(No Model.) 2 Sheets—Sheet 1.

G. L. BROWNELL.

MACHINE FOR MAKING PAPER TWINE.

No. 551,615. Patented Dec. 17, 1895.

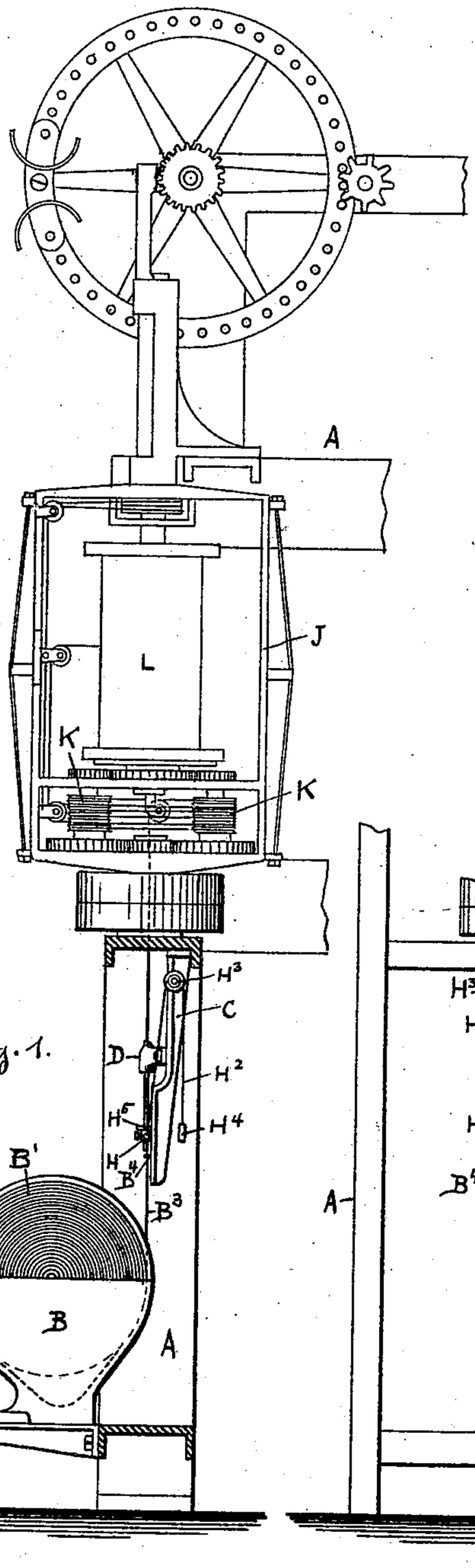

Fig. 1.

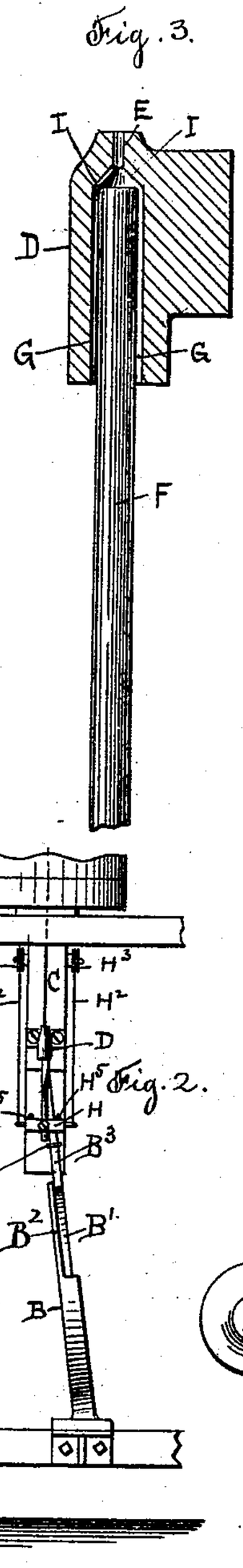

Fig. 2.

