

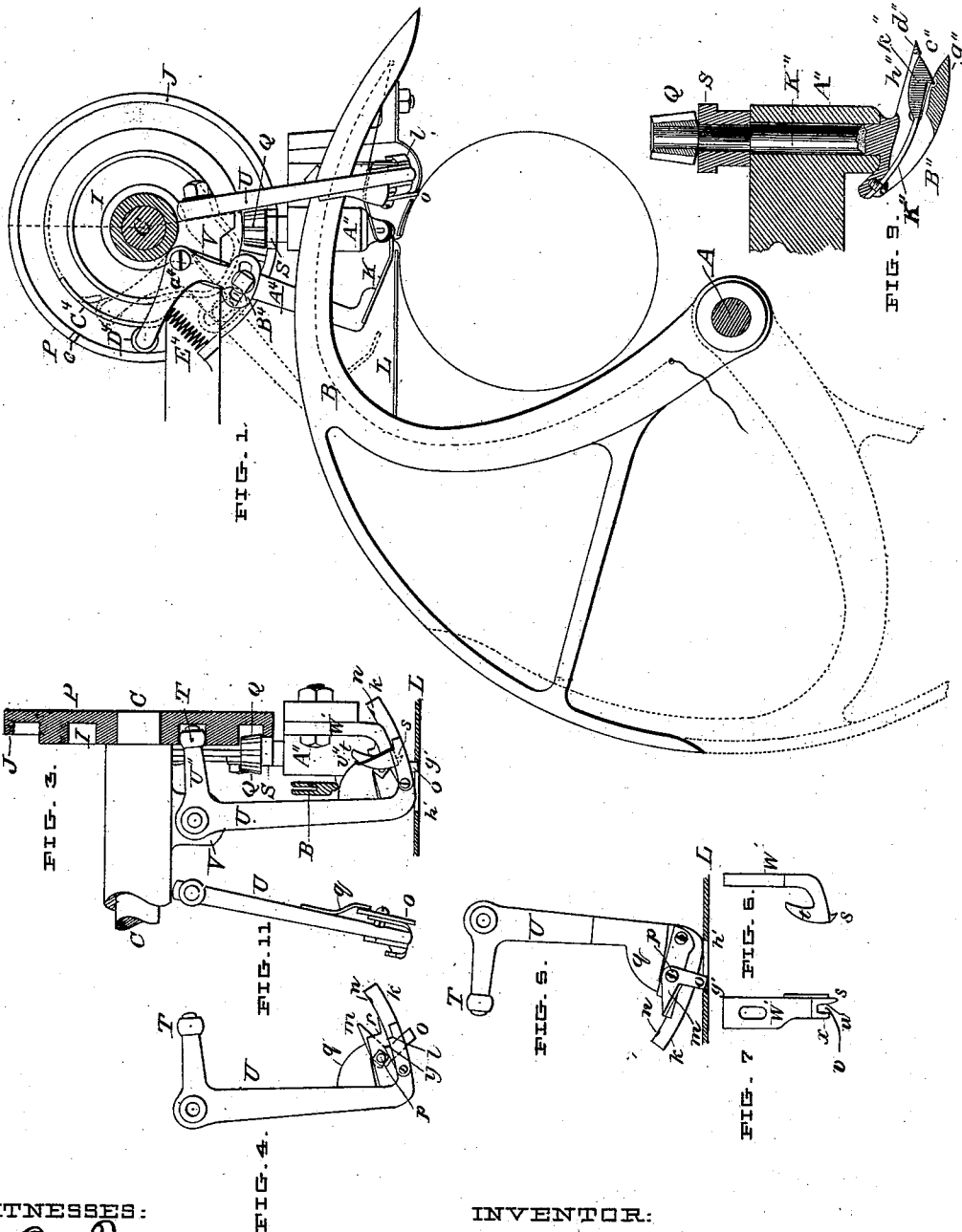
(Model.)

E. G. WATROUS.
GRAIN BINDER.

3 Sheets—Sheet 1.

No. 509,008.

Patented Nov. 21, 1893.



WITNESSES:

C. Floyd Henning
Loc & Co. Eng. & Mach.

INVENTOR:

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BY *Franklin J. Smith* ATT'Y.

(Model.)

