum, the winding-bar, the guide-rails, and the bearings, each comprising a fixed lower member, the front lower edge of which is below the axis of the bar, and a cap hinged to the lower member and adapted to swing forwardly and downwardly below the plane of the guide-rails.

7. The combination of the winding-drum, the winding-bar, bearings for the winding-bar, and an adjustable stop for limiting the downward movement of the bearings.

8. The combination of the winding-drum, the winding-bar, bearings for the winding-bar, the guide-rails, and an adjustable stop for limiting the movement of the bearings.

9. The combination of a winding-drum, a winding-bar, vertically-movable bearings for the winding-bar, power-increasing gearing for raising the bearings and connections between this gearing and the bearings, provided with devices substantially such as described for permitting the bearings to rise without operating the power-increasing gearing as the paper is being wound on the bar by the drum, but which automatically connects the gearing with the bearings when it is desired to raise them away from the drum.

10. The combination of a winding-drum, a winding-bar, vertically-movable bearings for the winding-bar, sprocket-gearing connected with the bearings and moved thereby as the bearings rise during the winding operation, a ratchet-wheel moving coincidentally with the sprocket-gearing, a loose gear-wheel carrying a pawl engaging the ratchet-wheel, and power-increasing gearing geared with the loose gear-wheel.

11. The combination of the winding-drum, the winding-bar, the bearings for the winding-bar, the sprocket-chain attached at its opposite ends to one of the bearings, the upper and lower sprocket-wheels, the shaft to which the upper sprocket-wheel is secured, a hand-wheel and ratchet-wheel fast on this shaft, a gear-wheel loose on said shaft, a pawl carried by the gear-wheel, engaging the ratchet-wheel, and power-increasing gearing connected with said loose gear-wheel.

12. A spreader for paper-winding machines, comprising an I-beam, a spreader-bar located above it, a series of hand-wheels arranged horizontally; screws extending upwardly and downwardly from said hand-wheels, a series of slides on the I-beam with which the lower screws engage, and a series of slides on the spreader-bar, with which the upper screws engage.

In testimony whereof I have hereunto subscribed my name.

GEORGE S. WITHAM.

Witnesses:
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S. E. REINECK.