(Model.)

3 Sheets—Sheet 1.

J. S. DAVIS.

BAND SECURING MECHANISM FOR GRAIN BINDERS.

No. 282,445. Patented July 31, 1883.

Fig 3.

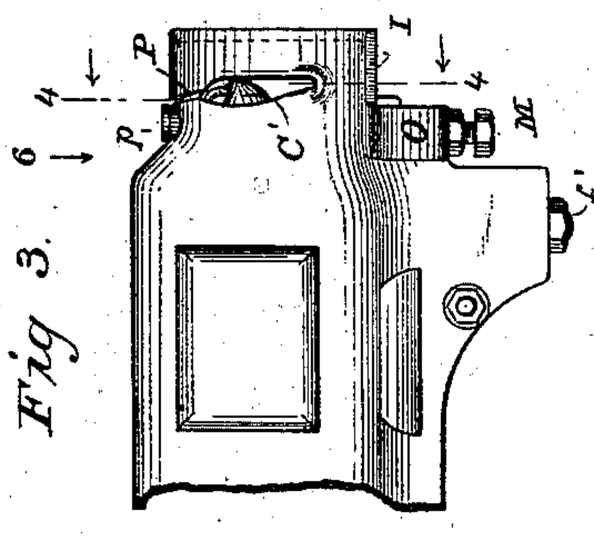


Fig. 4.

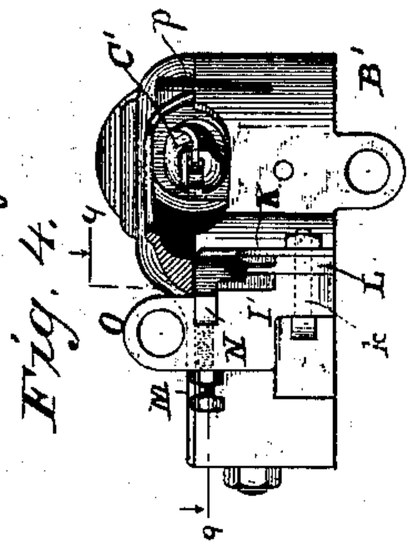


Fig. 5.

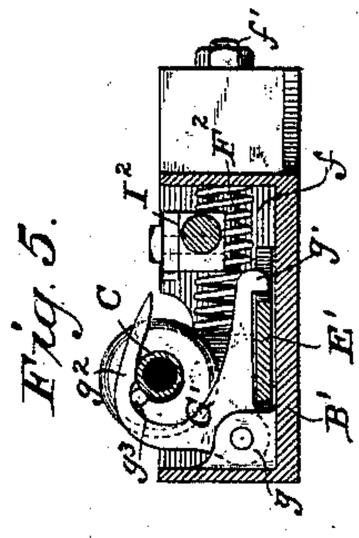


Fig. 6.

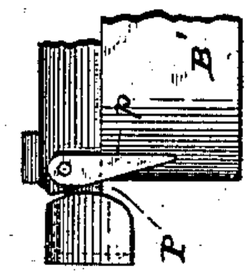


Fig 1

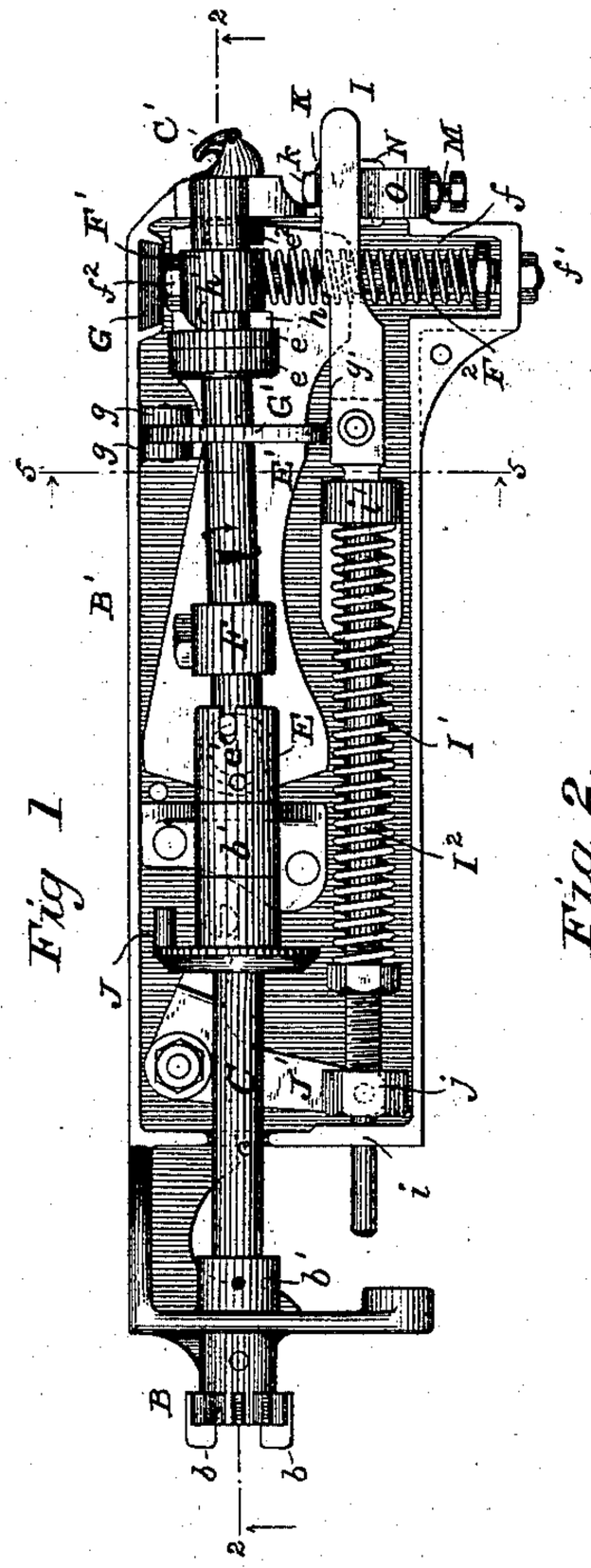


Fig. 2.

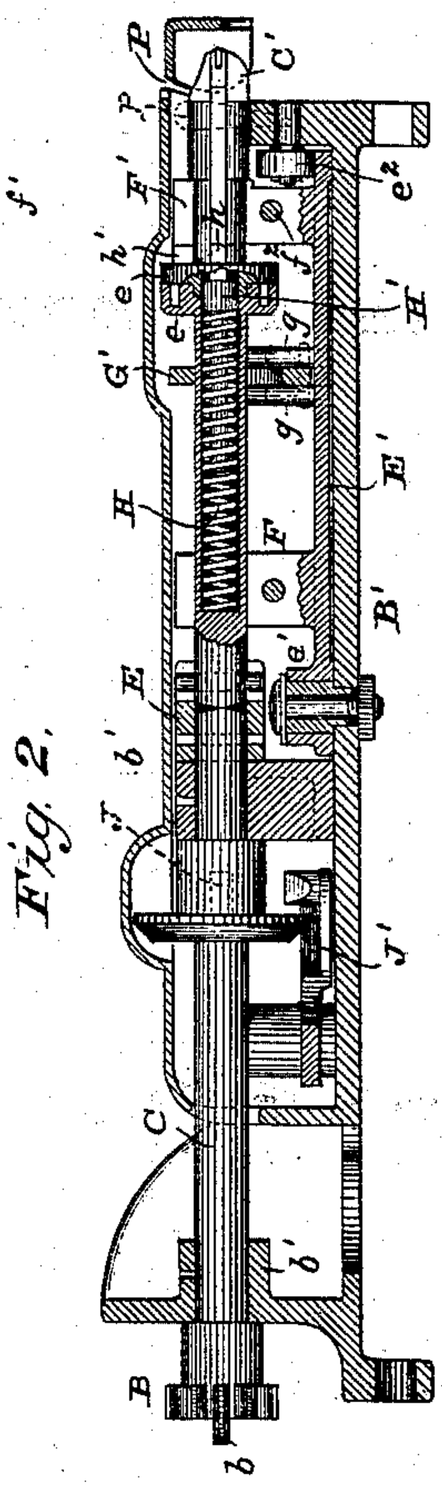


Fig. 11.