3 Sheets—Sheet 2.

E. G. WATROUS.
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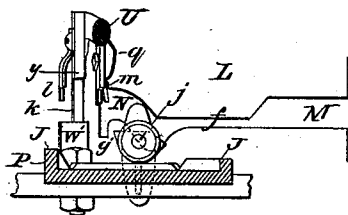


FIG. 2.

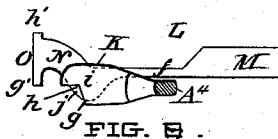


FIG. 3.

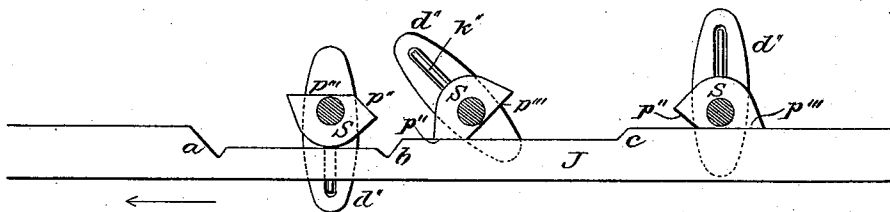


FIG. 10.

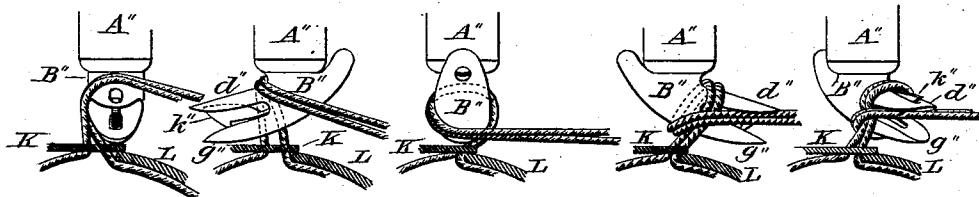


FIG. 12.

FIG. 13.

FIG. 14.

FIG. 15.

FIG. 16.

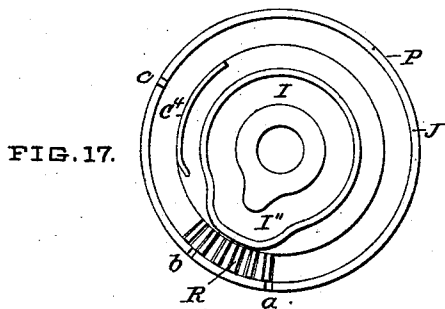


FIG. 17.

WITNESSES.

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(Model.)

E. G. WATROUS.
GRAIN BINDER.

3 Sheets—Sheet 3.

No. 509,008.

Patented Nov. 21, 1893.

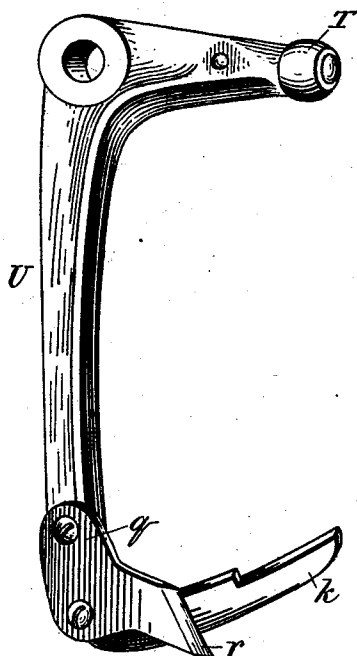


Fig. 18

WITNESSES:

Walter W. Longgrove.
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By Merrill Parsons.
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UNITED STATES PATENT OFFICE.

EARL G. WATROUS, OF SMITH'S MILLS, ASSIGNOR TO THE WALTER A. WOOD MOWING AND REAPING MACHINE COMPANY, OF HOOSICK FALLS, NEW YORK.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 509,008, dated November 21, 1893.

Application filed August 12, 1886. Serial No. 210,679. (Model.)

To all whom it may concern:

Be it known that I, EARL G. WATROUS, of Smith's Mills, in the county of Chautauqua and State of New York, have invented certain
5 Improvements in Grain-Binders, of which the following description, in connection with the accompanying two sheets of drawings, constitutes a specification.

This invention relates more particularly to
10 the knotting, grasping, and band severing devices of automatic grain binders, and has for its object the simplification of these parts.