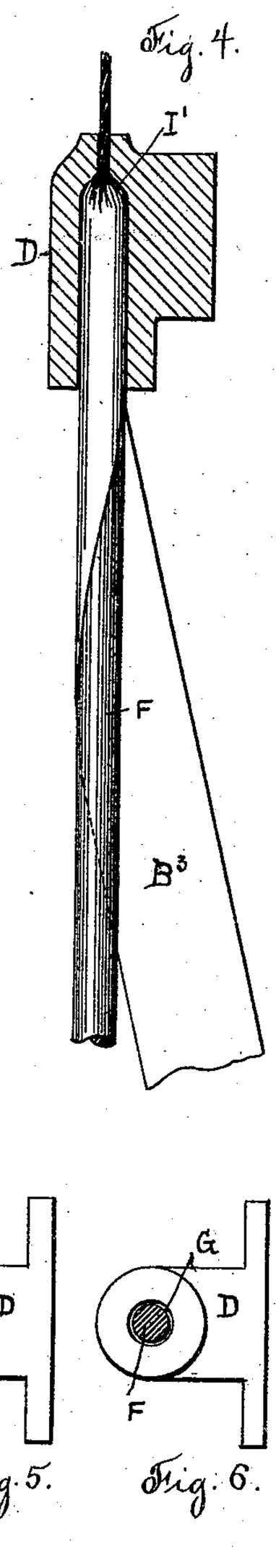

Fig. 4.

Fig. 3.

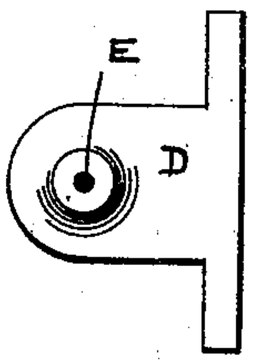

Fig. 5.

Fig. 6.

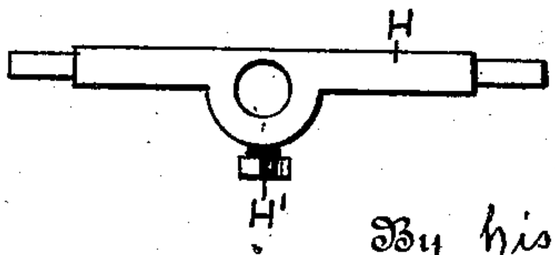

Fig. 7.

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(No Model.) 2 Sheets—Sheet 2.

G. L. BROWNELL.

MACHINE FOR MAKING PAPER TWINE.

No. 551,615. Patented Dec. 17, 1895.