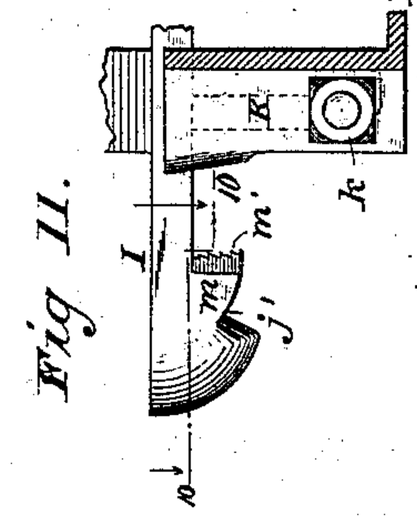


Fig. 12.

Fig. 10.

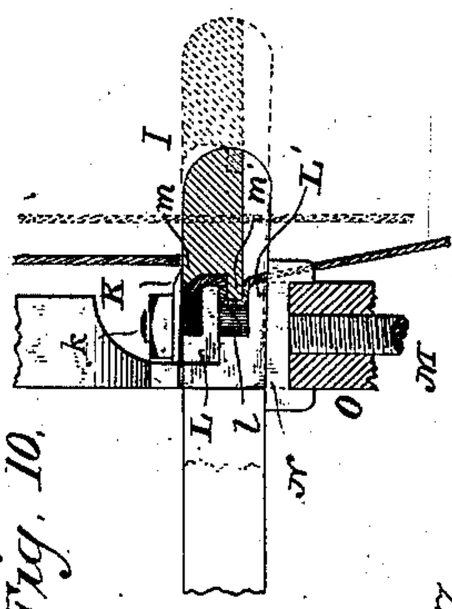


Fig 8

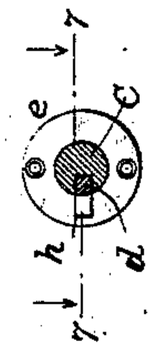


Fig. 9.

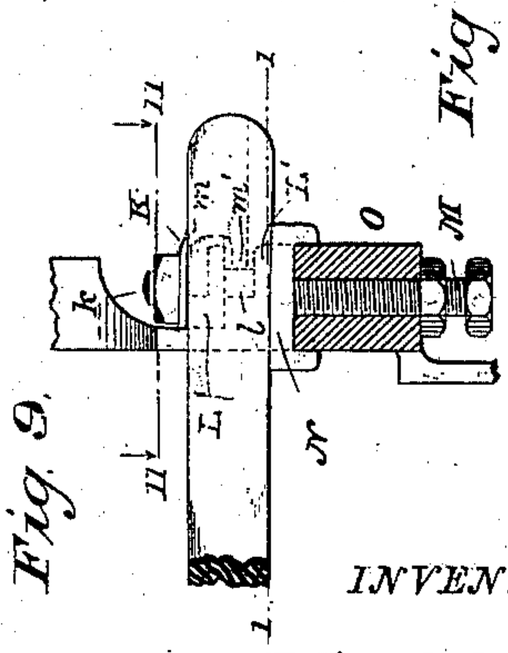
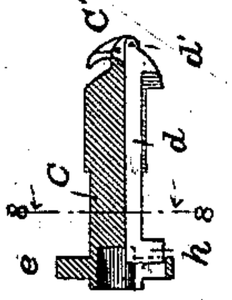


Fig 7



WITNESSES

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Francis D. Shoemaker

INVENTOR

John. S. Davis.

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(Model.) 3 Sheets—Sheet 2.

J. S. DAVIS.

BAND SECURING MECHANISM FOR GRAIN BINDERS.

No. 282,445. Patented July 31, 1883.

Fig. 13.

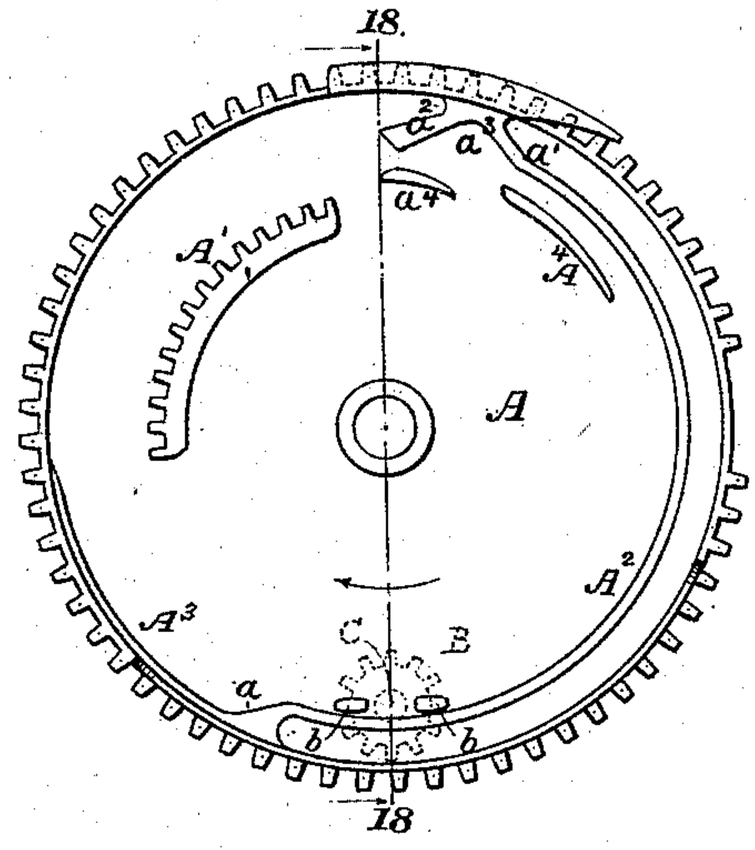


Fig. 18.

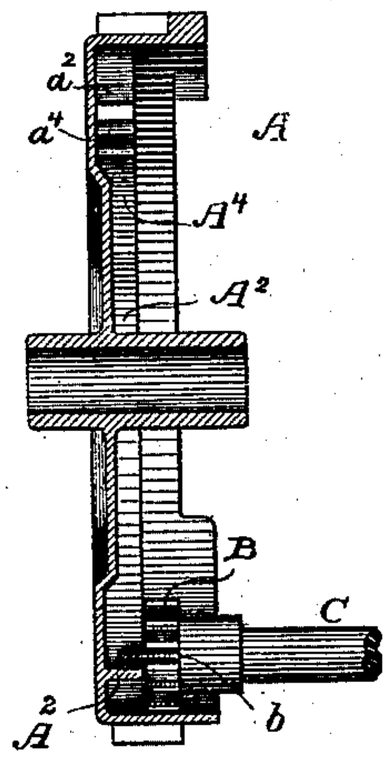


Fig. 19.