To this end it consists more essentially of the combination with a revolving knotter of
15 a stationary grasper so formed as to give the requisite amount of twine to the knotter to wrap the hook. It is well known to those familiar with the art that it has hitherto been found necessary to move the knotter toward
20 the cord-holder, or the latter toward the former, when the loop is being made in the bands to provide sufficient slack in the grasper end of the band. As in my devices, this movement of either the grasper or knotter is obviated, and all mechanism to produce such result done away with, the advantage of the invention is apparent.

My invention further consists in certain other details of construction and combinations of parts as will be more fully hereinafter described and pointed out in the claims.

My binding apparatus may be attached to a harvester so that the knotting apparatus will be either above or below the binding platform.
35

In the accompanying drawings I have shown the knotting apparatus located above the binder table, and the needle adapted to ascend from beneath the binding table or platform.
40

In the drawings, in which similar letters of reference indicate like parts, Figure 1 is a side elevation, only so much of the binding apparatus being shown as is necessary to illustrate my invention. Fig. 2 is a top plan view of the cord-holder and cutter, the knotter, and the breast-plate. Fig. 3 is a front elevation of the cord-holder and cutter, with a vertical cross section through the knotter driving disk.
45
50 Fig. 4 is a front side elevation of the grasper

lever. Fig. 5 is a rear side elevation of the same. Fig. 6 is a side elevation of stationary member of the cord-holder. Fig. 7 is an end elevation of the same. Fig. 8 is a top plan view of a portion of the breast-plate and the tucker. Fig. 9 is a sectional view of the knotter. Fig. 10 is a view showing the shape of the cam on the knotter driving disk, which cam is shown extended in a straight line, and is for the purpose of determining the various
55 positions of the knotter. Fig. 11 is an end elevation of the grasper lever. Figs. 12 to 16 inclusive are views illustrating the formation of the knot. Fig. 17 is a side elevation of the knotter driving disk. Fig. 18 is a perspective
60 view of the grasper lever, having a knife, stationary therewith, attached thereto.

A is the intermittently operated reciprocating binder arm shaft to which motion is imparted from some suitable part of the harvester in any well known way.
70

B is the binder-arm or needle secured rigidly to the shaft A, and is adapted to deliver the band to the knotter.

L is the breast-plate.
75

P is the knotter driving disk, and is secured to the intermittently operated binder shaft C, to which one complete revolution is given to each operation of the binder.

K is the cord-placer.
80

Both the cord-placer and the breast-plate are made preferably of thin sheet metal, in order that the knot may be tied as closely as possible to the bundle.

B' is the knotter-hook. Its spindle has a bearing in the knotter-frame A'', and carries at its upper end, rigidly secured thereto, the bevel pinion Q and the delay-shoe S.
85

The driving disk P is provided with a segmental rack near its periphery which is of a sufficient number of teeth to impart about three quarters of a revolution or thereabout to the knotter spindle. H is also provided with a raised portion J near its periphery, on which the delay shoe rides. The spindle of the knotter beneath its bearings in the frame A'' is turned or bent at about right angles, and this bent portion is horizontally divided or slotted, as shown in the drawings. In this slot is fastened the flat spring K'', the for-
90
100

ward end of which is free and plays up through a slot h'' in the upper jaw d'' , as clearly shown in Fig. 9. The lower side of the forward end h'' of the spring K'' is hooked to catch the ends of the band, and the forward end of the spring K'' is beveled so that as the cords enter between the jaws g'' and d'' , the spring will be forced up to permit the bands to pass, when it will afterward clamp the ends against the lower jaw g'' . The loop, which has, by the revolution of the knotter, been wound around the jaws g'' and d'' , will in being pulled off the jaws impinge upon the upper part of the spring K'' , as shown in Fig. 16, and the ends of the band will be thereby firmly held in place between the jaws until the knot is tied.

The breast-plate L is suitably slotted to permit the needle to pass, as at M . From M , the slot is narrowed, as at f , to more surely guide the band to the proper position with reference to the knotter. The slot curves around from f at g , in the direction the bands are carried by the knotter hooks. From g the slot is curved around, as at N , to the more readily permit the knot to be stripped from the hook by the stress of the outgoing sheaf. The slot in the breast-plate terminates in the opening O , against the ends of which the swinging member of the cutter abuts, to open and close the shear-blades. When the knife is used in lieu of the shear-blades the rectangular opening O is obviously unnecessary.