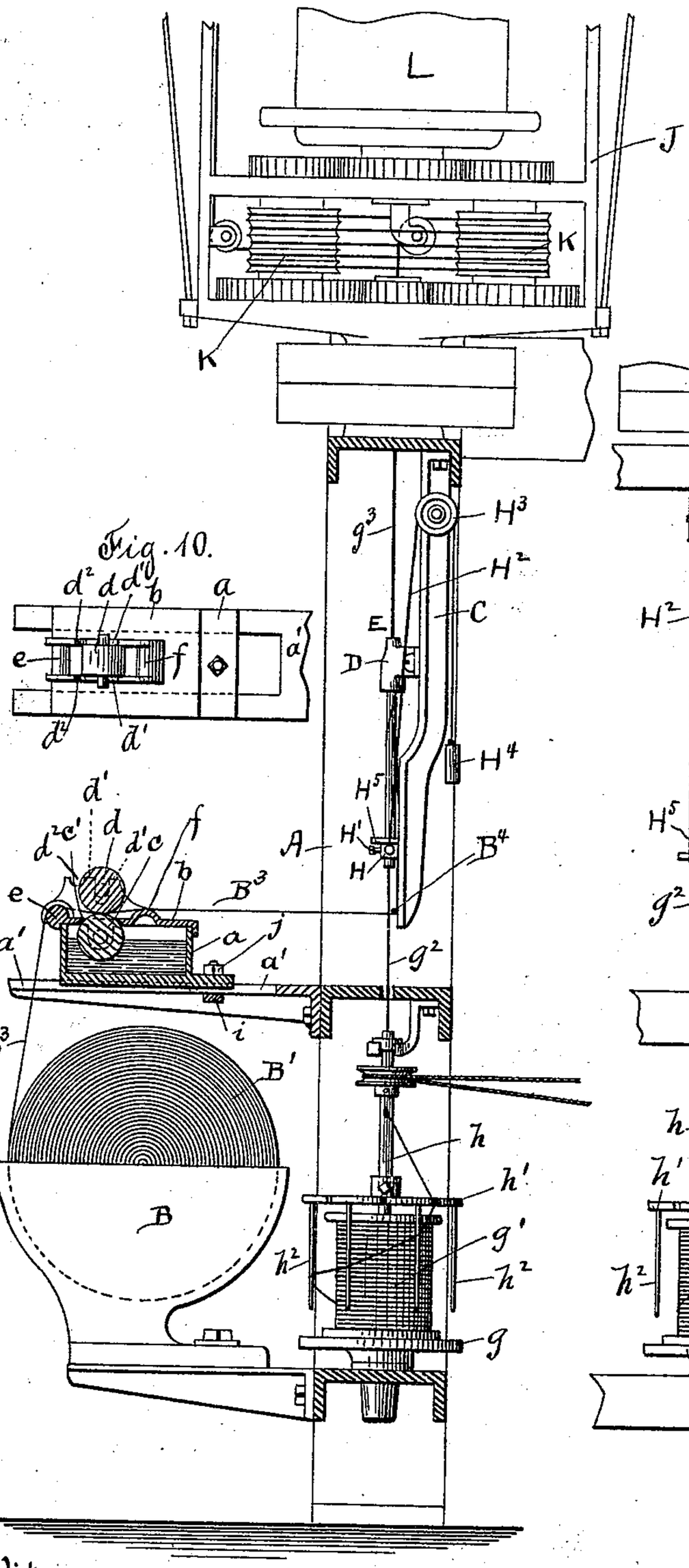


Fig. 10.

Fig. 8.