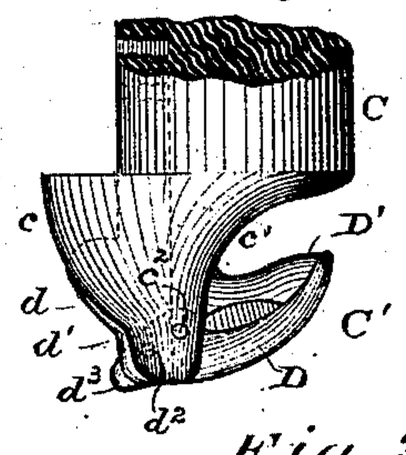


Fig 20.

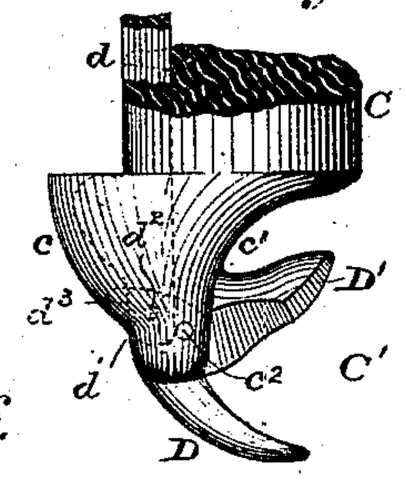


Fig 14.

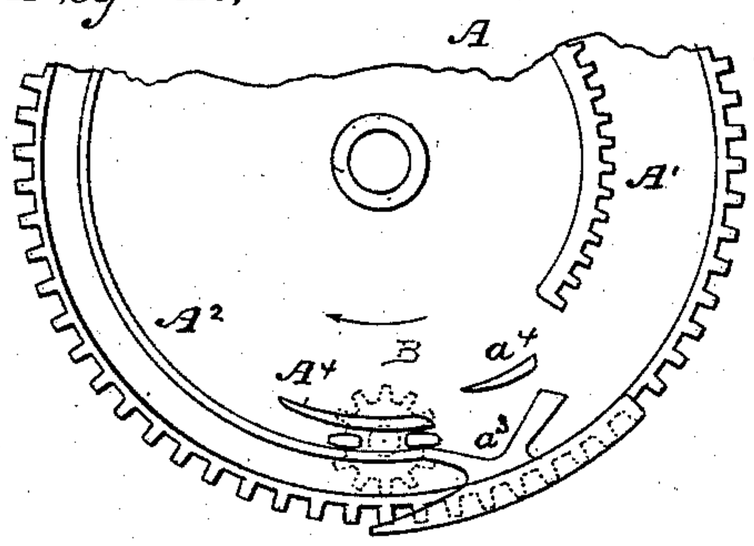


Fig. 16.

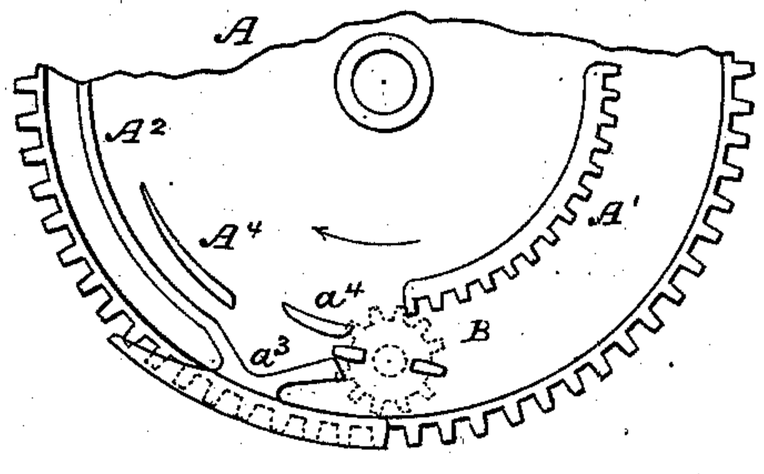


Fig. 15.

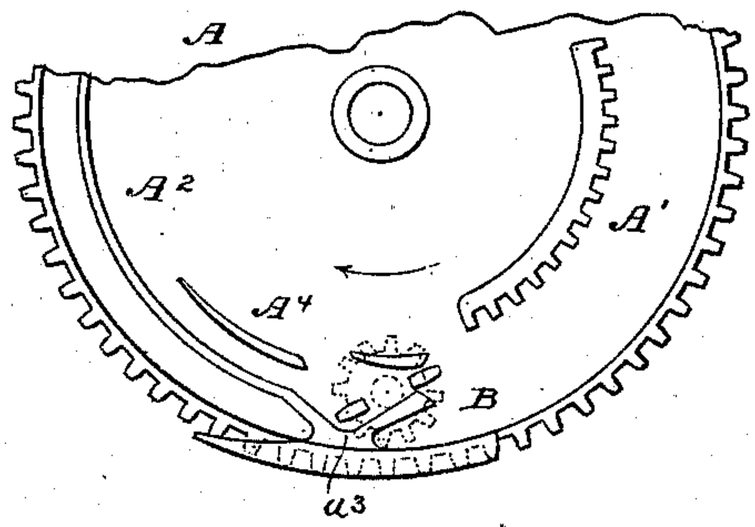
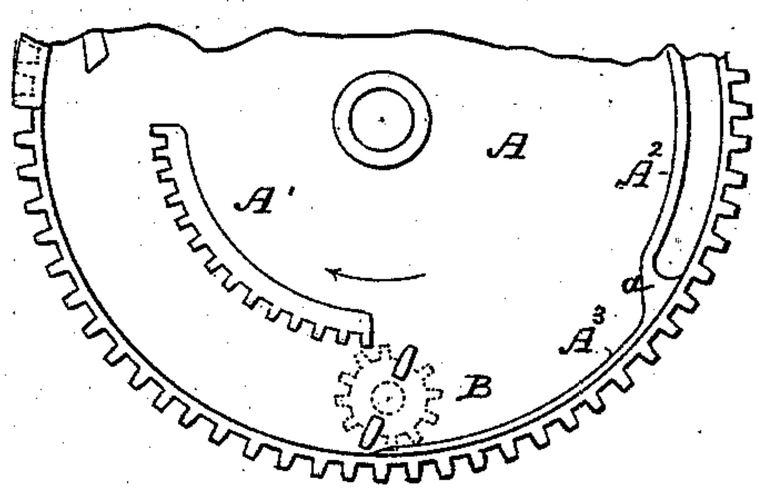


Fig. 17.



WITNESSES

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(Model.) 3 Sheets—Sheet 3.

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BAND SECURING MECHANISM FOR GRAIN BINDERS.

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Fig 21.