The essential features of the form of the slot in the breast-plate are that it should be wider at M , to permit the ascent of the needle; should be narrowed at f to guide the band into the desired position with reference to the knotter; and that it should then sweep around so that when the knotter has performed about three-quarters of a revolution the slot should point in the same direction as the jaws of the knotter.

The tucker is adapted to so confine the twine that when the knotter commences to revolve the bands will be surely held so that they will be wrapped around the hooks.

A^4 is the tucker lever. It is fastened at its upper end to the elbow lever B^4 by a bolt which passes through a segmental slot in the lower end of the lever B^4 . By these means the adjustment of the tucker is effected. The elbow lever is pivoted to the frame of the machine at a^4 , and carries at its upper end the friction roller D^4 . The driving disk P is provided with a cam C^4 , which in the revolution of the disk P , bearing against the friction roller D^4 , moves the tucker K up toward the knotter. The tucker is normally held in the position shown by dotted lines in Fig. 1 by a spring E^4 , which is interposed between the upper end of the lever B^4 and the frame of the machine, as shown in Fig. 1. The tucker K is preferably of thin sheet metal and is fastened to the lever A^4 , as shown in Fig. 1, or it may be formed integral with A^4 . It extends toward the knotter at about right an-

gles to the lever A^4 , and is notched, as shown at i . This notch is adapted to receive the cord, and when the tucker is moved forward by the cam C^4 , which occurs somewhat prior to the revolution of the knotter, the cord is confined in the opening j between the tucker and the edge of the slot in the breast-plate, as shown at Fig. 8. In this way the cord is surely caught by the knotter and wound around the jaws. This notch i in the tucker prevents the cord from being pushed away from the jaws of the knotter, and its importance will be readily apparent to any one skilled in the art.

U is the grasper lever. It is elbow-shaped, as shown, and is pivoted to the frame V at the elbow of the lever. The upper arm U' carries a friction roller T mounted thereon, which friction roller traverses a cam groove I formed on the face of the knotter driving disk. The lower end of the lever U is bent outwardly therefrom, and is formed into a curve from the pivoted point of attachment of the lever U to the frame V as a center. The lower part of the lever U carries the band severing devices. The lower horizontal arm of the cord-holder is designated k in the drawings.

A fixed shear-blade r is rigidly attached to the lever U , and may be provided with a cutting edge. Another shear-blade m is pivoted to the fixed shear-blade and has a dependent arm o which extends downwardly into the transverse opening in the breast-plate. It will be evident that as the lever U reciprocates, the arm o striking one edge of the opening O will open the shear-blades to receive the twine, and striking the other end of the slot will close the shear-blades to sever the band.

In Fig. 18 I have shown a stationary knife r attached to the lever U . The forward end of this knife is provided with a sharpened edge, which being moved against the bands sever them. It is obvious that when this knife is used in lieu of the shear blades, the transverse opening O may be done away with.

W' is the stationary member of the cord-holder. It is rigidly bolted to the frame. Its lower portion is formed so as to be concentric to the limb of the lever U . It is made with two lips or flanges wx , in the groove v between which the limb or tongue k plays. The lip w , or the one farthest from the knotter, has a hook s formed thereon for the purpose hereinafter described. The tongue k is formed with a shoulder y , which, when the lever U is swung away from the part W' , receives the cord delivered by the needle, and when the lever U is moved inwardly carries the cord in between the lips or flanges wx . The lower limb of the lever U carries also a second shoulder l' , which, bearing against the cord as the lever is swung inward, surely carries the cord beyond the hook s . The shoulders y and l' are on the opposite sides of the flange w . The purpose of the hook s is to prevent the cord being drawn out of the hold of the grasper