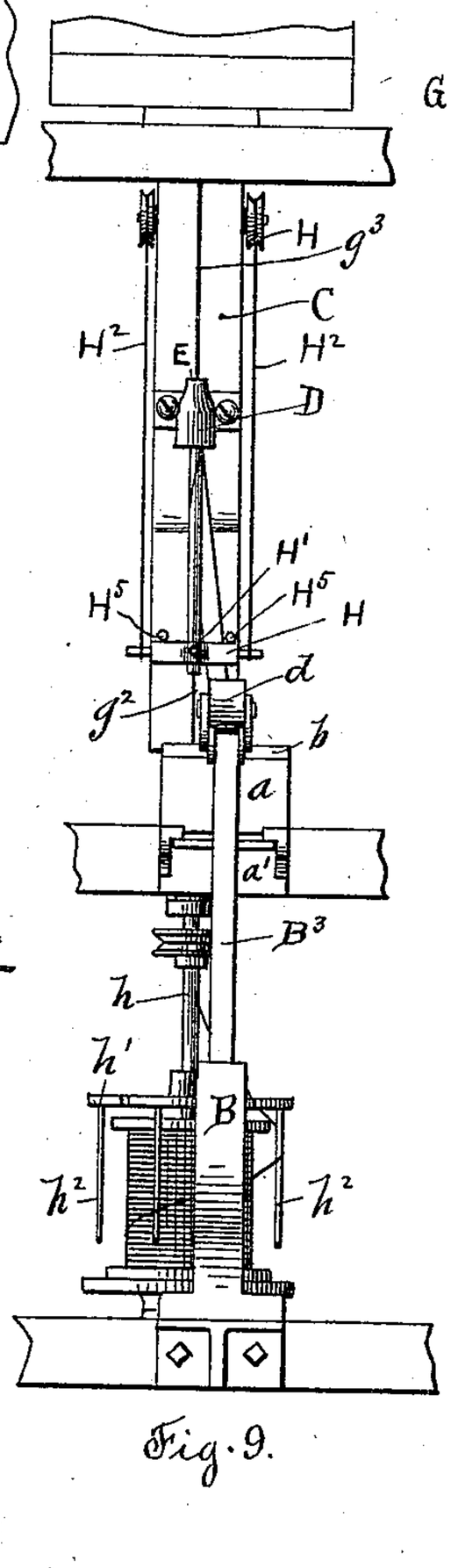
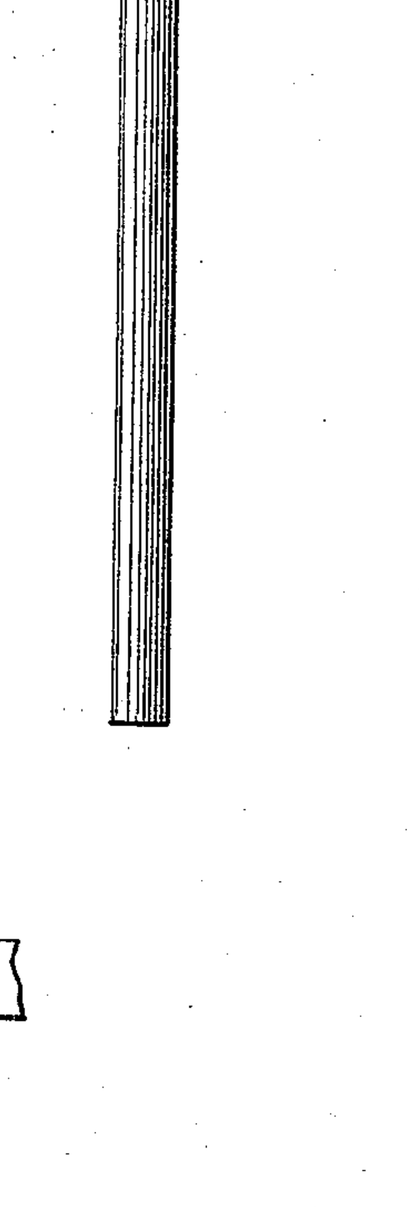


Fig. 9.

Fig. 11.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING PAPER TWINE.

SPECIFICATION forming part of Letters Patent No. 551,615, dated December 17, 1895.

Application filed July 10, 1891. Serial No. 399,095. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LOOMIS BROWNELL, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Machines for Making Paper Twine, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, and in which—

Figure 1 denotes a side elevation of so much of the operating mechanism as embodies my invention with a portion of the supporting-framework. Fig. 2 is a front view of the lower portion of the mechanism shown in Fig. 1. Fig. 3 is a central sectional view of the forming-tube with a portion of the inclosed spindle shown in full. Fig. 4 is a central sectional view of the forming-tube with the inclosed spindle shown in full, also representing the paper strip as it passes through the forming-tube. Fig. 5 is a top view of the forming-tube. Fig. 6 is a bottom view of the same. Fig. 7 represents a top view of the yoke in which the spindle is adjustably held. Fig. 8 is a side elevation of the lower portion of the machine and including a device by which the paper is moistened and also showing the mechanism by which a central core is inserted within a paper covering and the core and paper covering either twisted together or independently, as desired. Fig. 9 is a front view of that portion of the machine shown in side view in Fig. 8. Fig. 10 is a top view of the moistening device, and Fig. 11 is a central sectional view of the forming-tube and hollow spindle.

Similar letters refer to similar parts in the different figures.

My invention relates to mechanism for forming a cord from a flat strip or ribbon of paper in which the tensile strain upon the edges of the paper strip shall be equalized, and in which, when the cord is formed about a central core, the paper forming the cord shall be equally and uniformly distributed about said core, and these objects I accomplish by means of the mechanism described in the following specification and shown in the accompanying drawings.