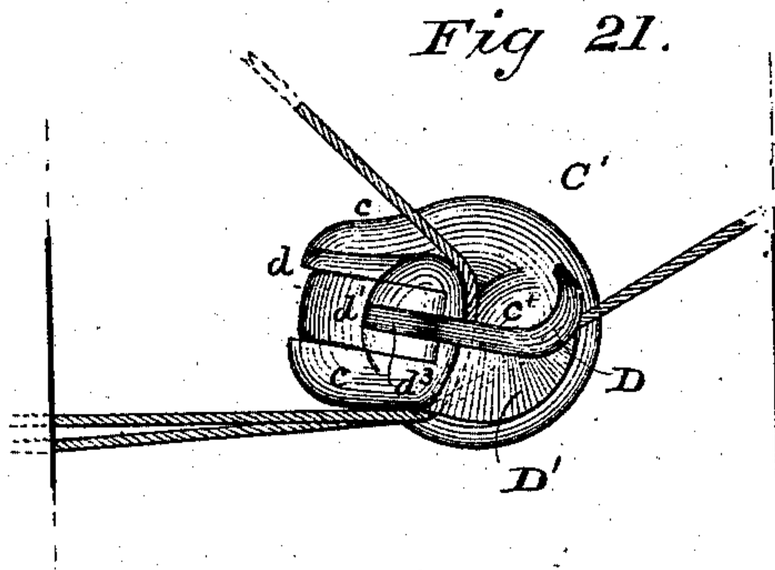


Fig. 22.

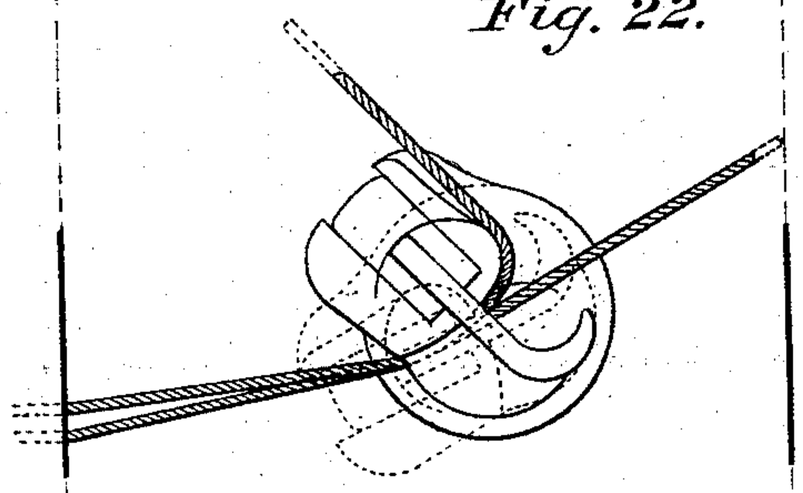


Fig. 23.

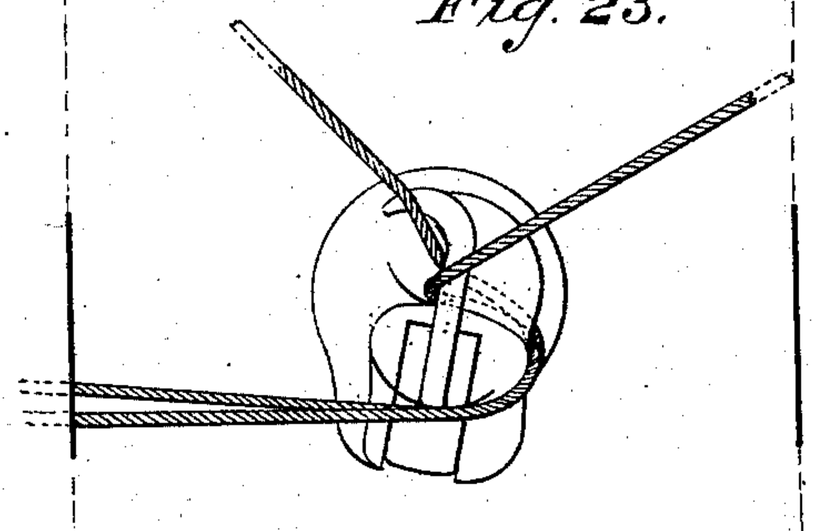


Fig 24.

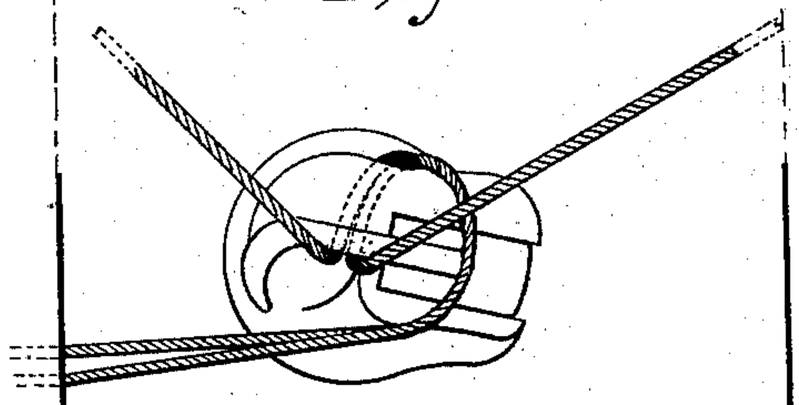


Fig 25.

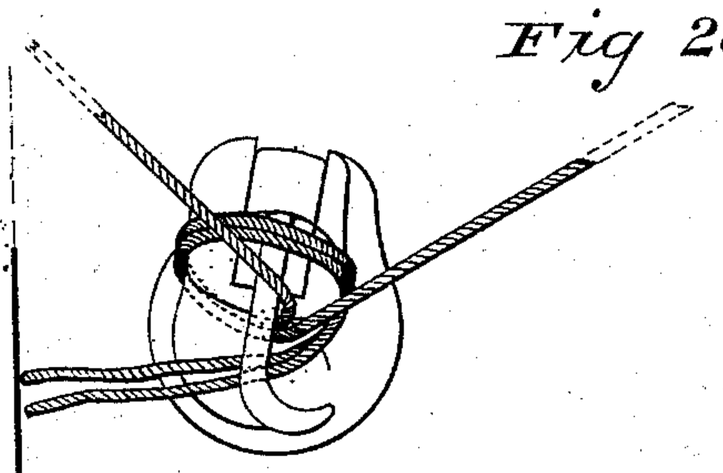


Fig 26

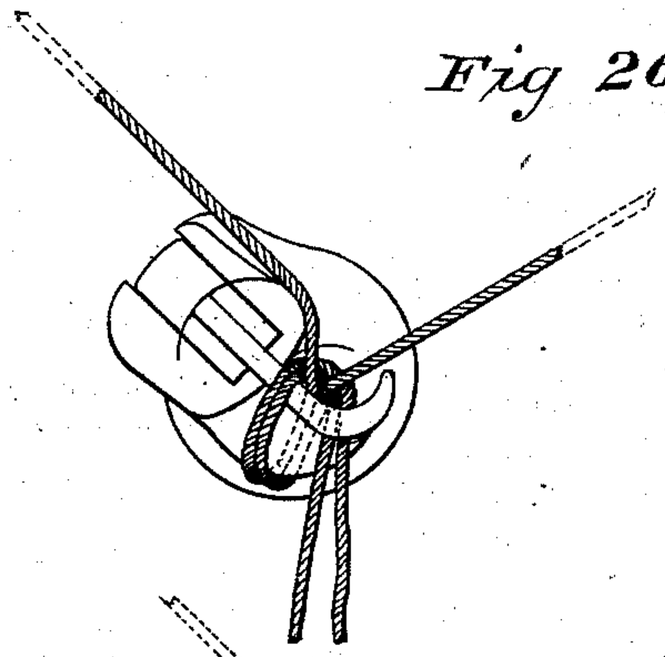


Fig. 27.