by the rearward movement of the lever U. This is very important, inasmuch as it is necessary that the lever U be swung backwardly at the commencement of the revolution of the knotter, in order to allow sufficient slack in the grasper end of the band to wrap the hook. It is of course immaterial whether the knife a be attached to the fixed member W' or to the swinging member U. If attached to the former, a shoulder m' should be formed on the lever U between the cord-holder and the grasper, to force the band against the knife V; and if the knife is carried on the lever U, the shoulder should be formed on the stationary member of the cord-holder. It is obvious that for the purposes of the present invention these three devices are fully equivalents, and it matters not which one is employed. The cord is held in the grasper by being passed between the tongue k and the groove v ; and also by being kinked or bent over the lip or flange w . It is also evident from the previous description, taken in connection with the drawings, that the bands being severed between the knotter and the grasper, and while the grasper end of the band is in the hold of the grasper, a short remnant of twine will be left in the grasper from the previously bound bundle. As these remnants or short ends accumulate in the grasper, they are forced outwardly therefrom by the new end of the band caught, which new end is forced against the old end by the tongue k , as it is evident that when enough ends have accumulated to fill the grasper, one of these old ends will be displaced by the entrance of the new. The new end of the band is pressed by the tongue k against these remnants, and the security of the hold of the grasper thereby increased. As the knotter commences to revolve and at that time when slack is required in the grasper end of the band, with which to wrap the hook, the knotter driving disk actuates the grasper lever to open the grasper. The cord is prevented from slipping laterally out of the grasper by the hook s on the stationary member of the cord holder, but the cord is free to slip or slide through the grasper to give slack for the wrapping of the hook. A sufficient amount of slack twine to wrap the hook may be provided by this construction, but it will be obvious that if no other means are provided the band will have to be severed at a sufficient distance from the grasper toward the knotter, to prevent the withdrawal of the cord from the grasper, as the cord is caused to slip through the grasper by the wrapping of the hook. The guides, q and t , act to furnish a further amount of slack to the knotter, and by this employment it is possible to sever the cord nearer the grasper and consequently leave a shorter amount of cord in the latter. The guides q and t answer an additional purpose, as will be hereinafter described. A curved guide q is attached to the lever U, and an oppositely disposed curved piece is attached to or formed integral with the sta-

tionary member W' of the cord-holder. When the grasper is closed these two guides q and t make a V-shaped groove in which the cord running from the grasper lies, and by which it is the better guided into a proper position with reference to the knotter hook. These guides q and t also act to give slack to the knotter to wrap the hook, as will be now explained. The cam groove I is so formed that it will, during the revolution of the disk, till the segmental rack thereon comes in mesh with the pinion Q, hold the grasper closed. When, however, the knotter commences to revolve, the cam swings the tongue k backwardly in the groove v . The grasper end of the cord is drawn back by such movement until it catches on the hook s , which prevents the cord from being withdrawn from between the lips w and x . The shoulder w on the tongue k carries the cord, when the grasper is shut somewhat beyond the hook s ; and as the latter is somewhat nearer the knotter, a certain amount of slack is thereby provided. As, however, the cord passes from between the lips or flanges x w up over the guides q and t , in the groove formed between them to the knotter, when the knotter starts and the lever U is swung away from the member W' , the cord is free to slip down the curved sides of the guides t and q , and the bow or arch or knot in the cord provides more slack to wrap the hook. The amount of slack provided is determined by the size or height of the guides t and q . When a knife is used attached to the swinging lever U, the knife may be so formed as to constitute the guide q . The guide t may also be formed integral with the member W' of the cord-holder. The member W' is secured to the breast-plate by means of a bolt passing through a slot in the holder W' . By this construction the holder W' may be adjusted with reference to the lever U.

The knotter spindle is provided with a delay shoe S, having the delay surfaces p'' p''' . The delay surface p''' rides on the rim J on disk P until the knotter pinion comes into engagement with the segmental rack on the disk. The shape of the rim J is illustrated in Fig. 10. The rim is cut away at a^b to permit the revolution of the knotter hook. The pinion runs out of engagement with the rack at b and the delay surface p'' rides subsequently on the raised portion between b and c , in which position it is held by the stress of the outgoing sheaf, and when in this position the hook points in that direction most advantageous to the stripping of the loop from the knotter. The raised part c then turns the hooks in a direction at right angles to the slot in the breast-plate, ready for the succeeding bundle. The knotter thus has an intermittent rotary movement at the binding of each bundle. The rim J may be entirely cut away adjacent to the segmental rack, or it may be depressed. It is obvious that either construction would accomplish the result aimed at.