In Figs. 1 and 2 I have represented the mechanism by which a flat strip or ribbon of paper is made into a cord without being moistened and without a central core, and in Figs. 8, 9, 10, and 11 is represented the mechanism by which the paper strip or paper ribbon is moistened, and by which a central core is introduced within a paper covering.

A denotes a portion of the supporting-framework. B denotes a trough containing the roll of paper ribbon from which the cord is to be made, and forming a pocket, which in the mechanism represented in Figs. 1 and 2 is arranged to support the coil B′ of paper ribbon in an inclined position, one side of the coil B′ resting against the extended side B^2 of the trough B.

Supported by the framework of the machine is a tube D with the circumference of its bore equal to or greater than the width of the paper ribbon from which the cord is to be formed and having its upper end reduced in diameter to form a tapering or funnel-shaped section having tapering or inclined walls I I, and at the end of the funnel-shaped opening is placed a die E with its diameter equal to or slightly greater than that of the twisted cord, and through the die the paper cord is delivered to the twisting mechanism. The tube D and the die E are represented in the accompanying drawings as being formed in a single piece, but it will be obvious that the die E can be made in a separate piece and placed in proximity to the smaller end of the funnel-shaped section of the tube D; but I prefer, however, to form the die E integral with the tube D, as represented. Within the tube D, I place a cylindrical spindle F of less diameter than the bore of the tube, so as to form an annular chamber G.

In the references to the integral piece shown in sectional view on Figs. 3 and 4 that portion of the piece inclosing the end of the spindle F, together with the funnel-shaped section formed by the inclined walls I I, is designated as the tube D, and the contracted opening leading from the funnel-shaped section is designated as the die E, and these two portions—viz., the tube D and the die E—perform separate and independent functions, and although shown in the drawings as integral, or constructed in a single piece, they could obviously be made in separate pieces.

The spindle F is supported in a yoke H, in

which it is capable of a vertical adjustment by means of a set-screw H′.

To the ends of the yoke H are attached cords H^2 H^2, which are carried over the pulleys H^3 H^3, turning upon studs held in the bracket C.

The cords H^2 are united at their ends and support a counterweight H^4, by which the weight of the yoke H is balanced and the yoke held against the under side of the pins H^5, projecting from the bracket C, and thereby determining the vertical position of the spindle F within the tube D.

It is desirable that the upper end of the spindle F should be maintained at such a distance from the contracted outlet or funnel-shaped section of the tube D as will allow the paper tube formed around the spindle F and within the annular chamber G to be properly crimped and twisted without becoming clogged in its passage through the forming-tube.

The annular chamber G and die E are connected by a short section having inclined or tapered sides I, by which the paper tube, as it leaves the annular chamber G, is reduced in diameter by outside pressure caused by the tapered or funnel-shaped section of the tube D and the surface of the paper longitudinally crimped, as shown at I′ in Fig. 4.

The ribbon or strip of paper is formed into a cylindrical tube around the spindle F, with both edges of the paper strip at equal distance from the center of the tube. The spindle F is raised within the tube D, so as to bring its upper end within the tapering sides I and leave a contracted annular space between the contracted sides I and the upper end of the spindle F, through which the cylindrical paper tube is drawn, the paper being pinched between the opposing surfaces to cause the paper to be uniformly distributed by a series of uniform, even, and longitudinal crimps, the crimped paper as it leaves the spindle F substantially filling the annular space between the end of the spindle and the tapering sides I, and also causing the upper end of the spindle to be held concentrically within the tapering sides I and with the axis of the spindle coincident with the center of the die E, through which the crimped paper tube is delivered.

As the paper tube is delivered from the outlet E, it is conducted directly to the twisting and winding mechanism, which may be of any known form of construction, that shown in the accompanying drawings consisting of a rotating flier-frame J, carrying scored drums K K and a concentric winding-spool L. This portion of the mechanism, however, forms no part of my present invention, it having been described in my applications for Letters Patent of the United States, Serial No. 261,433, filed January 20, 1888, and Serial No. 393,784, filed May 22, 1891.