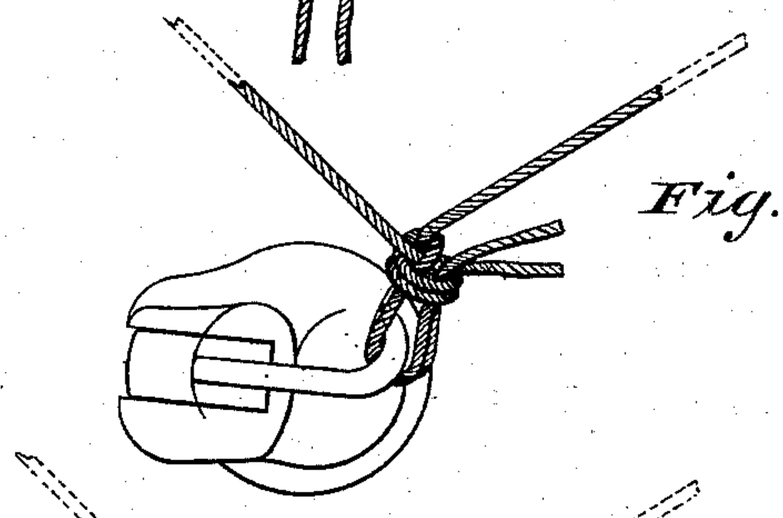
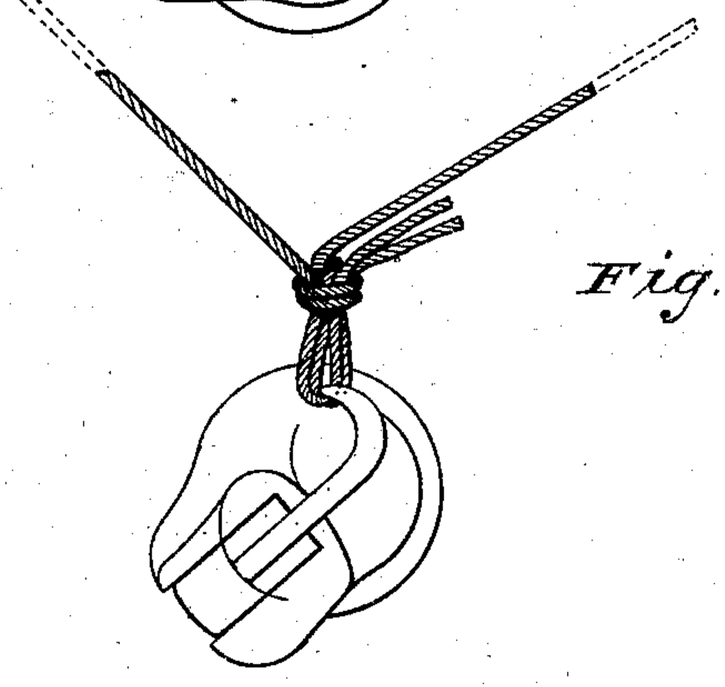


Fig. 28.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN S. DAVIS, OF TOLEDO, OHIO, ASSIGNOR TO THE TOLEDO MOWER AND REAPER COMPANY, OF SAME PLACE.

BAND-SECURING MECHANISM FOR GRAIN-BINDERS.

SPECIFICATION forming part of Letters Patent No. 282,445, dated July 31, 1883.

Application filed September 15, 1882. (Model.)

To all whom it may concern:

Be it known that I, JOHN S. DAVIS, of Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Band-Securing Mechanism for Grain-Binders, of which the following is a specification.

My invention relates to improvements in band-securing mechanism, including the devices for knotting, clamping, and cutting the binding material, applicable to grain-binders of the class in which are employed rotary tying-bills or knotter-heads having fixed and pivoted jaws.

A binder with knotting mechanism of the type to which my present improvements are especially applicable is shown and described in United States Letters Patent No. 260,668, dated July 4, 1882, for "improvements in grain-binding mechanism," of my invention.

My present objects chiefly are to avoid breaking or injuriously straining the binding material in banding the bundles of grain and knotting the bands about them, to insure a proper and, practically considered, uniform tension of the bands upon the bound bundles about which they are respectively secured, and to avoid to a considerable extent exerting strain, in addition to that resulting from the ordinary tension, upon the banding portion of the binding material after a bundle is encircled and during the formation of the knot in the ends of the band, while insuring the tight binding of the bundle. By "banding portion" is meant the length of binding material which encircles the bundle or is included in the loop formed by crossing or bringing together at the knotter that portion of the binding material next the end held by the clamp and that portion next the binder-arm.

The accompanying drawings represent a suitable application of my improvements. Only those parts of appropriate binding mechanism illustration of which is thought to be required in order to convey a proper understanding of my improvements are shown. Some of these improvements may, however, be used without the others, and also be employed in connection with mechanism differing in some respects from that shown, and hereinafter particularly described.

Figure 1 is a plan or top view of the knotting, clamping, and cutting mechanism, the top of its casing or box being removed and the parts represented as in their stationary or inoperative positions; Fig. 2, a view partly in elevation and partly in vertical longitudinal section on the line 2 2 of Fig. 1. Fig. 3 is a plan view of a portion of the rear or outer end of the knotter-box cover; Fig. 4, a view partly in elevation and partly in vertical transverse section on the line 4 4 of Fig. 3. Fig. 5 is a view partly in elevation and partly in vertical transverse section on the line 5 5 of Fig. 1. Fig. 6 is a view in elevation of the outer or rear end of the knotter-box and cover, seen from the inside, as indicated by the arrow 6, Fig. 3. Fig. 7 is a longitudinal section on the line 7 7 of Fig. 8 of the knotter-head or tying-bill and a portion of its shaft, showing the connection of the pivoted jaw of the tying-bill and its shank or slide rod with the rigid jaw and shaft; Fig. 8, a transverse section on the line 8 8 of Fig. 7. Fig. 9 is a view on an enlarged scale, partly in plan and partly in section on the line 9 9 of Fig. 4, showing the cutting and clamping devices, the movable section of the clamp being shown in its normal or retracted position; Fig. 10, a view similar to Fig. 9, except that the outer end or head of the movable section of the clamp is shown in section on the line 10 10 of Fig. 11, and also represented by dotted lines as in its advanced position; Fig. 11, a view partly in side elevation and partly in section on the line 11 11 of Fig. 9; Fig. 12, a bottom view of a portion of the sliding section of the clamp, showing the formation of the clamping and shearing head. Fig. 13 is a view in elevation of a gear-wheel, (hereinafter termed the "binder-gear,") by which the knotting, clamping, and cutting devices are actuated, this gear being represented in its normal or inoperative position, with the pinion on the knotter-shaft actuated thereby shown by dotted lines; Fig. 14, a similar view of a portion of the binder-gear and the knotter-pinion with this gear represented as having been rotated into the position it assumes just previous to its first actuation of the knotter-pinion; Fig. 15, a similar view of the binder-gear and knotter-pinion, representing the parts in the positions assumed at the time of the first actuation