Having now described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. In a grain binder, a grasper formed with a fixed and a swinging member, said fixed member being provided with a groove in which a tongue of the swinging member is confined and moves longitudinally, a shoulder on the tongue of the swinging member to carry the cord into the groove, and a hook or catch on the stationary member to prevent the withdrawal of the cord during the retrograde movement of the swinging member to carry the cord into the groove, substantially as and for the purpose specified.

2. In a grain binder, the combination with the knotter frame and the knotter driving disk, of a grasper lever pivoted on the knotter frame, a cam groove on the disk, an arm on the grasper lever taking into the cam groove a second arm on the grasper lever, curved concentrically with the axis of movement of the lever, and a grooved stationary member of the cord holder in which the curved arm of the grasper lever is confined and reciprocates, substantially as and for the purpose specified.

3. In a grain binder, a grasper formed of a fixed and a swinging member, the fixed member provided with a groove in which the tongue of the swinging member moves longitudinally, a hook on the fixed member to prevent the withdrawal of the twine by the retrograde movement of the tongue, a shoulder on the tongue to carry the band or cord within the groove, and a second shoulder on the swinging member to carry the cord beyond the hook on the fixed member, substantially as and for the purpose specified.

4. The combination with the knotter and grasper relatively immovable toward each other, said grasper formed of a stationary and swinging member between which the cord is confined, of a lug attached to the swinging member between the gripping device and the knotter, and adapted to take up a bow or arch in the cord as the grasper is closed, and to release the same as the grasper is opened, substantially as and for the purpose specified.

5. The combination of a revolving knotter and a grasper, immovable toward one another, said grasper formed of a fixed and reciprocating member, of a curved lug on the stationary member and a curved lug on the reciprocating member, to make a V-shaped guide for the twine, whereby the latter is guided with precision to the knotter when the grasper is closed, and slack is provided to wrap the hook when the grasper is opened, substantially as and for the purpose specified.

6. The combination with a grasper formed of a fixed and a reciprocating jaw, said fixed jaw being provided with a groove open at each end, in which the swinging jaw reciprocates and is confined, and a cutting apparatus carried on the swinging jaw, and adapted to sever both bands between the knotter and

the grasper, whereby a short remnant of twine is left in the grasper at the binding of each bundle, and the grasper is adapted to free or clear itself, substantially as and for the purpose specified.

7. The combination in a grain binder of a grasper and a knotter immovable toward each other, said grasper formed with a fixed and a reciprocating member, curved guides attached to the reciprocating and fixed member, and adapted when the grasper is closed to take up a bow or arch between the cord-holder or grasper and the knotter, and the knotter driving disk adapted to open the grasper as the knotter commences to revolve, to swing the guides away from each other, whereby the bow or arch of cord taken up furnishes slack in the grasper end of the band to wrap the hook, substantially as and for the purpose specified.

8. A knotter consisting of two rigid radial jaws, in combination with a spring loop catch between the jaws, said loop catch adapted when confining the cord to project through a slot in the upper jaw, whereby the withdrawal of the loop over the hooks presses on the spring to hold the twine between the jaws, substantially as and for the purpose specified.

9. The combination with the knotter and its pinion, of a delay shoe on the knotter spindle having two delay surfaces, the knotter driving disk, having two tracks to engage the delay surfaces, the one to limit the retrograde movement of the knotter, and the other to hold the knotter at right angles to the cord, and a cam incline uniting the tracks, substantially as and for the purpose specified.

10. The combination with the lever U, of the shear-blades carried thereon, one of said shear-blades being pivoted with respect to the other and adapted to operate therewith, the breast-plate having a transverse opening and a dependent arm from the pivoted blade taking into the transverse opening, substantially as and for the purpose specified.

11. The combination with the revolving knotter and its pinion of the knotter driving disk provided with a segmental rack adapted to drive the knotter about three-quarters of a revolution, a delay shoe on the knotter spindle having two delay surfaces, a rim on the driving disk having two planes united by a cam incline, to limit the retrograde movement of the knotter by stress of the outgoing sheaf, to then turn the knotter and hold it in position for the succeeding bundle, as and for the purpose specified.

In testimony whereof I have hereto subscribed my name, at Smith's Mills, New York, this 14th day of September, A. D. 1885.

EARL G. WATROUS.

In presence of—

FRANKLIN SCOTT,
JOHN CARLETON.