The supporting trough or pocket B is inclined, as represented at Fig. 2, in order that the paper ribbon B^3 can be delivered at a slight angle with the axis of the spindle F, so the extended ribbon as it approaches the cylindrical spindle F may be more readily wound about the spindle, as represented in Fig. 4. Between the coil B′ of paper ribbon and the spindle F, I place a staple or guide B^4. The paper ribbon is carried beneath the spindle F and in a spiral direction around the upper end of the spindle, by which it is formed into a paper tube, and through the contracted outlet E to the twisting mechanism. The paper tube formed within the annular chamber G and around the end of the spindle F is contracted in its diameter by the inclined sides I I, forming a series of longitudinal crimps or creases I′, and between the flier-frame J and the upper end of the spindle F the strand is subjected to rapid rotation, by which it is twisted against the upper end of the spindle F, as represented in Fig. 4, the crimping and twisting being carried on simultaneously as the paper tube is delivered off the upper end of the spindle F.

In Figs. 8 and 9 is represented an apparatus by which one side of the paper ribbon is moistened between the coil B′ and the tube D. The moistening apparatus comprises a water-pan *a*, supported upon a bracket *a′*, attached to the framework of the machine and provided with a cover *b*, having depending lugs upon its lower side, in which is journaled a roll *c*, partially immersed in the water in the pan.

The upper surface of the roll *c* extends through an opening *c′* in the cover *b*, and a weighted roll *d* rests upon the lower roll *c* and is held in lugs *d′*, which are provided with notches d^2 to receive the gudgeons of the weighted roll and support it out of contact with the lower roll *c*. The cover *b* is provided at its edge with a raised and rounded rib *e*, and upon the opposite side of the rolls the cover *b* has a raised rib *f*. A straight line joining the upper surfaces of the ribs *e* and *f* will pass above and out of contact with the lower roll *c*.

The strip or ribbon of paper B^3 is carried, as represented in Fig. 8, over the rib *e*, between the rolls *c* and *d*, and over the rib *f*, and beneath the guide-staple B^4, by which the direction of the ribbon is changed from a horizontal to a vertical plane and also deflected so as to be delivered to the spindle F at an angle thereto in the same relation as shown in Fig. 2. The paper ribbon as it crosses from the rib *e* to the rib *f* is pressed down and carried into contact with the lower roll *c* by the weighted roll *d*, causing the under surface of the paper ribbon to be moistened by the water raised by and carried upon the surface of the lower roll, thereby expanding the lower side of the paper and causing the ribbon to curl or roll and feed itself around the cylindrical spindle F.

When it is desired to remove the paper ribbon from contact with the lower roll *c* the

weighted roll d is raised and supported in the notches d^2, allowing the paper ribbon to be drawn taut across the ribs e and f out of contact with the lower roll c. The proper moistening of the surface of the paper as it approaches the tube D requires a certain amount of time for its accomplishment and I therefore make the water-pan a adjustable upon the bracket a', so its position can be varied and the distance between the moistening-rolls c and d and the tube D increase or diminish as may be necessary, allowing more or less time between the moistening of the paper by the rolls c and d and the forming of the paper ribbon around the spindle F.

The spindle F is made hollow with its bore coincident with the opening E, and also with the axis of rotation of the flier-frame J, and upon a spool-support g I place a spool g', upon which is wound a small cord or twine g^2, which is to form a core for the twisted paper tube.

The spool g is held upon a rotating spindle h, carrying a disk h' and pins h^2, and the cord wound upon the spool g I carry around the pins h^2 to secure the requisite tension and through the center hole F′ of the spindle F to the twisting mechanism. The paper ribbon B^3, as it is delivered from the upper end of the spindle F, will be wound around and form a covering for the cord taken from the spool g.