or preparatory turn of the pinion; Fig. 16, a similar view of the binder-gear and knotter-pinion with the parts in the positions assumed at the time of the next actuation of the pinion; Fig. 17, a similar view of the binder-gear and knotter-pinion with the parts in the positions assumed after the third actuation of the pinion, at about the time of the completion of a knot and shortly in advance of a fourth and final actuation of the pinion, before the binder-gear comes to rest after making one revolution. Fig. 18 is a vertical central section through the binder-gear on the line 18 18 of Fig. 13, showing a portion of the knotter-shaft with its pinion. Fig. 19 is a view showing the tying-bill or knotter-head and a portion of the knotter-shaft with the tying-bill shown as closed; Fig. 20, a similar view with the tying-bill opened. Figs. 21 to 28, inclusive, are end views on an enlarged scale of the knotter-head with the binding material engaged thereby, showing the manner of forming a knot, the position of the clamp relatively to the knotter-head being indicated in each view by a heavy line. Fig. 21 shows the position of the knotter when the band ends are first presented to it after the encircling of a bundle by the descent of the binder-arm. Fig. 22 shows, in full lines, that stage in the banding operation at which the tying-bill has been rocked downward to cross or reach outside of the band ends while the knotter-pinion is in the position in which it is shown by Fig. 16, and in dotted lines the tying-bill is shown as in the preparatory position which it is caused to assume by the knotter-pinion when in the position shown by Fig. 15. Figs. 23 to 27, inclusive, represent various positions of the knotter and successive stages in the formation of the knot during the greater portion of the time the knotter-pinion is being actuated by the rack of the binder-gear—that is to say, during the time the binder-gear is turning from the position in which it is represented by Fig. 16 to near the position in which it is shown by Fig. 17. The position of the tying-bill and condition of the knot at the time the binder-gear rack has completed its action, as represented in Fig. 17, are shown by Fig. 28.

In some respects features shown in connection with my present invention are the same and in others substantially the same as devices and combinations of mechanism shown and described in connection with or as constituting the subject-matter of my before-referred-to invention patented July 4, 1882, as No. 260,668. Other of the features of a fully-organized grain-binder not herein described, but in connection with which my present invention is suited to be used, are shown and described in said Patent No. 260,668, and in United States Letters Patent, also for my inventions, Nos. 261,590 and 261,591, dated July 25, 1882, and Nos. 274,441 and 275,330, dated, respectively, March 20, 1883, and April 3, 1883.

An intermittingly-actuated binder-gear making one revolution at each actuation and thrown into and out of operation automatically, as set forth in the above-mentioned patents, or in equivalent way, serves, as therein explained, to actuate suitable binding mechanism; but as my present improvement relates only to the knotting, cutting, and clamping mechanism, illustration and description of all other mechanism are omitted, it being only requisite, in employing my said improvements, to provide suitable co-operating mechanism for supplying the grain, compacting it in gavels, starting and stopping the binder-gear, rocking the binder-arm, locking it against movement during the accumulation of gavels and while knotting, compressing the bundles, holding them properly compressed without injurious strain on the binding material while knotting the bands about them, and discharging them when bound.

The intermittingly-turning binder-gear A is provided with suitable means for imparting the required movements to a pinion, B, fast on the knotter-shaft C, to cause a tying-bill or knotter-head, C′, to knot the ends of the bands, the pinion-actuating mechanism in this instance shown being formed by a sector-gear, A′, so located upon the face of the binder-gear as to come between the pinion and binder-gear hub for engaging the pinion from above when in action, and by a camway or series of guide-ribs consisting of a main rib and two auxiliary or guard ribs. The main rib of the camway is formed by the two circularly-curved portions A^2 A^3, which are concentric with the binder-gear, the incline *a* between these two concentric portions, and the inclines *a′* and a^2, between which is the recess a^3 at one end of the longer concentric portion A^2. The opposite end of this portion terminates in the incline *a*, uniting it with the shorter concentric portion A^3, which is nearer the periphery of the binder-gear than the portion A^2. The auxiliary ribs A^4 and a^4 are located inside the main rib at its doubly-inclined or recessed end. The knotter-pinion has two face lugs or side teeth, *b b*, diametrically opposite each other, and at and near its periphery, and these lugs (shown in full lines, while the pinion is dotted, in Figs. 13 to 17, inclusive) are acted upon by the camway of the binder-gear to positively control the pinion and cause it to in turn assume the positions in which it is shown in Figs. 15, 16, and 13, the movements imparted to the pinion to bring it to the positions in which it is shown in Figs. 15 and 16 being given before the action of the sector-gear, and the movement to bring it to the position of rest in which it is shown in Fig. 13 being given after the action of the sector-gear upon the pinion.

The tying-bill C′, instead of being located close to a clamp and carried by a shaft rotating in fixed bearings, as in the before-mentioned Patent No. 260,668, is adapted to swing horizontally beneath and crosswise of the binding-receptacle toward and away from the clamping and cutting mechanism, in order that

after the banding of a bundle or presentation of the two ends of a band to the knotter a suitable amount of binding material between the knotter and the clamp may be taken up in forming the knot, instead of mainly drawing it out of the bundle-encircling loop or banding portion of the material, and the knotter is so constructed that the slight amount of cord taken from the banding portion is formed into the knot, instead of being again given up to produce slack in the band, as formerly. By providing for moving the knotter-head toward the clamp, so as to take up the greater portion of the length of material needed to form the knot, providing the needed amount of material between the clamp and the knotter-head while the latter is in the normal position, and providing suitable compressing devices, such preferably as heretofore patented by me, gavels may be properly banded without compression by injurious tension on the binding material, and bundles be bound tightly and of uniform size, and each held under a corresponding degree of tension by the bands secured about them, the gavels being compressed for binding by positively-actuated mechanism, and the bands being snugly secured about them without materially straining the binding material and while they are held under the desired degree of compression.

Instead of forming the knotter-head C′ so as to surround or project at its neck on all sides from its axis of rotation, and with the tying-bill projecting farther from the axis than the neck, so as to necessitate the location of its shaft or axis at an unnecessary and objectionable distance beneath the knotter-box cover or bottom of the binding-receptacle, as in my prior improvement patented as No. 260,668, the knotter-head is formed at its neck (that portion of the head about which the cord is wound to form a knotting-loop) with a lateral projection or bulge, *c*, at one side of the axis of rotation of the knotter, its opposite side being reduced or cut away on a curve to form a rounded surface or throat, *c′*, against which, during the knotting operations, the binding material presses in or about in the axial line of the knotter-shaft, and the tying-bill proper (the jaws D D′) projects from the head in a direction the opposite to that in which the eccentric neck or bulge *c* projects, but terminates much closer to the axis of the knotter-shaft than before, owing to the fact that the projection of the bill is from the cut-away or throat side of the head in this instance. In this way, as will be made apparent by inspection of Figs. 1, 2, 4, 19, and 20, together with the description next to be given, the knotter may be located closer to the knotter-box cover without interfering with the bill, and the knot formed much nearer the bundle than before with obvious advantage.

The laterally-projecting or side-bulged knotter-head (see Figs. 19, 20, 21, &c.,) is curved or inclined inward or toward the axis from the base to the outer end of the head, is slotted for the reception of the movable jaw D, and its sliding rod or actuating-shank *d* carries the fixed jaw D′, and is so formed as to provide the offset or curved shoulder *d′* near the point or extreme end of the head. The movable jaw is pivoted in the head at c^2 at one side of the longitudinal center of the shaft *c*, and to the slide-rod at d^2, and has the heel-extension d^3. The slide-rod *d*, it should be noticed, is fitted to reciprocate in the open slot at one side of the knotter-head and its shaft C, instead of being centrally mounted in the knotter-shaft, as in my prior patented improvements, thus enabling the binding material to be brought against the head at the throat *c′* at the base of the fixed jaw of the tying-bill, and in this way avoiding the wrapping of binding material from the loop or banding portion about the head, as farther on will more plainly appear.

The knotter-shaft is divided into two portions, the inner section, to which the pinion B is secured, being suitably mounted to rotate in fixed bearings *b′ b′* of the knotter-box B′, and the outer portion being connected thereto by a suitable joint, as shown at E, so that while the two parts of the shaft rotate together the outer section may be vibrated with a suitable support to cause the knotter-head to approach and move away from a clamp, I, in turn to be described.

The vibrating portion of the shaft C is shown as made in two lengths abutted and connected by the flanges *e e*, as in my before-patented improvements, and this portion is supported by a vibrating plate, E′, pivoted at one end, as at *e′*, so as to sway about a center directly beneath the joint between the two sections of the shaft. The pivotal connection between the inner or heel end of the vibrating support E′ and the bottom of the knotter-box is formed, as clearly shown in Fig. 2, so as to avoid binding or cramping the plate or interfering with its free vibration. A stud-supported roller, *e′*, above the rear or outer end of the support holds it against being accidentally moved vertically out of place. The stud-shaft of this retaining-roller is suitably fastened to the rear end of the knotter-box. Post or bracket bearings F F′ of the vibrating plate E′ support the vibrating section of the shaft C. These bearings are each formed of two parts, in a well-known way, to facilitate adjustment.

The vibrating section of the knotter-shaft is acted upon by a spring, so as to be yieldingly held in its normal position, which, as shown in Fig. 1, is at a slight angle with the fixedly-supported section of the shaft. At the proper time, when the force of the spring is overcome in the formation of the knot, the knotter-head is swayed first toward the clamp I by the pull of the binding material as it is taken up by the knotter, and upon the completion of the knot and release of the band the spring returns the knotter to its normal position. This knotter-actuating spring F^2 is shown as adapted to perform its function by a thrusting

action, being connected at its opposite ends, respectively, with the vibrating support and the outer side of the knotter-box, the knotter-box being chambered or widened at *f* to accommodate the spring, which is secured against displacement by the bolt *f'*. At its opposite end the spring is similarly connected with the bearing-post F' by the bolt f^2.

A yielding stop or rubber cushion, G, against which the head of the bolt f^2 bears, serves to limit the movement of the knotter in one direction and to relieve the parts of injurious shocks when the spring returns the swaying section of the knotter-shaft to its normal position.

Accidental or premature movement of the vibrating section of the knotter-shaft toward the clamp is prevented by means of a suitable automatically-tripped device, shown as formed by a gravitating forked or yoke-shaped detent, G', pivoted between lugs *g g*. The lower arm of the detent is provided with the shoulder or hook *g'* at its end, and normally this arm crosses the plate E', (see Fig. 5,) so that the hook serves to dog it against movement toward the clamp. The upper or tripper arm of the detent crosses the knotter-shaft when in its normal position, is inclined on its under side at its end, and is provided with the inclined or rounded shoulder g^2. A short pin or rounded projection, g^3, fixed to the knotter-shaft, acts, at the proper time when the shaft is being turned, to lift the tripper-arm and so raise the detent-arm to free the vibrating supporting-plate. Upon the return of the shaft to its normal position the tripper-arm rides over the shaft into its position of rest, to dog the shaft-supporting plate. A spring might be used in connection with this detent-yoke; but in practice it has not been found necessary, the force of gravity serving to insure proper operation.

The slide-rod *d* of the pivoted jaw D is provided with a shoulder or side stud, *h*, at its end, and the knotter-shaft is made hollow for a portion of its length, and provided with a spring, H, to act upon the slide-rod to move it outward and hold the pivoted jaw closed against the fixed jaw, except when the movable jaw is tripped and opened by the action of an incline, *h'*, of the bearing F' upon the stud *h*, essentially as in the before-mentioned Patent No. 260,668. As the slide-rod is in a slot at the side of the knotter-shaft, instead of in the center of the shaft, as before, the spring H is made to act upon the stud *h* through or by way of a stemmed plug or headed rod, H'. The spring surrounds the plug-stem. (See Fig. 2.)

The clamping and cutting mechanism is in many respects the same as in Patent No. 260,668, the receiprocating clamp I, as in said patent, being actuated by the spring I', the rod I^2, supported and guided and limited in its movements by the bearings *i i'*, the crank-pin J of the knotter-shaft, and the bell-crank lever J'. The spring retracts the clamp-head to cut and clamp the cord at the proper time, after the lever J', by its connection at *j* with the slide-rod of the clamp, has advanced it, and the clamp-head is provided with a notch, *j'*, to receive the binder-arm end of the cord when a gavel is first encircled, as before. In some respects, however, the clamp and the knife or fixed member K of the cutter differ from the devices of Patent No. 260,668, as will appear in the description next to be given.

The head or outer end of the clamp-bar I is made slightly tapering or wedge-shaped, the clamp-bar being widest at its outer end, as will be understood by inspection of Fig. 9, where the distance between the dotted line *l l* and the full line, which shows the width of the clamp-bar, indicates the amount of taper of the bar, this inclination being all on one side—that opposite the knife K. This knife is secured by a bolt, *k*, passing through its shank and through the knotter-box lug or flange beneath the guiding recess or chamber, in which the clamp-head works, up to and away from the fixed member of the clamp. (See Figs. 4, 9, 10, and 11.) This fixed member of the clamp is formed in part by a shouldered lug, L, secured by the bolt *k*, and in part by properly shaping the bottom of the chamber, in which the movable section or head of the clamp slides. As shown, the fixed jaw of the clamp is formed with a recess between the lug L and shoulder L', and a piece of leather, *l*, or equivalent packing or yielding material, is placed therein to prevent injury to the cord when jammed against it. The clamp-head has the knife-edged shoulder *m*, downwardly projecting at one side, to act in connection with the knife K, and at the other side is the downwardly-projecting lip or lug *m'*, to enter the recess of the fixed section of the clamp and compress the binding material against the yielding surface or cushion *l* thereof.