Rotary motion can be given to the spindle h, by which the cord g^2, forming the core of the completed twine g^3, may be twisted independently either with the twisted-paper tube or in the opposite direction.

I am aware that it is not new to form a twisted cord from a strip or ribbon of paper by conducting the paper strip through a conical tube, or through a longitudinally-tapered former or guide, having in cross-section a spiral or snail wheel form, and I do not claim such, the purpose of the mechanism herein described being to form the paper ribbon into a cylindrical tube with both edges of the ribbon at an equal distance from the center of the tube, so that when the tube is twisted the tensile strain upon the opposite edges of the ribbon will be equal, and to maintain the cylindrical form of the paper tube up to the point at which the contraction and twisting of the tube takes place, and also to render the longitudinal crimps or folds of the paper substantially uniform by forming such crimps or folds within the contracted annular space between the upper end of the cylindrical spindle F and the inclined sides I, for it will be obvious that it will be impossible for the paper ribbon to be otherwise than uniformly distributed around the delivering end of the spindle F, for the reason that when the paper is thus uniformly distributed throughout the annular space between the tapering spindle and the tapering sides I the annular space is substantially filled.

While I deem it advisable to deliver the crimped-paper tube either with or without a central core directly to the twisting mechanism, I do not deem it necessary to so deliver it to a twisting mechanism, as in some cases it may be desirable to wind the paper tube as delivered from the forming-tube directly upon a winding spool or drum, or the continuous tube can be drawn from the tube by means of rolls placed at the mouth or outlet E, and the paper tube subsequently twisted by an independent twisting mechanism.

When the paper tube is delivered directly from the die E to the twisting mechanism, the contraction and twisting of the tube will take place simultaneously at the end of the cylindrical spindle F, and the action of twisting will be limited by the end of the spindle.

The bracket a', by which the water-pan a is supported, is bifurcated, and the water-pan is held in position thereon by means of a clamping-bar i, extending below and transversely across the bracket, and a tightening-bolt j, allowing the pan to be adjusted along the bracket a' and the distance between the moistening-roll c and the forming-tube D to be varied.

I do not confine myself to the specific arrangement of the flier-spindle h, as any of the well-known flier-spindles by which a single strand or cord is twisted may be used in place of that shown in Figs. 8 and 9.

I do not claim broadly twisting a strip of paper from the end of a pointed cylinder, as such is shown in the Letters Patent of the United States, No. 43,874. The end of the spindle F, against which the paper strip is twisted, is not pointed but abrupt and of substantially the same diameter as the body of the spindle, around which the paper strip is wound, in order to form a tube which holds the paper to be expanded against the twisting, so as to cause the longitudinal crimps to be uniformly distributed, and I wind the paper strip into a cylindrical tube before it is delivered from the end of the spindle, by which I secure a uniform tensile strain upon the opposite edges of the paper strip, as already described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for forming a paper cord from a paper ribbon, the combination of a cylindrical spindle, a roll support for supporting a roll of paper ribbon with its axis held obliquely to the axis of said spindle, whereby said ribbon is fed to and wound spirally around said spindle to form a paper tube, means for drawing said paper tube off the end of said spindle and means for twisting said paper tube into a compact cord, beyond the end of said spindle, whereby said paper tube is held distended to its full size up to its delivery from said spindle, substantially as described.

2. In a machine for forming a cord from a paper ribbon, the combination of a cylindrical spindle around which the paper ribbon is formed into a cylindrical tube, a die with its

axis coincident with the axis of said spindle, and twisting mechanism by which the cord is twisted and drawn off said spindle and through said die, substantially as described.

3. In a machine for forming a cord from a paper ribbon, the combination of a cylindrical spindle, around which the paper ribbon is formed into a cylindrical paper tube, a tube having its inner side tapering and inclosing the end of said spindle and forming a contracted annular space between the end of said spindle and said tapering side and means by which the ribbon is drawn through said annular space, substantially as described.

4. In a machine for forming a cord from a paper ribbon, the combination of a spindle around which the ribbon is formed into a cylindrical tube, a tube, as at D, inclosing the end of said spindle and provided with tapering or inclined walls, as at I, I, and a die, as at E, having its axis concentric with the tube inclosing the end of said spindle and means by which a paper ribbon is drawn off the end of said spindle and through said die, substantially as described.

5. In a machine for forming a cord from a paper ribbon, the combination of a spindle around which the ribbon is formed into a cylindrical tube, a roll support for supporting a roll of ribbon and holding the same at an angle to the axis of said spindle, a tube, as at D, inclosing the end of said spindle and provided with tapering, or inclined walls, as at I, I, and forming a funnel-shaped section, and a die, as at E, located as at said funnel-shaped section, through which the twisted cord is drawn, substantially as described.

6. In a machine for forming a cord from a paper ribbon, a cylindrical spindle around which the ribbon is formed into a cylindrical tube with the edges of the ribbon at an equal distance from the center of the tube, means for twisting the paper tube as it leaves the end of said spindle and a tube inclosing the end of said spindle and forming a contracted annular space around the end of said spindle, by which the paper tube is uniformly and evenly crimped longitudinally, substantially as described.

7. In a machine for forming a cord from a paper ribbon, the combination of a spindle around which the ribbon is formed into a cylindrical tube, said spindle having a longitudinal opening to provide for the passage of a core, a cylindrical tube, as at D, inclosing said spindle and provided with tapering or inclined walls, as at I, I, forming a funnel-shaped section at the end of said spindle, and a die as at E, through which the twisted cord passes, substantially as described.

8. A machine for forming a cord from a paper ribbon having a cylindrical spindle around which the ribbon is formed into a cylindrical tube of uniform diameter with the edges of the ribbon at an equal distance from the center of the tube, said spindle having a longitudinal opening to provide for the passage of a core and twisting mechanism by which the paper tube formed around said spindle is twisted as it is delivered from the end of the spindle, substantially as described.

9. In a machine for forming a cord from a paper ribbon, the combination of a spindle around which the ribbon is formed into a cylindrical tube, a supporting yoke in which said spindle is held, twisting mechanism by which the paper is twisted as it is delivered from the end of said spindle and a die through which the twisted cord is drawn, said spindle being adjustable in said yoke, whereby its position is varied relatively to said die, substantially as described.

10. In a machine for forming a cord from a paper ribbon, the combination of a spindle, around which the ribbon is formed into a cylindrical tube, a supporting yoke by which said spindle is held, cords attached to said yoke and passing over guide pulleys, a counterweight attached to said cords and fixed pins, or stops, against which said yoke is held, substantially as described.

11. In a machine for forming a cord from a paper ribbon, the combination of a spindle around which the ribbon is formed into a cylindrical tube, said spindle having a longitudinal opening to provide for the passage of a core, twisting mechanism by which said tube formed around said spindle is twisted, as it is delivered from said spindle and twisting mechanism placed in advance of said spindle, by which the core is twisted as it passes to said spindle, substantially as described.

12. The combination of the water pan, a cover *b* provided with lugs depending from the lower side of said cover, a roll *c* journaled in said lugs and extending through an opening in said cover, notched lugs d' extending upward from said cover, weighted roll *d* held by said lugs, said lugs having roll supporting notches d^2 and ribs *e* and *f* upon opposite sides of the roll *c* and raised above said roll, substantially as described.

13. In a machine for forming a cord from a paper ribbon, the combination with mechanism for forming the ribbon into a tube and mechanism for twisting the same, of a trough or pocket B, placed in an inclined position, so as to partially support the roll of ribbon upon its side, said trough having one side extended at B^2 to form a support for the roll of ribbon, substantially as described.

Dated at Worcester, in the county of Worcester and State of Massachusetts, this 6th day of July, 1891.

GEORGE LOOMIS BROWNELL.

Witnesses:

RUFUS B. FOWLER.

CHARLES F. SCHMELZ.