The knife K is adapted to spring slightly, being formed with an upwardly-projecting portion having the vertical cutting-edge, and with a shank, by which it is adjustably secured in place by the bolt *k* and its nut, so that the knife may be made to bear upon the sliding clamp I with a yielding pressure, in order that when the clamp is acted upon by its spring and retracted suddenly it will be properly wedged in place, so as to hold the cord with greater force than that exerted by the spring alone, and yet not be so tightly bound as to require too great force for starting it when to be advanced. At its side opposite the knife K the clamp works against an adjustable gib, N, secured in the desired position by a screw, M, and nuts. This gib has flanged ends to snugly embrace the bearing-post or box-lug O, through which the screw passes, at one side of the clamp-head guideway, and so enable the parts to be readily fitted together, and provide for adjusting the width of the guideway to compensate wear resulting from the frequent reciprocations of the clamp.

From the above description, with reference, if necessary, to my prior improvements patented July 4, 1882, the operation of the clamping and cutting mechanism will be understood. A guard or cord-director, *p*, insures the entrance of the cord into the guide-slot P, when, upon the descent of the binder-arm, its nose is caused to cross beneath the knotter-head in well-known way.

In knotting the ends of a band (after the grain has accumulated against the cord, pushed it back so as to cause it, near its clamped end, to enter the slot and be guided to the knotter throat, and the binder-arm has been rocked downward to present the other end of the band to the knotter) the operation is as follows: The tying-bill is first rocked upward from the normal position in which it is shown in Fig. 21 to the preparatory position in which it is shown by dotted lines, Fig. 22. This preliminary preparatory movement of the knotter is merely incidental to the peculiar construction of the mechanism by which the knotter-pinion is positively controlled, so as to secure certainty of action of the knotter. Next the knotter is rocked downward to cause the jaws to cross over or reach outside of the band ends, as shown in full lines, Fig. 22. The knotter-head is then rocked in the opposite direction, or upward, and makes about one and one-quarter revolution, operating upon the band ends as shown by Figs. 23 to 28, inclusive, completing the knot and leaving the end of the binding material clamped. The knotter-head, as it swings toward the clamp and rolls up and winds up cord between it and the clamp, takes up from the bundle-loop or banding portion but a small proportion of the amount of cord required in forming the knot. The cord thus taken from the banding portion may be provided by the slack produced by any suitable bundle-compressing devices—such, for instance, as shown in Patents No. 275,330 and 275,441; or it may be provided by slightly increasing the tension on the cord about the bundle, so as, if preferred, to give the proper additional compression to the bundle by slight strain on the cord, instead of by appropriate compressing mechanism acting to give the needed additional compression to the bundle after banding it. At about the time the band ends are seized by the tying-bill jaws (at a stage in the knotting operation intermediate the times at which the knotter occupies the positions in which it is shown by Figs. 24 and 25, respectively,) the clamping and cutting mechanism is actuated to first release the clamped end of the band and then sever the other end of the band and clamp the end of the binding material in an obvious way. By the time the binder-gear has been brought to rest, as represented in Fig. 13, the knotter will have been returned to its normal position, as shown in Fig. 21. It will be seen that in opening the tying-bill the heel d^3 of the movable jaw (see Figs. 19 and 20) will be forced under and inside of or behind the loop of cord wound about the neck of the knotter, so that in closing this jaw its heel will force the loop from the knotter-neck to the jaws, as it is shown in Fig. 26. The strain upon the bundle-loop or banding portion of the cord which is required to draw tight the knot is given in part by the slight tension which comes upon the bundle-loop when the knotter-head is horizontally vibrated and moved toward the clamp transversely to the length of the bundle in the binding receptacle above, and in part by the slight increased tension resulting from taking up the short length of cord needed from the banding portion to pass about the jaws only of the knotter-head, as will readily be understood from inspection of the drawings.

It will further be understood that the slight amount of cord taken from the banding portion by strain on the cord or otherwise is utilized in forming the knot instead of being to an injurious extent given back into the band, as it would be were the throat omitted and the neck extended on the jaw side of the knotter-head.

I do not wish to be understood as confining my improvements to the precise details of construction and arrangement particularly described above, as my invention may be variously modified—as, for instance, by the substitution of other mechanism for that which I prefer to employ for actuating the knotter, and by having a non-yielding or rigid knife and providing for yieldingly wedging the clamp in place in other ways than by the spring of the knife.

I do not herein claim features hereinbefore shown and described other than those relating to a vibrating knotter and its coacting mechanism, having elsewhere claimed such novel features as are not comprised in the claims hereinafter made.

I claim as of my own invention—

1. The combination, substantially as hereinbefore set forth, of the rotary knotter-head, its rotary shaft, consisting of the inner and outer sections jointed together, the fixed bearings in which the inner section is mounted, and clamping mechanism toward which the knotter-head moves in taking up cord to form the knot, for the purpose described.

2. The combination, substantially as hereinbefore set forth, of a vibrating rotary knotter-head, its sectional jointed shaft, mechanism for actuating the knotter, and clamping mechanism toward and away from which the knotter-head moves, for the purpose described.

3. The combination, substantially as hereinbefore set forth, of the horizontally-vibrating rotary knotter-head, its shaft, consisting of the inner section and outer vibrating section jointed thereto, the pinion secured to the inner section, mechanism for actuating the pinion, and clamping mechanism toward and away from which the knotter-head moves, for the purpose described.

4. The combination, substantially as hereinbefore set forth, of a rotary knotter-head, its sectional jointed shaft, and a vibrating sup-

port for the outer section of the shaft, for the purpose described.

5. The combination, substantially as hereinbefore set forth, of a rotary knotter-head, its sectional jointed shaft, a vibrating support for the outer section of the shaft, and a spring acting on said support, for the purpose described.

6. The combination, substantially as hereinbefore set forth, of a rotary knotter-head, its sectional jointed shaft, a vibrating spring-actuated support for the outer section of said shaft, and cord clamping and cutting mechanism, for the purpose described.

7. The combination of the knotter-box, the inner section of the knotter-shaft, mounted to rotate in fixed bearings, the outer section of said shaft, the joint connecting the two sections, the vibrating supporting-plate, pivoted beneath said joint and provided with bearings for the outer section of the knotter-shaft, the cord clamping and cutting mechanism, and the spring acting upon the vibrating support, substantially as and for the purpose hereinbefore set forth.

8. The combination of the knotter-box, the knotter-head, the knotter-shaft, the vibrating support for the outer end of the knotter-shaft, and the retaining-roller, substantially as and for the purpose hereinbefore set forth.

9. The combination of the rotary knotter-head, its vibrating support, the clamp, the spring acting on said support to move the knotter-head away from the clamp, and the stop-cushion for the support, substantially as and for the purpose hereinbefore set forth.

10. The combination of the vibrating knotter-head, its sectional jointed shaft, the vibrating support for the outer section of the shaft, the clamp, the spring acting on said support, and the stop-cushion, substantially as and for the purpose hereinbefore set forth.

11. The combination of the knotter-head, its shaft, the vibrating support for the outer end of said shaft, and the detent, actuated by the knotter-shaft and dogging said support to prevent accidental vibration of the knotter-head, substantially as hereinbefore set forth.

12. The combination of the knotter-box, the rotary knotter-shaft, the vibrating support for the knotter-shaft, the detent dogging said support and provided with the tripper-arm, and the projection on the knotter-shaft, acting upon the tripper-arm to free the vibrating support, substantially as and for the purpose hereinbefore set forth.

In testimony whereof I have hereunto subscribed my name.

JOHN S. DAVIS.

Witnesses:

GEORGE W. HUMPHREY,

WILLIE HUMPHREY.